

**Development and evaluation of a brief school-based
intervention to prevent tobacco initiation and promote
the health and well-being of adolescents in Dhaka,
Bangladesh**

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*A thesis submitted in partial fulfilment of the requirements for
the degree of*

**Doctor of Philosophy
of
University College London**

*Department of Behavioural Science and Health
Institute of Epidemiology and Health Care
University College London*

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Declaration

I, Sahadat Hossain, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

The following work was carried out at the Department of Behavioural Science and Health, Institute of Epidemiology and Health Care at University College London, under the supervision of Professor Lion Shahab and Dr Emma Beard. This thesis has not been submitted, in whole or in part, for any other degree, diploma or qualification at any other University.

My work was funded by the Commonwealth Scholarship Commission in the UK.

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Abstract

Adolescent tobacco initiation is a pressing global public health concern, particularly in low- and middle-income countries (LMICs), where preventive interventions remain scarce. Schools provide an ideal setting for tobacco prevention initiatives, yet there is a lack of such programmes in Bangladesh. This thesis aimed to develop and evaluate a brief, evidence-based and theory-driven, school-based intervention – Intervention for Adolescent Tobacco Initiation Prevention (IATIP) – to prevent tobacco initiation and promote adolescent health and well-being in Dhaka, Bangladesh.

This mixed-methods thesis comprises five interrelated studies. First, a systematic review identified that theory-driven, concise, and interactive interventions, incorporating culturally relevant content and trained facilitators, were more likely to be effective in reducing adolescent tobacco use. Second, a school-based survey of 2,593 adolescents (aged 11-18 years) from 24 schools found that 16.0% had ever used tobacco and 7.3% were current users. Students expressed strong preferences for expert-led interventions that addressed peer influence, social norms, and mental well-being. These findings, alongside behaviour change theories and expert consensus, informed the development of IATIP. Third, a qualitative study informed cultural adaptation of the intervention, highlighting the importance of incorporating religious values, relatable visuals, and interactive delivery methods. Fourth, a pilot cluster randomised feasibility trial (n=1,396; aged 11-17 years; 8 schools) demonstrated high recruitment (88.4%) and retention (96.5%) rates, with an approximately 75.4% reduction in intention to use tobacco in the intervention

group at one-month follow-up. Feasibility indicators such as fidelity, acceptability, and implementation quality were favourable. Preliminary data also suggested positive trends in mental well-being (mean difference: 6.16), refusal skills (odds ratio: 22.12), and decision-making abilities (mean difference: 3.23). Finally, a process evaluation identified implementation strengths and areas for future refinement.

The findings suggest that IATIP is a feasible, acceptable, and contextually relevant school-based intervention for adolescents in Bangladesh. A full-scale trial with extended follow-up is recommended to evaluate the effectiveness of long-term behavioural outcomes and the potential for scalability in Bangladesh and comparable LMIC settings.

Impact statement

My research contributes to the prevention of adolescent tobacco initiation and the promotion of mental well-being by developing and piloting a school-based intervention, the Intervention for Adolescent Tobacco Initiation Prevention (IATIP), in Bangladesh. While tobacco use and poor mental well-being are interlinked, prevention efforts in low- and middle-income countries (LMICs) rarely address both issues concurrently. I developed a culturally tailored, theory-driven intervention that integrates tobacco prevention strategies with mental well-being components, offering preliminary insights into its feasibility and relevance for adolescent health promotion.

Within academia, my research advances knowledge by integrating behaviour change theories, systematic evidence synthesis, and empirical research to inform intervention development. Through a feasibility cluster randomised controlled trial (C-RCT), I piloted IATIP, demonstrating high recruitment (88.4%, n=1,396) and retention (96.5%), with a 75.4% reduction in intention to use tobacco in the intervention group at one-month follow-up. The trial also showed significant improvements in mental well-being, refusal skills, and decision-making abilities. These findings support the feasibility and acceptability of the intervention and offer early indications to inform future full-scale evaluations in Bangladesh.

I have actively disseminated my findings through conference presentations, journal publications, and research collaborations. My systematic review and meta-analysis has been published in the American Journal of Preventive Medicine, and another article is currently under review in the Journal of Pilot and Feasibility Studies. I am also preparing additional findings for submission to high-impact journals. I co-supervised a UCL BSc dissertation utilising a part of my school survey data (n=2,593), fostering academic development. My research has also facilitated collaborations with public health researchers at Queen Mary University of London and Jahangirnagar University in Bangladesh, ensuring its relevance for future studies on multi-component school-based interventions.

Beyond academia, my research has significant implications for public health, education, and policymaking. Through participatory activities such as poster-making on tobacco prevention and mental well-being (see Appendix 8.1), my intervention fostered critical thinking, life skills, and adolescent engagement. Most participants (94.6%) rated the intervention as highly acceptable, and teachers reported observable improvements in students' confidence and decision-making skills. While preliminary, these findings suggest the potential of creative, school-based interventions to address adolescent health in resource-constrained settings.

The field implementation of my intervention was supported by a £17,480 grant from the Commonwealth Scholarship Commission, reflecting its practical value and feasibility. I have shared my findings with public health professionals, educators, and policymakers to help shape future adolescent health behaviour strategies. I intend to build on this work through policy briefs, stakeholder engagement, and collaborative adaptation of IATIP in other LMICs.

My next step is to conduct a full-scale C-RCT to evaluate the long-term effectiveness, sustainability, and scalability of IATIP. This research lays important groundwork by demonstrating the feasibility of delivering integrated tobacco prevention and mental health promotion interventions in school settings, and by informing future efforts to improve adolescent well-being in Bangladesh and beyond.

Publications

Peer-reviewed journal articles deriving from my PhD studies

1. Hossain S, Tattan-Birch H, Beard E, Shahab L. (2025): **Evaluating school-based interventions for preventing and reducing tobacco use among adolescents in low- and middle-income countries: A systematic review and meta-analysis**. American Journal of Preventive Medicine.
<https://doi.org/10.1016/j.amepre.2025.107656>
2. Hossain S, Beard E, Shahab L. [Provisionally accepted for publication, Manuscript number: PAFS-D-24-00188, 16 July 2025]: **Intervention for Adolescent Tobacco Initiation Prevention (IATIP) to promote health and well-being: A protocol for a pilot feasibility cluster randomised controlled trial in Dhaka, Bangladesh**. Pilot and Feasibility Studies.
3. Hossain S, Beard E, Kale D, Mishu MP, Jackson S, Cox S, Shahab L. [Under review, Manuscript number: 7330224b-3089-4cf5-bcf6-76d6b8463cb2, submitted 18 July 2025]: **Prevalence and correlates of tobacco use among adolescents in Dhaka, Bangladesh: A cross-sectional study**. BMC Public Health.
4. Hossain S, Beard E, Kale D, Mishu MP, Jackson S, Cox S, Shahab L. [Manuscript in progress for journal submission]: **Association of adolescent tobacco use with depression and anxiety: Evidence from Bangladesh**.

