



Strengthening Oral Health and Oral Hygiene Behaviour among School-Aged Children through the Healthier Smiles Phase 7 Programme: Results of an End-line Assessment in North Luwu and East Luwu Regencies, South Sulawesi, Indonesia

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Abstract

Oral health problems among school-aged children remain a major public health challenge in Indonesia, particularly in rural areas where access to dental care services is limited. This study aimed to evaluate the achievements of the Healthier Smiles Phase 7 Programme through an end-line assessment, focusing on changes in oral health knowledge, attitudes, and practices, the strengthening of the school environment, and programme sustainability. A mixed-methods approach with a non-experimental repeated cross-sectional design was employed, integrating quantitative surveys, school observations, Key Informant Interviews (KIIs), and Focus Group Discussions (FGDs). A total of 544 respondents, comprising 250 students, 250 parents or caregivers, and 44 teachers from 12 schools, participated in the study. The findings demonstrated that students' knowledge increased from 64.4% to 84.0%, while positive attitudes reached 98.4%. The programme also strengthened supervised toothbrushing activities, school-based health education, collaboration with community health centres (*Puskesmas*), and the implementation of the School Health Programme (*Usaha Kesehatan Sekolah*—UKS). However, healthy behavioural practices did not fully correspond with the improvement in knowledge, indicating the need for sustained reinforcement through support from families, schools, and local government. It is concluded that the Healthier Smiles Phase 7 Programme has contributed to improving oral health and oral hygiene behaviours while strengthening the school health system. Nevertheless, sustaining these achievements requires stronger policy support and continued cross-sectoral collaboration.

Keywords: Oral Health; Oral Hygiene; Health Behaviour; School-Aged Children; Healthier Smiles; Healthy Schools; Mixed Methods; Health Promotion.

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**1. Introduction**

Oral health is an integral component of overall health, as it influences an individual's ability to eat, speak, learn, and interact socially. Among school-aged children, poor oral health not only increases the risk of dental caries and oral infections but also adversely affects nutritional status, academic performance, quality of life, and psychosocial development. Consequently, oral health has become a key indicator of child health development and forms an essential part of promotive and preventive health efforts that should be implemented sustainably through a cross-sectoral approach ((WHO, 2022); (Petersen, 2003)).

The Healthier Smiles Phase 7 End-line Assessment Report highlights that Indonesia continues to face a substantial burden of oral health problems, particularly among school-aged children living in rural areas. In South Sulawesi Province, especially in North Luwu and East Luwu Regencies, these challenges are exacerbated by geographical barriers, a shortage of oral health professionals, limited parental awareness, and inadequate Water, Sanitation and Hygiene (WASH) facilities in schools. These conditions have hindered optimal oral disease prevention, emphasising the need for more comprehensive and sustainable interventions ((Kemenkes RI, 2023); (WHO, 2022)).

The Healthier Smiles Phase 7 Programme was developed in response to these challenges through a school-based health promotion approach that integrates oral health promotion with the strengthening of school health systems. The programme is implemented by Save the Children Indonesia, with support from the Mars Wrigley Foundation, across 40 schools in North Luwu and East Luwu Regencies. The intervention extends beyond oral health education to include supervised toothbrushing, capacity building for teachers and parents, oral health screening through community health centres (Puskesmas), strengthening the School Health Programme (Usaha Kesehatan Sekolah—UKS), and integrating other health components such as handwashing with soap, nutrition, mental health, menstrual health management, climate literacy, and waste management. This multisectoral approach was designed to promote sustainable behavioural change through the active involvement of schools, families, communities, and local government ((Save the Children Indonesia, 2026); (WHO, 2021)).

Although successive phases of the Healthier Smiles Programme have demonstrated improvements in public knowledge of oral health, previous evaluations have consistently identified a gap between high levels of knowledge and the consistent adoption of healthy behaviours. Barriers such as limited access to dental services, family habits, socio-cultural influences, and inadequate reinforcement of healthy practices at home have constrained sustained behavioural change. Furthermore, programme sustainability is influenced by the degree of institutionalisation within schools, local government commitment, policy support, and the availability of continued funding following programme completion. Therefore, an end-line assessment is required not only to measure changes in outcome indicators but also to evaluate the factors influencing programme sustainability ((Nutbeam, 2000); (Green & Kreuter, 2005)).