Conference oral presentation

1. Hossain S, Tattan-Birch H, Beard E, Shahab L. (2023): **Adolescent tobacco use prevention interventions in low-and middle-income countries (LMICs): A systematic review and meta-analysis**. Society for Research on Nicotine and Tobacco Europe (SRNT-E) Annual Conference 2023 in London.

Planned manuscripts for publication

1. Hossain S, Crayton E, Beard E, Shahab L. **Identification of behaviour change techniques in school-based tobacco prevention interventions for adolescents in low- and middle-income countries: A systematic review.** (Planned manuscript from Chapter 2)
2. Hossain S, Beard E, Shahab L. **Exploring the suitability, cultural adaptation, and practical implementation challenges of a tobacco prevention intervention for adolescents in Dhaka, Bangladesh: A qualitative study.** (Planned manuscript from Chapter 5)
3. Hossain S, Beard E, Shahab L. **Feasibility of the Intervention for Adolescent Tobacco Initiation Prevention (IATIP) in school setting in Bangladesh: A pilot cluster randomised controlled trial.** (Planned manuscript from Chapter 6)
4. Hossain S, Beard E, Shahab L. **Efficacy of the Intervention for Adolescent Tobacco Initiation Prevention (IATIP) among school adolescents in Bangladesh: A pilot cluster randomised controlled trial.** (Planned manuscript from Chapter 6)
5. Hossain S, Beard E, Shahab L. **Process evaluation of the IATIP trial: A qualitative analysis of perceived efficacy, future improvements, and resource implications.** (Planned manuscript from Chapter 7)

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American Journal of Preventive Medicine

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Dedication

This thesis is dedicated to my beloved father, Amanat Ullah (1 March 1974 – 8 January 2023). Losing you during my PhD journey was the hardest challenge I have ever faced. Your love, wisdom, and steadfast encouragement have been my guiding light. Your memory continues to inspire and guide me every day. I miss you deeply, and you are forever in my heart, my dear father. May the Almighty Allah grant you the highest place in Jannah and shower you with His infinite mercy and blessings. Ameen.

I also dedicate this thesis to the martyrs of the July 2024 uprising led by students in Bangladesh. Your courage and sacrifice for justice and freedom continue to inspire generations. May your legacy live on in our hearts and actions.

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List of abbreviations

AOR	Adjusted Odds Ratio
ABC	Arena Blended Connected
ANOVA	ANalysis Of VAriance
ASSIST	A Stop Smoking in Schools Trial
BATB	British American Tobacco Bangladesh
BCTs	Behaviour Change Techniques
BCTTv1	Behaviour Change Technique Taxonomy v1
BCW	Behaviour Change Wheel
BHIR	Behavioural Health Intervention Research
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
COM-B	Capability, Opportunity, Motivation, Behaviour
C-RCT	Cluster-Randomised Controlled Trial
ETS	Environmental Tobacco Smoke
EVM	Ecological Validity Model
FCTC	Framework Convention on Tobacco Control
FGDs	Focus Group Discussions
GAD-7	Generalized Anxiety Disorder-7
GATS	Global Adult Tobacco Survey
GBD	Global Burden of Disease
GDRP	General Data Protection Regulation
GLMM	Generalised Linear Mixed Model
GYTS	Global Youth Tobacco Survey
HICs	High-Income Countries
IATIP	Intervention for Adolescent Tobacco Initiation Prevention
ICCs	Intra-class Correlation Coefficients
ICER	Incremental Cost-Effectiveness Ratio
IDIs	In-Depth Interviews
IQR	Interquartile Range
ITT	Intention-To-Treat
JU	Jahangirnagar University
LMICs	Low- and Middle-income Countries

MPOWER	'Monitor tobacco use and prevention policies', 'Protect People from Tobacco Smoke', 'Offer help to quit tobacco use', 'Warn about the dangers of tobacco', 'Enforce bans on tobacco advertising, promotion and sponsorship', 'Raise taxes on tobacco'
MRC	Medical Research Council
NCTB	National Curriculum and Textbook Board
NTCC	National Tobacco Control Cell
OR	Odds Ratio
OSF	Open Science Framework
PHQ-9	Patient Health Questionnaire-9
PPIE	Patient and Public Involvement and Engagement
PRIME	'Plans', 'Responses', 'Impulses', 'Motives', 'Evaluations'
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCT	Randomised Controlled Trial
RoB	Risk of Bias
RR	Risk Ratio
SD	Standard Deviation
SDGs	Sustainable Development Goals
SE	Standard Error
SHS	Second-Hand Smoke
SLT	Smokeless Tobacco
SPSS	Statistical Package for the Social Sciences
SRH	Self-Rated Health
STS	Second-hand Tobacco Smoke
TDF	Theoretical Domains Framework
UCL	University College London
UK	United Kingdom
UTARG	UCL Tobacco and Alcohol Research Group
WHO	World Health Organization
WTP	Willingness To Pay

Chapter 1 – Introduction of the PhD

1.0 Chapter summary

Tobacco use is a major global health concern, contributing to over 8 million deaths annually and accounting for a significant proportion of the global burden of disease. Both smoking and smokeless tobacco (SLT) products continue to be widely used, particularly in low- and middle-income countries, where weaker tobacco control policies and aggressive industry marketing exacerbate the issue. Adolescents are particularly vulnerable to tobacco initiation, with early exposure increasing the risk of long-term nicotine dependence and associated health complications.

In Bangladesh, tobacco use remains alarmingly high, with a substantial proportion of both adults and adolescents engaging in smoking and SLT consumption. Despite being an early signatory of the WHO Framework Convention on Tobacco Control and implementing various tobacco control policies – including smoking bans, advertising restrictions, and health warnings – gaps remain in enforcement, industry regulation, and adolescent-focused prevention efforts.

School-based interventions have proven effective in preventing adolescent tobacco use globally, yet Bangladesh lacks a structured, culturally tailored prevention programme. This thesis aims to develop and evaluate a school-based intervention to prevent tobacco initiation and promote adolescent health and well-being.

1.1 The global tobacco epidemic

The global tobacco epidemic remains a major public health challenge, with both smoking and smokeless tobacco consumption contributing significantly to morbidity, mortality, and economic burdens. As of 2023, over 1.3 billion

individuals worldwide use tobacco, with more than 80% residing in low- and middle-income countries (LMICs) ¹. Despite a gradual decline in global smoking prevalence – from 22.7% in 2007 to 17.5% in 2019 ², the absolute number of tobacco users remains alarmingly high, particularly in LMICs. This is driven by aggressive tobacco industry marketing strategies and population growth, which have sustained high levels of consumption ^{3,4}. Consequently, the health and economic burden of tobacco epidemic is projected to worsen in the coming years ⁴.