This end-line assessment was designed as a programme performance assessment rather than an experimental impact evaluation. The study focuses on assessing the





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contribution of the Healthier Smiles Programme to changes in knowledge, attitudes, and health practices, improvements in the school environment, strengthening institutional support, and the processes of programme institutionalisation and sustainability. The findings are expected to provide an evidence base for programme learning, donor accountability, and the development of strategic recommendations for future phases of the Healthier Smiles Programme ((OCDE, 2021); (Save the Children International, 2021)).

Conceptually, this study adopts the Knowledge, Attitudes, and Practices (KAP) Framework to understand the relationships among health knowledge, attitudes, and behaviours. In addition, the analysis is informed by Bloom's Taxonomy, Social Cognitive Theory (SCT), and the Health Belief Model (HBM) to explain how behavioural change is influenced by learning processes, self-efficacy, environmental support, perceived risk, and the barriers individuals encounter when adopting healthy behaviours. The integration of these theoretical perspectives provides a more comprehensive basis for interpreting the findings, particularly regarding the discrepancy between increased knowledge and the consistent practice of healthy oral health behaviours observed among some respondents ((Bloom et al., 1956); (Bandura, 1986); (Rosenstock, 1974); (Launiala, 2009)).

Based on the above considerations, this study aims to evaluate the contribution of the Healthier Smiles Phase 7 Programme to improving oral health and oral hygiene behaviours among school-aged children, assess the strengthening of the school environment and institutional support, identify factors influencing programme implementation and sustainability, and develop evidence-based recommendations for more effective, sustainable, and scalable school health programmes in similar settings. The findings are expected to provide an important reference for strengthening school-based health promotion policies in Indonesia ((WHO, 2021); (WHO, 2022)).

2. Research Method

This study formed part of the End-line Assessment for Oral Health and Oral Hygiene Behaviour among School-Aged Children in North Luwu and East Luwu, South Sulawesi Province, which was designed as a programme performance assessment to evaluate the implementation outcomes of the Healthier Smiles Phase 7 Programme. Unlike experimental studies that aim to examine the effectiveness of an intervention by comparing intervention and control groups, this study focused on measuring programme indicators, identifying factors influencing programme implementation, and assessing programme sustainability after several years of implementation. Accordingly, the findings were interpreted as evidence of the programme's contribution to observed changes rather than as evidence of a direct causal relationship ((OCDE, 2021); (Save the Children Indonesia, 2026)).

This study employed a mixed-methods approach using a convergent parallel design, in which quantitative and qualitative data were collected concurrently, analysed separately, and subsequently integrated during the interpretation stage. This approach was selected because it provides a more comprehensive understanding of changes in oral health and oral hygiene behaviours while simultaneously explaining the factors





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contributing to both the success and the challenges of programme implementation. Quantitative data were used to measure changes in indicators specified within the programme's logical framework (programme logframe), whereas qualitative data were used to explain the implementation context, social dynamics, institutional support, and programme sustainability ((Creswell & Clark, 2007); (Creswell & Creswell, 2017)).

The study was conducted in North Luwu Regency and East Luwu Regency, South Sulawesi Province, where the Healthier Smiles Phase 7 Programme had been implemented. These two regencies were selected because they comprised the programme implementation sites across 40 target schools with diverse geographical characteristics, including urban, rural, and remote settings. This geographical diversity provided an opportunity to evaluate programme implementation across different educational and healthcare contexts while identifying the challenges encountered in delivering school-based health interventions (Save the Children Indonesia, 2026).

The study population included all stakeholders involved in the implementation of the Healthier Smiles Programme, namely primary school pupils in Years 1–4, parents or caregivers, teachers, headteachers, community health centre (Puskesmas) staff, and district-level policy-makers. However, as this study was designed as a programme performance assessment, the target population was limited to schools that had received the programme intervention. Consequently, the findings were intended to describe programme achievements within participating schools rather than to generalise the results to all schools in North Luwu or East Luwu Regencies (Patton, 2014).