Tobacco use can be broadly classified into smoking tobacco and smokeless tobacco (SLT). Smoking tobacco, primarily in the form of cigarettes, remains the most common method of consumption globally. However, SLT products, such as chewing tobacco, snuff, betel quid with tobacco, gutkha, and khaini are widely consumed, particularly in South and Southeast Asia ^{5,6}. In these regions, cultural acceptability, affordability, and accessibility have contributed to the high prevalence of SLT use, making it a critical yet often overlooked component of the global tobacco epidemic ^{5,7}.

The trends in tobacco use prevalence have varied significantly across countries and regions due to a complex interplay of tobacco control policies, industry influence, and demographics factors ⁴. In high-income countries (HICs), tobacco use peaked in the 1960s and 1970s and has since declined due to stronger regulatory measures following overwhelming evidence of the health risks associated with smoking ⁸. However, tobacco use is expected to rise in many LMICs, driven by rapid economic development, weak tobacco control regulations, and increasing industry influence ^{9,10}. In 2019, the ten countries with the largest number of tobacco smokers, collectively accounting for nearly two-thirds of the global smoking population, were China, India, Indonesia, the USA, Russia, Bangladesh, Japan, Turkey, Vietnam, and the Philippines. China alone had 341 million smokers, representing 30% of the global tobacco users ⁴.

Tobacco use is one of the leading causes of preventable deaths worldwide. More than 8 million deaths occur annually due to tobacco consumption, including approximately 1.3 million deaths caused by second-hand smoke

(SHS) exposure ¹. Over the past century, 100 million people have died due to tobacco use, and this figure is projected to surpass one billion in the 21st century if current trends persist ¹¹. Tobacco consumption is responsible for a loss of up to 15 years of life expectancy, with half of all lifetime users dying from tobacco-related diseases ¹². On average, smokers live 10 years less than non-smokers ¹³.

The burden of tobacco-related morbidity and mortality is particularly severe in LMICs, where healthcare systems are already under strain ¹⁴. Without rigorous tobacco control measures, the health and economic impact of tobacco use will continue to escalate. The morbidity and mortality associated with tobacco use impose substantial economic costs, including lost productivity, increased healthcare expenditures, and premature deaths ¹². The rising population and increasing tobacco consumption in LMICs exacerbate health inequalities and impose significant economic losses ¹⁵.

Given the far-reaching consequences of tobacco use – ranging from reduced economic productivity to widening health disparities – tobacco control has become a key priority for countries committed to achieving the United Nations Sustainable Development Goals (SDGs) and the World Health Organization’s monitoring framework for non-communicable diseases ¹⁴. Stronger regulatory frameworks, enforcement of tobacco control policies, and sustained public health interventions remain essential in mitigating the tobacco epidemic and its associated global health and economic burden.

1.1.1 Adolescence and tobacco use

Adolescence is a critical transitional period between childhood and adulthood (typically defined by the World Health Organization (WHO) as ages 10–19 years), during which individuals undergo significant physical, cognitive, and behavioural changes that shape their long-term lifestyle and health behaviours ¹⁶. Tobacco use is one of the most common modifiable health-related behaviours initiated during adolescence, often extending into adulthood, leading to lifelong dependence and adverse health outcomes such as lung dysfunction,

asthma, and respiratory diseases ^{3 17}. Research indicates that the majority of adult tobacco users initiate use during adolescence, with early experimentation significantly increasing the risk of long-term addiction ^{18 19}.

The adolescent brain is particularly susceptible to nicotine exposure, as it undergoes crucial neurological development, affecting cognitive function, impulse control, and susceptibility to addiction ²⁰⁻²². As a result, adolescents who use tobacco are at a significantly higher risk of developing nicotine dependence than those who start later in life ^{23 24}. This underscores adolescence as a key window for intervention and prevention efforts aimed at reducing lifelong tobacco-related harm.

Globally, adolescent tobacco use remains a major public health concern. According to the WHO, approximately 38 million adolescents (25 million boys and 13 million girls) aged 13–15 years currently use tobacco, with over half residing in LMICs ²⁵. The Global Youth Tobacco Survey (GYTS) further estimates that 24 million adolescents use smoking tobacco, while 13 million use SLT ²⁶. Among the WHO regions, the South-East Asian region accounts for 34% of the world's child tobacco users, the highest proportion among all regions ²⁵. Overall, nearly one in every five adolescents globally uses some form of tobacco, with prevalence rates ranging from 2% to over 30%, depending on region and tobacco type ²⁷.

Beyond smoking tobacco, adolescent use of SLT is a growing concern, particularly in South and Southeast Asia, where it is deeply embedded in cultural practices ²⁸. Common SLT products include betel quid, gutkha, and khaini, which are widely consumed despite their strong associations with oral cancer and other severe health risks ⁵. Globally, 3.6% of adolescents aged 13–15 years report using some form of SLT, with prevalence higher among boys (4.0%) than girls (2.0%) ²⁹. In total, over 13 million adolescents (8.5 million boys and 4.3 million girls) currently use SLT products ³⁰. Within WHO regions, the South-East Asian region reports the highest adolescent SLT use at 7.5%, reflecting the urgent need for regulatory action ³⁰. Weak policy enforcement,

limited awareness of health risks, misconceptions of SLT as a 'safer' alternative to smoking have exacerbated adolescent SLT consumption ²⁸.

While adolescent tobacco use has declined in many high-income countries (HICs) due to strong regulations, taxation, and targeted public health interventions ³¹, prevalence remains high in LMICs, where weak enforcement of tobacco control measures, aggressive marketing, and social influences contribute to continued tobacco uptake ³². Alarming, the rapid rise of e-cigarettes and other novel tobacco products has further complicated the adolescent tobacco use landscape. Emerging evidence suggests that e-cigarettes may serve as a gateway to conventional smoking, increasing the likelihood of future cigarette use among adolescents ^{33 34}.

The factors influencing adolescent tobacco initiation are multifaceted, spanning individual, familial, social, and environmental determinants ^{29 35}. Key predictors include:

- i. **Parental and peer influence:** Adolescents with parents or peers who smoke are significantly more likely to initiate tobacco use ³⁵.
- ii. **Low awareness of health risks:** Many adolescents underestimate the long-term health consequences of tobacco use, particularly in regions where public health education is lacking ^{36 37}.
- iii. **Tobacco industry marketing:** The use of flavoured products, social media campaigns, and corporate sponsorships specifically targeting youth has contributed to increased experimentation and uptake ^{6 38}.
- iv. **Socioeconomic factors:** Poverty, stress, and lack of access to cessation resources have been linked to higher rates of adolescent tobacco use, especially in LMICs ^{29 35}.

Given the far-reaching health and social consequences of adolescent tobacco use, addressing the social, environmental, and regulatory factors influencing adolescent tobacco use is imperative to reducing the global burden of tobacco-related diseases and achieving long-term public health goals.

1.2 Scenario of tobacco use in Bangladesh

Bangladesh, a low- and middle-income country in South Asia, faces a significant public health challenge due to the high prevalence of tobacco use, encompassing both smoking and smokeless tobacco. As of 2018, approximately 35.3% of adults (aged 15 and above) reported using some form of tobacco, with a marked gender disparity: 46.0% of men and 25.2% of women³⁹. This places Bangladesh among the top ten countries globally with the highest rates of tobacco consumption⁴.

Smoking remains highly prevalent, with 18.0% of adults engaged in this practice – 36.2% of men and 0.8% of women³⁹. Cigarettes are the most commonly consumed smoking product, with over 99% of smokers reporting cigarette use, while 32.5% also reported smoking bidis (hand-rolled cigarettes wrapped in tendu leaves), which are cheaper and widely consumed among lower socioeconomic groups⁴⁰. In addition to smoking, SLT use remains widespread. In 2018, 27.5% of adults aged 18–69 years were current SLT users, with a higher prevalence among women (28.1%) than men (26.9%)³⁹. SLT products such as zarda, gul, and sadapata are deeply embedded in cultural and social practices, particularly in rural areas, where awareness of their health risks remains limited.

Second-hand smoke (SHS) exposure is a critical public health concern in Bangladesh, particularly for women and children, who are more likely to experience involuntary exposure at home. Approximately 39.0% of adults, equating to 40.8 million individuals, are exposed to SHS at home due to smoking by family members and visitors⁴¹. A community-based study on children's SHS exposure found that 55.5% of households had at least one adult smoker, with 30.3% reporting smoking in the presence of children, leading to SHS exposure among 39.6% of resident children⁴². Similarly, 42.7% of adults were exposed to SHS in their workplace³⁹. Alarming, recent research indicates that 92% of children in Bangladesh are exposed to SHS, underscoring

the pervasive nature of the issue and the urgent need for stronger enforcement of tobacco control laws ⁴³.

The health burden of tobacco use in Bangladesh is immense. According to Global Burden of Disease (GBD) estimates, tobacco was responsible for approximately 158,000 deaths in 2019, accounting for 19% of total deaths nationwide ⁴⁴⁻⁴⁶. Furthermore, 1.2 million people in Bangladesh suffer from tobacco-related diseases each year, contributing to high healthcare costs and productivity losses.

1.2.1 Adolescent tobacco use in Bangladesh

Adolescent tobacco use in Bangladesh presents a significant public health concern, with both smoking and smokeless tobacco use contributing to early initiation and potential long-term health consequences. Data from the Global School-based Student Health Survey indicate that 9.8% of students aged 13–15 have experimented with cigarette smoking, with a higher prevalence among boys (13.8%) compared to girls (2.0%) ⁴⁷. In addition to smoking, the GYTS reported that 4.5% of students aged 13–15 use SLT products, with boys (5.9%) showing a higher prevalence than girls (2.0%) ⁴⁸. Alarming, SHS exposure is pervasive, with 31.1% of adolescents exposed at home and 59.0% exposed in enclosed public places ⁴⁸.

The initiation of tobacco use among adolescents in Bangladesh is driven by multiple factors, including peer pressure, parental smoking, socio-economic status, psychological distress, and aggressive tobacco industry marketing ⁴⁹⁻⁵². Studies indicate that 35.1% of adolescents start smoking due to peer influence, while 31.8% are influenced by family members ⁵¹. Additionally, easy access to low-cost tobacco products and widespread SHS exposure further normalise smoking behaviours among adolescents.

1.3 Health consequences of tobacco use

1.3.1 Physical health consequences

The harmful effects of tobacco use have been a focal point of public health research for decades, leading to significant advancements in epidemiological methodologies and causal inference techniques. Early scientific debates in the 20th century sought to establish whether the observed higher incidence of lung cancer among smokers was a direct consequence of smoking or merely a result of other confounding factors. This led to pioneering epidemiological studies, including some of the first case-control and cohort studies ⁵³⁻⁵⁷, which provided robust evidence confirming smoking as a primary cause of lung cancer and numerous other diseases.

Among the most influential of these studies was Doll and Hill's landmark case-control research ⁵⁶, which examined smoking patterns among individuals diagnosed with lung cancer compared to matched controls. Their findings demonstrated a strong association between cigarette smoking and lung cancer, with a dose-response relationship – indicating that heavier smoking corresponded to a higher likelihood of developing the disease. Subsequent large-scale cohort studies, such as the British Doctors Study ⁵⁸, further strengthened this evidence by tracking mortality patterns among physicians over five decades. These studies revealed that smokers, on average, lose approximately 10 years of life expectancy compared to non-smokers, even after adjusting for potential confounders.

Beyond lung cancer, smoking is a major risk factor for cardiovascular diseases, chronic respiratory conditions, and various cancers ⁵⁹⁻⁶². Cigarette smoke contains over 7,000 chemicals, many of which are carcinogenic or toxic to the cardiovascular and respiratory systems ⁶³. Long-term smoking is linked to chronic obstructive pulmonary disease, stroke, coronary heart disease, and peripheral vascular diseases (Figure 1.1), contributing to a significant burden of morbidity and mortality globally. Estimates from the GBD 2019 suggest that approximately 8 million deaths annually are attributable to smoking-related diseases ⁴.

In addition to smoking, SLT use also poses serious health risks, particularly in regions where its consumption is prevalent. According to a study analysing data from 127 countries by Siddiqi et al. (2020), SLT use leads to an estimated 348,798 deaths and a loss of 8.7 million disability-adjusted life years annually ⁵. The most significant health consequences of SLT include cancers of the mouth, pharynx, and oesophagus, as well as ischemic heart disease.

The detrimental impact of tobacco extends beyond premature mortality. Smokers and SLT users experience a higher burden of chronic disease and disability, leading to reduced quality of life and increased healthcare costs ^{5 62}. However, the health risks associated with tobacco use are largely reversible. Evidence suggests that smokers who quit by age 30 can avoid nearly all excess mortality risks, while those quitting at later ages still gain significant health benefits ^{64 65}.