A multi-stage sampling approach was employed, combining several sampling techniques according to respondent characteristics. In the first stage, stratified cluster sampling was used to select 12 schools from the 40 programme schools, taking into account district representation, school type, and geographical conditions. Schools were treated as the primary sampling units because the intervention was implemented at the institutional level, and most outcome indicators, such as supervised toothbrushing activities and the availability of Water, Sanitation and Hygiene in Schools (WinS) facilities, were school-level characteristics ((Lohr, 2023); (Levy & Lemeshow, 2009)).

Subsequently, simple random sampling was used within each selected school to recruit pupils in Years 1–4 from the official school register. The quantitative sample consisted of 250 pupils, each paired with 250 parents or caregivers using a paired sampling approach. This enabled analysis of the relationship between children's behaviours at school and family support at home. Additionally, 44 teachers were selected through purposive sampling, comprising teachers directly involved in implementing the Healthier Smiles Programme, including oral health education, supervision of toothbrushing activities, and management of the School Health Programme (Usaha Kesehatan Sekolah—UKS) ((Etikan et al., 2016); (Creswell & Creswell, 2017)).

The qualitative component was undertaken to provide a deeper understanding of programme implementation through Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), and field observations. In-depth interviews were conducted with representatives from the District Health Office, District Education Office, Regional Development Planning Agency (Bappeda), Puskesmas, and school headteachers to explore programme institutionalisation, policy support, cross-sectoral coordination, and





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sustainability strategies. Meanwhile, FGDs were conducted with groups of pupils and parents to explore their experiences of programme implementation, behavioural changes, and factors influencing programme success in both school and household settings. Field observations were undertaken to verify school facilities, health-related activities, and routine practices implemented as part of the programme intervention ((Krueger & Casey, 2009); (Patton, 2014)).

The research instruments were developed based on the Healthier Smiles Programme evaluation framework and consisted of structured questionnaires, semi-structured interview guides, FGD guidelines, and school observation checklists. The quantitative instruments measured several indicators, including oral health knowledge, twice-daily toothbrushing behaviour, handwashing with soap, consumption of sugary foods and beverages, access to oral healthcare services, and the availability of WinS facilities within schools. To ensure comparability with previous evaluations, most indicators and instruments were retained from Phase 6, while several new indicators were incorporated to reflect the expanded scope of the programme (Save the Children Indonesia, 2026).

Quantitative data were analysed using descriptive statistics to describe respondent characteristics and the achievement of each programme outcome indicator. These findings were subsequently compared with Phase 6 results to identify trends over time. Qualitative data were analysed through data reduction, coding, thematic categorisation, and interpretation using thematic analysis. Finally, quantitative and qualitative findings were integrated through data triangulation to provide a more comprehensive understanding of the relationships between programme outcomes, implementation context, and the factors influencing programme success ((Braun & Clarke, 2006); (Miles et al., 2013)).

To ensure data quality, the study implemented several quality assurance procedures, including intensive enumerator training, the use of standardised research instruments, field supervision, data quality control, and validation and triangulation across multiple data sources. Enumerators also received training in interview techniques, maintaining neutrality during data collection, and applying child safeguarding procedures to protect child participants. These measures were intended to minimise the risks of social desirability bias, recall bias, recording errors, and inconsistencies between enumerators during fieldwork ((Denzin, 2017); (Patton, 2014)).

The study adhered to recognised principles of research ethics, as outlined in the Inception Report. All adult participants received a full explanation of the study objectives before providing informed consent to participate. For child participants, written parental or caregiver consent was obtained prior to data collection, after which children were invited to provide voluntary assent. Participants' identities were kept confidential, and all data were used solely for research purposes. Throughout the data collection process, enumerators were required to apply child safeguarding principles, ensure children's safety and well-being, and discontinue interviews whenever a child appeared uncomfortable or unwilling to continue participating ((World Medical Association, 2013); (UNICEF, 2021)).