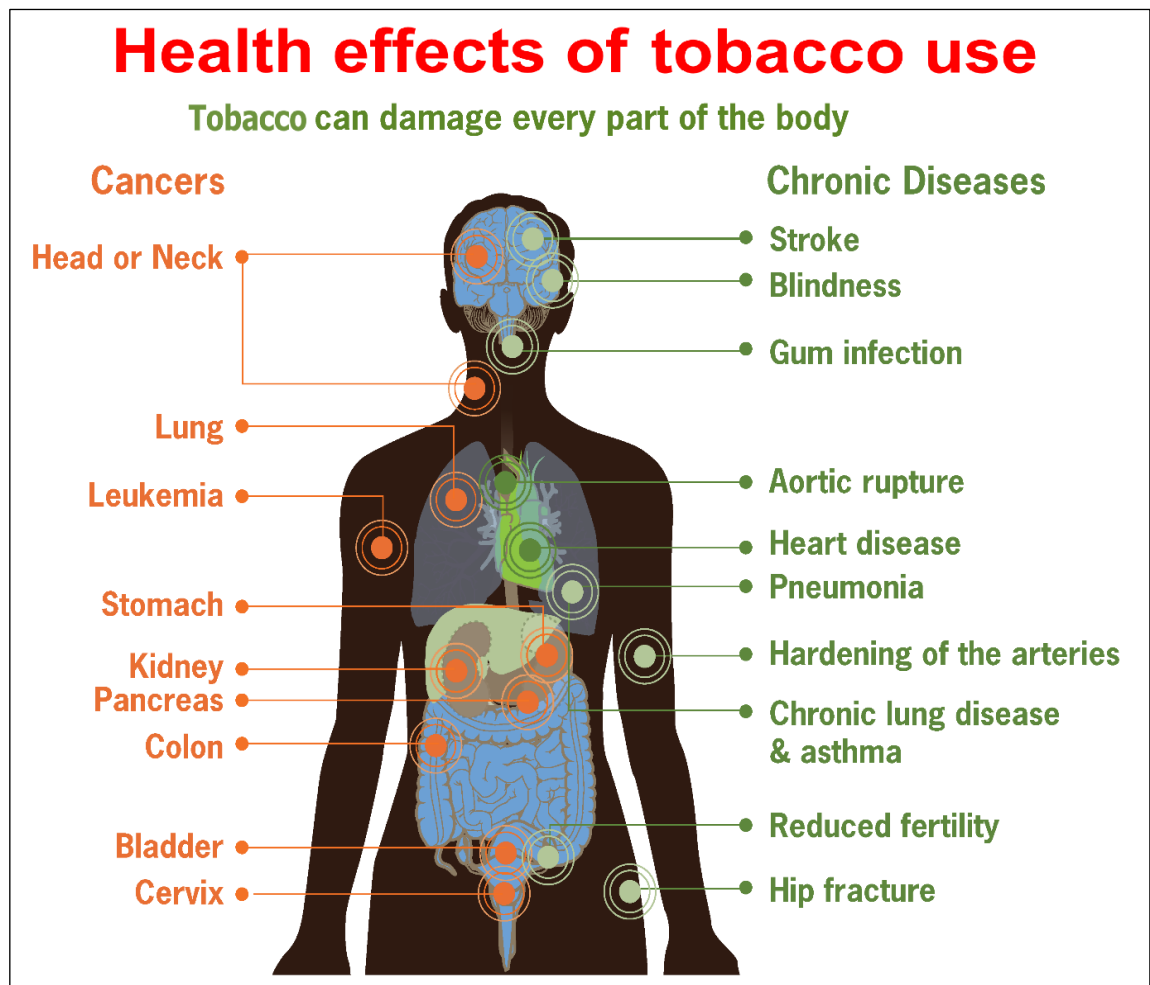


Figure 1.1: A diagram illustrating the various cancers and chronic diseases caused by tobacco use in the human body (reproduced from CDC, 2010 ⁶⁶)

1.3.2 Mental health consequences

The relationship between tobacco use and mental health is complex and bidirectional. Individuals with mental health disorders are more likely to use tobacco, while tobacco use itself can exacerbate mental health conditions ⁶⁷. Nicotine, the primary addictive component of tobacco, swiftly enters the bloodstream upon consumption, stimulating the release of dopamine and other neurotransmitters, which are associated with pleasurable sensations and positive reinforcement ⁶⁸. However, as nicotine levels decline in the blood, individuals experience withdrawal symptoms, leading to negative reinforcement that compels continued tobacco use ⁶⁹. This cycle of nicotine dependence creates a persistent urge to smoke, commonly described by consumers as a

means of relieving stress. Over time, users require increasing amounts of nicotine to achieve the same level of satisfaction, leading to heightened dependence and the establishment of a steady-state addiction ⁶⁹.

The association between tobacco use and mental disorders has been extensively studied, with much of the research focusing on individuals with severe mental illnesses, such as schizophrenia, or those receiving psychiatric treatment ⁷⁰⁻⁷³. A meta-analysis of 42 studies found that individuals with schizophrenia were 5.3 times (95% CI: 4.9-5.7) more likely to use tobacco compared to the general population ⁷⁴. It is widely believed that many individuals with psychiatric conditions resort to tobacco use as a form of self-medication, only to develop greater nicotine dependence over time ^{75 76}. Conversely, increasing tobacco consumption has been linked to an increased risk of developing mental health disorders, reinforcing the bidirectional relationship between tobacco use and psychiatric conditions ^{67 76}.

Tobacco use has also been proposed as a potential risk factor for various major mental health disorders, including suicidal behaviour, major depressive disorder, and bipolar disorder ⁷⁷. Several observational studies have demonstrated a strong association between cigarette smoking and psychiatric disorders ^{78 79}, with smoking exhibiting a dose-response relationship with suicidal risk and schizophrenia, as confirmed by meta-analyses of prospective studies ^{80 81}. Additionally, depression and anxiety have been identified as strong predictors of smoking initiation and progression to regular smoking during adolescence ⁸². Simultaneously, smoking has been linked to the onset of mental health symptoms in adolescents, suggesting that tobacco use and psychiatric conditions may co-develop due to shared underlying factors ^{83 84}. While controlling for common confounding variables helps clarify this relationship, smoking continues to demonstrate predictive capacity for mental disorders, particularly depression and anxiety, and vice versa ⁸⁵.

1.4 Global tobacco control initiatives

Recognizing the catastrophic implications of tobacco use, international efforts have sought to mitigate its impact. The WHO has been at the forefront of these initiatives, primarily through the establishment of the Framework Convention on Tobacco Control (FCTC) in 2003 ⁸⁶. As the first international public health treaty, the FCTC legally binds its 182 signatory countries to implement evidence-based measures aimed at reducing tobacco consumption. These measures include implementing tobacco taxes, enacting comprehensive bans on advertising, ensuring smoke-free public spaces, and mandating prominent health warnings on packaging.

To facilitate the implementation of FCTC provisions, WHO introduced the MPOWER package, which outlines six key tobacco control strategies ⁸⁷:

- i. **M**: Monitor tobacco use and prevention policies
- ii. **P**: Protect people from tobacco use
- iii. **O**: Offer help to quit smoking
- iv. **W**: Warn about the dangers of tobacco
- v. **E**: Enforce bans on tobacco advertising, promotion and sponsorship
- vi. **R**: Raise taxes on tobacco

These strategies provide a practical framework for countries to implement effective tobacco control interventions. All six MPOWER strategies are cost-effective, well-documented, and have demonstrated measurable progress in reducing tobacco use globally.

Several countries have successfully implemented MPOWER measures, yielding significant reductions in tobacco consumption.

- i. Turkey, after adopting MPOWER in 2008, witnessed a 13.4% decline in smoking prevalence by 2012, alongside reductions in second-hand smoke exposure ⁸⁷. Turkey became the third country in Europe to

achieve 100% tobacco-free indoor status and the first globally to implement all six MPOWER strategies.

- ii. Brazil followed as the second country to fully implement MPOWER, reducing tobacco use from 22.4% in 2003 to 12.6% in 2019 ⁸⁷.
- iii. Mauritius and the Netherlands recently joined Brazil and Turkey as countries that have fully implemented MPOWER at best-practice levels ².
- iv. The Philippines achieved a 20% decline in tobacco consumption between 2009 and 2015 after successfully implementing MPOWER strategies ⁸⁸.
- v. Ukraine, after adopting new MPOWER-based tobacco control policies, recorded a 19% reduction in tobacco use between 2010 and 2017 ⁸⁷.

However, despite these successes, 41 LMICs have yet to implement a single MPOWER component, leaving them struggling with persistently high tobacco consumption rates (WHO, 2021). Strengthening global tobacco control efforts, particularly in resource-limited settings, remains a critical priority to further reduce the global burden of tobacco-related diseases and deaths ⁸⁹.

1.5 Gap identification in the context of tobacco control initiatives in Bangladesh

Bangladesh was the first signatory country of the WHO FCTC, which entered into force in 2005 ⁸⁶. In the same year, the government adopted the Smoking and Usage of Tobacco Products (Control) Act, 2005, introducing several tobacco control measures such as restrictions on smoking in public places and transport, bans on tobacco advertising, and the implementation of written health warnings ⁹⁰. However, this initial legislation had several inconsistencies with FCTC guidelines, particularly concerning health warnings, which were not graphical and did not cover all tobacco products ⁹¹. Additionally, while the 2005 Act banned tobacco advertisements, it did not comprehensively cover sponsorship, allowing the industry to continue promotional activities through indirect means. Recognising these gaps, the Act was amended in 2013 to strengthen tobacco control policies ⁹². Key reforms included:

- i. Mandatory graphic health warnings covering 50% of both sides of all tobacco packs, including SLT products.
- ii. A comprehensive ban on the depiction of tobacco use on television.
- iii. Prohibition of sponsorship using tobacco companies' names, trademarks, or symbols.
- iv. Increased fines for violations related to smoke-free policies and advertising restrictions.

To support the implementation of the 2013 Amendment, the government introduced the Smoking and Usage of Tobacco Products (Control) Rules in 2015, providing detailed implementation guidelines ⁹³. Despite these advancements, significant challenges remain, particularly concerning regulatory enforcement and industry interference.

One of the major challenges to effective tobacco control in Bangladesh is tobacco industry interference, which continues to undermine policy enforcement and governance. Various individual and institutional conflicts of interest have been identified as key obstacles, leading to weakened regulatory measures and delays in policy implementation ⁹⁴. Additionally, the government's financial stake in tobacco companies, such as the British American Tobacco Bangladesh (BATB) and Japan Tobacco Industries, creates a conflict of interest that complicates decisive policy actions. The government holds nearly 10% of shares in BATB, and high-ranking government officials have served as directors of BATB and other tobacco companies ^{94 95}.

Although diverse tobacco control initiatives – such as awareness campaigns – have been implemented by the National Tobacco Control Cell, non-governmental organisations, and community-based groups, their effectiveness has been constrained by fragmented coordination, insufficient funding, and unsustainable long-term planning ⁹⁶. Moreover, Bangladesh lacks a comprehensive, nationwide tobacco prevention programme specifically targeting adolescents and young people, who face elevated risks of tobacco initiation. While the country has achieved progress in adopting tobacco control

policies, significant gaps persist, particularly in enforcement, regulation of the tobacco industry, and prevention strategies. Addressing these challenges necessitates:

- i. Strengthened conflict-of-interest policies to mitigate tobacco industry influence.
- ii. Enhanced enforcement mechanisms for existing tobacco control legislation.
- iii. Expansion of cessation support services to increase quit rates among users.
- iv. A national school-based intervention programme to prevent adolescent tobacco initiation.

This PhD research will concentrate on designing and evaluating a school-based tobacco prevention intervention for adolescents. This focus aligns with addressing one of the critical gaps identified in Bangladesh's current tobacco control framework.

1.6 School-based tobacco prevention intervention

School-based tobacco prevention interventions have significant potential to contribute to the health of future generations. Schools have long been targeted as key settings for tobacco prevention, as they provide an opportunity to reach adolescents from diverse socio-demographic backgrounds and integrate tobacco education into daily academic activities ^{97 98}. These interventions often include classroom-based educational sessions, skill-building exercises, and peer-led activities, enabling students to develop personal resistance skills against tobacco use ^{99 100}. The Centers for Disease Control and Prevention has also highlighted that school-based interventions effectively prevent the initiation of tobacco use, thereby reducing the risk of nicotine addiction and long-term tobacco-related complications ⁹⁷. The primary goal of school-based interventions is to equip children and adolescents with the knowledge and motivation to abstain from using tobacco products. Additionally, for those who

have already initiated tobacco use, these interventions can provide motivation and resources to support quitting ⁹⁷.