3. Results And Discussions

a. Characteristics of the Study Respondents

A total of 544 respondents participated in this study, comprising 250 pupils in Years 1–4, 250 parents or caregivers, and 44 teachers from 12 schools located across North Luwu Regency and East Luwu Regency. Respondents were selected using a multi-stage sampling approach tailored to the characteristics of each respondent group, thereby providing a representative overview of the implementation of the Healthier Smiles Phase 7 Programme within the participating schools. In addition to the survey respondents, the study also involved key informants from the District Health Office, District Education Office, Regional Development Planning Agency (Bappeda), Puskesmas, and school headteachers through in-depth interviews, as well as groups of pupils and parents through Focus Group Discussions (FGDs), to obtain a more comprehensive understanding of programme implementation and sustainability ((Creswell & Clark, 2007); (Patton, 2014)).

The respondent characteristics indicated that the interviewed pupils were drawn from Years 1 to 4, with a relatively even distribution across year groups. All participating schools had implemented the Healthier Smiles Programme for several years, meaning that respondents had substantial experience of programme activities, including oral health education, supervised toothbrushing, hand hygiene education, and other school-based health promotion initiatives. This provided a sound basis for evaluating behavioural changes associated with programme implementation (Save the Children Indonesia, 2026).

b. Changes in Oral Health Knowledge

One of the principal objectives of the Healthier Smiles Programme is to improve children's knowledge of oral health as the foundation for developing healthy behaviours. The findings demonstrated a substantial improvement in pupils' knowledge compared with the previous evaluation. The proportion of pupils with good oral health knowledge increased from approximately 64.4% in Phase 6 to 84.0% in Phase 7, indicating that the school-based health education activities effectively enhanced pupils' understanding of the importance of maintaining good oral health ((WHO, 2022); (Petersen, 2003)).

The improvement in knowledge extended beyond correct toothbrushing techniques to include an understanding of the use of fluoride toothpaste, the importance of reducing the consumption of sugary foods and drinks, the importance of handwashing with soap, and the relationship between oral health and overall health. These findings suggest that the educational components of the Healthier Smiles Programme successfully broadened pupils' understanding of healthy lifestyle behaviours in general (WHO, 2021).

From the perspective of behavioural change theory, increased knowledge represents the initial stage in the development of healthy behaviours. Bloom et al. (1956) argued that improvements in the cognitive domain are a prerequisite for developing positive attitudes and ultimately changing behaviour. Similarly, within





the Knowledge, Attitudes, and Practices (KAP) Framework, knowledge serves as the primary foundation influencing the development of attitudes and health-related practices (Launiala, 2009). Therefore, the observed improvement in knowledge suggests that the Healthier Smiles Programme has successfully strengthened pupils' cognitive capacity as a basis for long-term behavioural change.

c. Positive Attitudes towards Healthy Behaviour

In addition to improving knowledge, the study found that the majority of pupils demonstrated highly positive attitudes towards oral health and oral hygiene behaviours. Survey results indicated that approximately 98.4% of pupils expressed positive attitudes towards brushing their teeth twice daily, maintaining hand hygiene, reducing the consumption of sugary foods, and keeping the school environment clean (Ajzen, 1991).

The high proportion of positive attitudes suggests that the health messages delivered through classroom learning, health education, and routine school activities were well received by pupils. Regular activities such as supervised toothbrushing not only enhanced knowledge but also fostered the perception that maintaining oral health is an essential part of everyday life (WHO, 2021).

Nevertheless, the findings also revealed that these highly positive attitudes were not always accompanied by consistent behavioural change. This suggests that positive attitudes do not automatically translate into healthy practices. Such findings are consistent with the Health Belief Model, which proposes that health behaviour is influenced by various additional factors, including perceived barriers, environmental support, and individuals' ability to maintain healthy behaviours in their daily lives (Rosenstock, 1974).

d. Oral Health and Oral Hygiene Practices

The evaluation of behavioural practices indicated that most pupils had adopted the habit of brushing their teeth twice daily, washing their hands with soap at key times, and reducing their consumption of sugary foods and beverages. Nevertheless, the findings also revealed that some pupils had not yet been able to maintain these healthy behaviours consistently, particularly within the home environment (WHO, 2022).

The discrepancy between knowledge and practice emerged as one of the study's most significant findings. Although knowledge and attitudes had improved considerably, behavioural change required a longer process because it was influenced by numerous external factors, including family habits, the availability of facilities, parental supervision, and prevailing social norms within the community. These findings support Bandura's Social Cognitive Theory, which argues that behavioural change results from reciprocal interactions between individuals, their social environment, and their learning experiences.

The Healthier Smiles Programme has contributed to establishing healthy routines within schools; however, sustained long-term success requires continuous reinforcement of healthy behaviours within the home. Consequently, parental





involvement represents a crucial factor in maintaining children's behavioural changes beyond the school setting (Bandura, 1986).

e. Changes in Caregiver Knowledge and Support

The findings demonstrated that parents and caregivers possessed relatively high levels of knowledge regarding oral health, the importance of healthy dietary practices, personal hygiene, and the utilisation of healthcare services. Health education delivered through schools not only benefited pupils but also facilitated the dissemination of health information to families (Green & Kreuter, 2005).

However, the study also found that the adoption of healthy practices at home continued to be influenced by several factors, including parents' work commitments, family habits, household economic circumstances, and the easy availability of sugary foods and beverages. These findings indicate that improvements in parental knowledge need to be accompanied by effective family support strategies to ensure that children's behavioural changes are sustained over time (Nutbeam, 2000).

According to Green & Kreuter (2005), health behaviour is influenced by predisposing, enabling, and reinforcing factors. Within the context of this study, the family functions as a reinforcing factor, playing a pivotal role in sustaining positive behavioural changes among children over the long term.

f. Strengthening the School Environment through the Implementation of the Healthier Smiles Programme

One of the key findings of this study is that the Healthier Smiles Phase 7 Programme not only contributed to individual behavioural change but also successfully strengthened the school environment as a setting that supports the development of healthy behaviours. Based on school observations, teacher surveys, and interviews with headteachers and key stakeholders, it was evident that most schools had integrated a range of health promotion activities into their routine school programmes. The implementation of supervised toothbrushing, classroom-based oral health education, regular handwashing with soap, and the strengthening of the School Health Programme (Usaha Kesehatan Sekolah—UKS) demonstrates that health has increasingly become embedded within the school culture rather than being regarded merely as a project-based activity conducted at specific times ((WHO, 2021); (Langford et al., 2014)).

The observational findings also indicated that most schools had established basic facilities to support programme implementation, including handwashing stations, access to clean water, health education materials, and designated spaces for UKS activities. Although the quality and completeness of these facilities varied between schools, particularly those located in remote areas, there was an overall improvement in schools' commitment to providing an environment that encourages healthy and hygienic behaviours. These findings suggest that changes in children's behaviour are influenced not only by improved knowledge but also by the availability of supportive environments that enable healthy practices to be incorporated into everyday life ((WHO, 2020); (WHO, 2022)).





From the perspective of the Social Ecological Model, health behaviour is shaped by interactions between individuals and their physical, social, and institutional environments. Therefore, strengthening school facilities and fostering a healthy school culture are essential strategies for ensuring the sustainable adoption of healthy behaviours. The Healthier Smiles Programme demonstrates that school-based interventions have considerable potential to promote behavioural change because schools constitute environments that directly influence children's daily activities (McLeroy et al., 1988).

g. Strengthening Teachers' Capacity as Agents of Change

Teachers occupy a strategic position in the successful implementation of the Healthier Smiles Programme, as they serve not only as facilitators of learning but also as role models for pupils. The findings revealed that the majority of teachers participating in the study understood the objectives of the programme and had developed greater capacity to deliver oral health education to pupils. In addition, teachers played an active role in supervising toothbrushing activities, encouraging pupils to maintain personal hygiene, and integrating health messages into classroom teaching (WHO, 2021).