1.6.1 Global context

Over the years, several school-based tobacco prevention programs have been implemented worldwide, demonstrating significant success in reducing adolescent smoking rates ⁹⁹. One such intervention was the ASSIST (A Stop Smoking in Schools Trial), a cluster randomised controlled trial (C-RCT) conducted in 59 schools across England and Wales, involving over 10,000 adolescents aged 12–13 years ¹⁰¹. In this intervention, influential students were trained as peer supporters who engaged in informal, outside-class interactions to discourage smoking initiation among their peers. The findings indicated that, compared to the control group, the odds of smoking in the intervention group were reduced by 25% immediately after the intervention (OR = 0.75), by 23% at one-year follow-up (OR = 0.77), and by 15% at two-year follow-up (OR = 0.85) ¹⁰². These results suggest that peer-led interventions in school settings have strong potential to reduce smoking among adolescents at the population level. Another successful school-based intervention conducted among secondary school students in England (Leeds and Staffordshire) used repeated implementation intentions and anti-smoking messages to prevent smoking initiation. This approach was statistically effective in reducing smoking initiation among adolescents (risk ratio [RR] = 0.83, 95% CI: 0.71–0.97; $p = 0.016$) ¹⁰³. These studies, among others, provide strong evidence that school-based programs can significantly impact smoking behaviour and reduce tobacco use initiation among young people.

Globally, school-based interventions have also been incorporated into multi-component tobacco control strategies. Studies indicate that such programs can reduce smoking initiation by 25–30%, and when combined with community-wide interventions, this reduction can reach 35–40% by the end of high school ¹⁰⁴. In LMICs, school-based programs have been shown to increase awareness of second-hand smoke dangers, encourage support for smoke-free policies, and lower the likelihood of youth experimentation with tobacco ^{105 106}. However,

implementation and reach vary across regions, with limited adoption in many resource-constrained settings ¹⁰⁷.

1.6.2 Bangladesh context

Despite global evidence supporting the effectiveness of school-based interventions, Bangladesh lacks a structured, nationwide school-based tobacco prevention program. Although the GYTS highlighted the need for school-based interventions ⁴⁸, no large-scale initiatives have been introduced.

The only school-based tobacco control trial in Bangladesh – the Smoke-Free Intervention (SFI) – was designed to reduce children's exposure to SHS in primary school settings (Year 5 students) ¹⁰⁸. While the results of the definitive trial are yet to be published, findings from the feasibility (CLASS I) and pilot (CLASS II) trials provide promising evidence:

- i. The CLASS I (feasibility) trial found that SFI successfully increased voluntary household smoking restrictions and reduced the social visibility of smoking behaviour (OR = 3.9, 95% CI = 2.0–7.5) ¹⁰⁹.
- ii. The CLASS II (pilot) trial demonstrated that SFI reduced SHS exposure among children, as evidenced by a lower mean cotinine level in the intervention group compared to the control group (mean difference = -1.31 ng/ml, 95% CI = -2.86 to 0.24) ¹¹⁰.

These findings highlight the potential of school-based interventions in tobacco prevention and reducing SHS exposure. However, SFI specifically targeted second-hand smoke exposure rather than direct tobacco initiation prevention among adolescents. Given the high prevalence of adolescent tobacco use in Bangladesh, there is a critical need to develop and implement school-based programs focused on preventing initiation and providing cessation support to promote the health and well-being.

1.7 Aims and objectives of the current thesis

Given the rising burden of tobacco-related morbidity and mortality in LMICs, particularly in Bangladesh, this PhD seeks to address a critical gap in tobacco prevention by developing and evaluating a contextually relevant, theoretically driven school-based intervention. The primary aim of this thesis is to develop and assess the feasibility, acceptability, and potential efficacy of a brief school-based intervention to prevent tobacco initiation and promote the health and well-being of adolescents in Bangladesh.

To achieve this aim, the thesis adopts a multi-phased research approach, integrating systematic evidence synthesis, epidemiological assessment, expert consensus, qualitative exploration, intervention development, feasibility testing, and process evaluation (Figure 1.2). The specific objectives of the thesis are as follows:

1. Synthesise existing evidence on the effectiveness of school-based tobacco prevention interventions for adolescents in LMICs through a systematic review and meta-analysis (Study 1). This will help identify effective intervention components and key gaps in the literature.
2. Investigate the prevalence of tobacco use, associated risk factors, and its relationship with common mental disorders (e.g., anxiety and depression) among school adolescents in Dhaka, Bangladesh, through a large-scale school-based cross-sectional survey (Study 2). Additionally, explore adolescents' perspectives on tobacco prevention interventions to identify their needs and inform the development of targeted prevention strategies.
3. Develop a brief, school-based tobacco prevention intervention, tailored to the socio-cultural and environmental realities of Bangladeshi adolescents. This will involve expert consensus using a structured intervention mapping approach, ensuring that the intervention is evidence-based, theoretically grounded, and contextually relevant.

4. Explore the suitability, cultural adaptation needs, and practical implementation challenges of the intervention through qualitative research with students, parents, and teachers (Study 3). This qualitative exploration will ensure cultural sensitivity and alignment with the lived experiences of adolescents.
5. Assess the feasibility, acceptability, and preliminary efficacy of the intervention through a pilot C-RCT in Dhaka, Bangladesh (Study 4). This phase will examine intervention fidelity, recruitment, retention, and initial behavioural outcomes to determine the potential efficacy of the intervention in preventing tobacco initiation.
6. Conduct a parallel process evaluation to explore implementation fidelity, engagement, acceptability, and cost-effectiveness of the intervention (Study 5). This will involve perspectives from students, teachers, and other stakeholders, providing valuable insights to refine the intervention for future large-scale implementation.