In-depth interviews with teachers indicated that the training provided during programme implementation enhanced their confidence in delivering school-based health promotion activities. Teachers no longer viewed oral health solely as the responsibility of healthcare professionals but increasingly recognised it as an integral component of the educational process that should be fostered through everyday routines. This shift in perspective represents an important indicator that the programme has successfully strengthened human resource capacity within the school environment (Bandura, 1986).

Nevertheless, several teachers also reported that sustaining programme activities remained challenging, particularly when staff turnover occurred or when schools experienced resource constraints. Consequently, institutional mechanisms are required to ensure that health promotion activities continue despite changes in school personnel (Fullan, 2025).

h. Family Support in Sustaining Behavioural Change

The findings from the Focus Group Discussions (FGDs) with parents indicated that families play a crucial role in sustaining the behavioural changes established through school-based activities. Most parents reported that, after participating in the Healthier Smiles Programme, their children had begun reminding other family members to brush their teeth regularly, wash their hands with soap, and reduce their consumption of sugary foods and beverages. This demonstrates that schools function not only as places of learning for children but also as important channels for disseminating health information to families (Green & Kreuter, 2005).

However, the study also found that the adoption of healthy practices within the home continued to be influenced by several factors, including parents' work commitments, limited time to supervise their children, household economic





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circumstances, and the easy availability of sugary snacks within the local environment. Some parents acknowledged that they were not yet able to consistently supervise their children's toothbrushing before bedtime or restrict their intake of sugary foods (Nutbeam, 2000).

These findings indicate that behavioural change cannot be achieved solely through school-based interventions. Family support serves as a vital reinforcing factor that determines the long-term success of behavioural change. Therefore, school-based health promotion programmes should continue to engage parents as key partners in fostering healthy lifestyle habits among children (Bandura, 1986); (Bronfenbrenner, 1979).

i. Programme Institutionalisation at School and Local Government Levels

One of the principal objectives of the End-line Assessment was to evaluate the extent to which the Healthier Smiles Programme had been institutionalised within both the school system and local government structures. Interviews with representatives of the District Health Office, District Education Office, Bappeda, Puskesmas, and school headteachers revealed a strong commitment to continuing the various activities developed throughout programme implementation. Several schools had incorporated health promotion activities into their school work plans, while Puskesmas had begun integrating school health development activities into their routine community health service programmes ((WHO, 2021); (Save the Children Indonesia, 2026)).

Nevertheless, the degree of institutionalisation varied between districts and among individual schools. Several informants noted that programme sustainability still required stronger regulatory support, adequate budget allocation, and more systematic cross-sectoral coordination mechanisms. Without such policy support, there is a risk that some programme activities may decline following the conclusion of external funding and programme assistance (OCDE, 2021).

These findings suggest that the success of a school health programme depends not only on individual behavioural change but also on the capacity of education and health systems to adopt and sustain innovations that have been developed through programme implementation (Rogers, 2003).

j. Integration of Quantitative and Qualitative Findings

The mixed-methods approach enabled this study to generate a more comprehensive understanding than would have been possible through the use of either quantitative or qualitative methods alone. The quantitative findings demonstrated improvements in knowledge, attitudes, and health practices, while the qualitative findings explained the factors contributing to these changes as well as the challenges that remained. The integration of these two sources of evidence indicated that programme success was influenced by a combination of health education, school-based routine practices, teacher support, family involvement, and collaboration between schools, Puskesmas, and local government authorities ((Creswell & Clark, 2007); (Fetters et al., 2013)).





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Data triangulation further demonstrated that several behavioural indicators reported in the survey corresponded with field observation findings, including the implementation of routine supervised toothbrushing and the availability of supporting school facilities. Nevertheless, some discrepancies remained between high levels of knowledge and the consistency of everyday health practices. These findings reinforce the conclusion that behavioural change is a complex process influenced by factors operating at the individual, family, school, and wider social environment levels ((Denzin, 2017); (Miles et al., 2013)).

Overall, the findings indicate that the Healthier Smiles Phase 7 Programme has made a significant contribution to improving oral health and oral hygiene behaviours among school-aged children while simultaneously strengthening the school health system. However, sustaining these achievements requires stronger policy support, enhanced institutional capacity, and the active engagement of all stakeholders to ensure that the improvements achieved can be maintained and replicated in other areas with similar characteristics ((WHO, 2022); (Save the Children Indonesia, 2026)).

4. Conclusion

This study demonstrates that the Healthier Smiles Phase 7 Programme has made a significant contribution to strengthening oral health and oral hygiene behaviours among school-aged children in North Luwu and East Luwu Regencies. The school-based approach, which integrates health education, behavioural reinforcement through supervised toothbrushing, teacher capacity building, family engagement, and collaboration with *Puskesmas* (community health centres), has successfully improved knowledge, fostered positive attitudes, and enhanced health practices among the majority of respondents. These findings highlight the strategic role of schools as effective settings for promoting healthy behaviours from an early age.

The findings also indicate that improvements in knowledge and attitudes have not been fully accompanied by consistent behavioural change. A gap remains between pupils' understanding of the importance of maintaining good oral health and their everyday practices, particularly within the home environment. This suggests that behavioural change is a complex process influenced by multiple factors, including family support, social norms, economic circumstances, the availability of facilities, and access to oral healthcare services. Consequently, the success of school-based health interventions depends not only on educational activities but also on the ability to create supportive environments that reinforce healthy behaviours over the long term.

The mixed-methods approach employed in this study provided a more comprehensive understanding of the implementation of the Healthier Smiles Programme. Quantitative findings demonstrated improvements in key behavioural indicators, while qualitative findings explained the processes of change, enabling factors, implementation challenges, levels of programme institutionalisation, and opportunities for sustainability. The integration of these two methodological approaches produced stronger evidence than the use of a single research method, as it enabled the study to explain not only what had changed but also why and how those changes had occurred.





The study further revealed that the success of the Healthier Smiles Programme was determined not only by individual behavioural change but also by the strengthening of school systems and the commitment of local government. The active involvement of teachers, headteachers, *Puskesmas*, District Education Offices, District Health Offices, and the Regional Development Planning Agency (*Bappeda*) played a vital role in supporting programme sustainability. Several schools have integrated health promotion activities into their routine school programmes, while local government authorities have begun strengthening cross-sectoral coordination as part of broader efforts to establish healthy schools. Nevertheless, stronger regulatory frameworks, adequate budget allocation, and more systematic coordination mechanisms remain essential to ensure that programme benefits are sustained beyond the period of external support.

Based on these findings, it is recommended that the Healthier Smiles Programme should continue to be strengthened through enhanced collaboration between the education sector, the health sector, and local government. Greater support for families is also required to ensure that healthy behaviours established at school are maintained within the home. Furthermore, improving access to oral healthcare services in remote areas, strengthening teachers' capacity, and integrating the programme into local government policies represent strategic priorities for sustaining and scaling up the programme in other areas with similar characteristics.

Overall, this study provides evidence that a participatory and multisectoral school-based health promotion approach represents an effective strategy for improving oral health and oral hygiene among school-aged children. The findings are expected to provide an important scientific basis for strengthening school-based health promotion policies in Indonesia while supporting the implementation of child health programmes that emphasise sustainable behavioural change and long-term health system strengthening.

5. Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there are no financial or non-financial conflicts of interest that could have influenced the conduct of this study, the analysis and interpretation of the data, or the preparation of this manuscript.





Statement of informed consent

This study was conducted in accordance with internationally recognised ethical principles governing research involving human participants. All adult participants provided written informed consent prior to their participation in the study. For school-aged child participants, written consent was obtained from their parents or caregivers, while the children themselves provided voluntary assent before the interviews commenced. All information collected during the study was treated as strictly confidential and used solely for research purposes. Throughout the data collection process, child safeguarding principles were rigorously applied to ensure the safety, well-being, dignity, and protection of children's rights during every stage of the research.

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