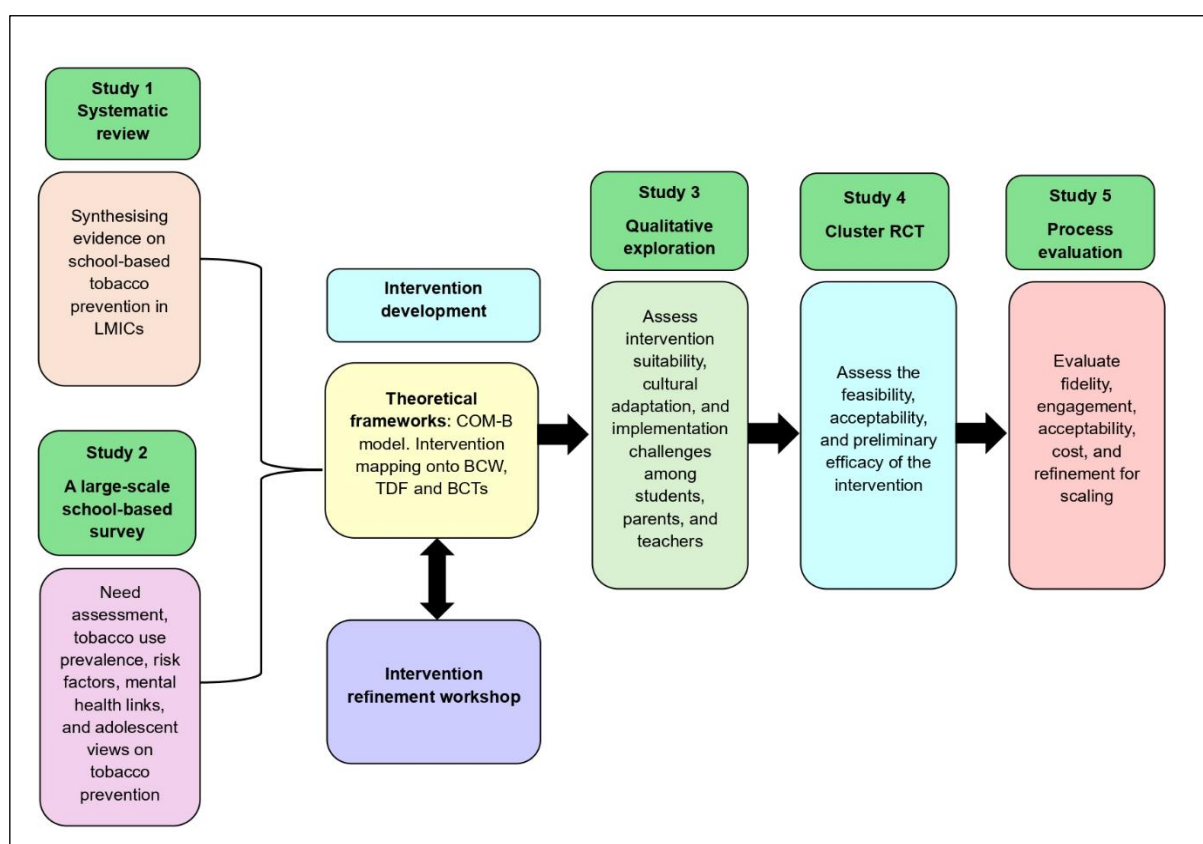


Figure 1.2: Conceptual framework of this thesis

Chapter 2 – School-based tobacco use prevention interventions for adolescents in low-and middle-income countries (LMICs): A systematic review and meta-analysis (Study 1)

2.0 Chapter summary

Tobacco-related disease and death remain high in many low- and middle-income countries (LMICs), and most people start using tobacco during adolescence. This chapter presents a systematic review and meta-analysis evaluating the effectiveness of school-based tobacco use prevention interventions for adolescents in LMICs.

A comprehensive search was conducted across seven electronic databases up to 20 March 2024, using search terms related to behaviour (smoked/smokeless tobacco use), population (adolescents aged 10–18 years), intervention (school-based prevention programme), study design (randomised controlled trials [RCTs] or cluster-randomised controlled trials [C-RCTs]), and geographical context (LMICs). The primary outcome was tobacco use initiation, defined as the proportion of participants who reported ever using tobacco at the longest follow-up point. Risk of bias (RoB) was assessed, and random-effects meta-analyses were performed, with meta-regression conducted to explore sources of heterogeneity. The protocol of this systematic review was registered with PROSPERO (Registration number: CRD42022330329).

A total of 2,133 studies were identified, of which 27 involving 57,292 participants were included in this review, and 20 were meta-analysed. The majority of studies were conducted in Brazil (n = 5, 18.5%), India (n = 5, 18.5%), China (n = 3, 11.1%), and Pakistan (n = 2, 7.4%). Twelve studies (44.4%) assessed newly developed interventions, while fifteen (55.6%) evaluated culturally adapted existing interventions. Over half of the interventions (n=14, 51.9%)

focused solely on tobacco prevention, whereas the remainder addressed multiple health behaviours. Sixteen studies (59%) were found to have a high RoB, four (15%) had some concerns, and seven (26%) had a low RoB. Overall, school-based interventions were found to reduce the odds of tobacco use among adolescents (odds ratio [OR]: 0.76, 95% confidence interval [CI]: 0.64–0.91; $I^2 = 47\%$; 20 studies). However, when adjusting for study duration, interventions with higher contact time were found to have a lower effect on tobacco use initiation compared to those with lower contact time (adjusted OR: 1.36, 95% CI: 1.01–1.84, $p=0.045$, $I^2 = 22\%$; 20 studies). Additionally, participants in studies with a low RoB had lower odds of initiating tobacco use (OR: 0.66, 95% CI: 0.50–0.87; $I^2 = 14\%$; 6 studies).

The findings of this systematic review and meta-analysis suggest that school-based tobacco prevention interventions in LMICs are effective in reducing tobacco use among adolescents. Meta-regression analyses indicated that interventions with shorter total contact time were associated with greater effectiveness. However, in the absence of direct head-to-head comparisons, this finding should be interpreted with caution. These results underscore the potential value of designing interventions that are both engaging and time-efficient. This has important implications for addressing the tobacco epidemic among adolescents in LMICs.

2.1 Introduction

As outlined in the general introduction (see Chapter 1), tobacco use is responsible for more than 8 million deaths annually ¹. Despite global efforts to curb tobacco consumption, an estimated 1.3 billion adults continue to use tobacco products ¹. Low- and middle-income countries (LMICs) are disproportionately affected, comprising approximately 80% of the world's tobacco users ¹. Historically, tobacco consumption was lower in LMICs than in high-income countries; however, recent trends indicate a concerning rise. Between 2000 and 2015, tobacco use in LMICs increased by 33.3 million users, whereas high-income countries experienced a net reduction of 61.9 million

users ³⁰. The disparity in tobacco control efforts and outcomes between these regions is alarming, particularly considering the potential expansion of the tobacco industry in LMICs ^{1 111}. Evidence suggests that the tobacco industry has deliberately targeted adolescents and young adults who are tobacco non-users to increase consumption and sustain market demand ¹¹¹.

Adolescence, a critical period of physical, mental, and behavioural development, is when most individuals initiate tobacco use ¹⁶. According to the Global Burden of Disease study, approximately 155 million individuals aged 15–24 years were tobacco smokers worldwide in 2019 ¹⁴. Additionally, millions of adolescents use smokeless tobacco products, such as chewing tobacco, gutka, snuff, and zarda ¹¹²⁻¹¹⁴. The prevalence of tobacco use among adolescents varies widely by region and type of tobacco product, ranging from 2% to over 30% ²⁷. The addictive nature of tobacco and its associated health risks, including lung dysfunction, asthma, and respiratory diseases, underscore the importance of addressing tobacco use during adolescence ^{3 17 18}. Without effective intervention, the burden of tobacco-related diseases in LMICs is expected to remain significant in the coming decades. The Lancet Commission has recommended the development and implementation of evidence-based policies and interventions to mitigate adolescent morbidity and mortality worldwide ¹¹⁵.

Schools provide an essential platform for promoting adolescent health and development, reaching a large proportion of young individuals who may not regularly access healthcare services ^{116 117}. School-based interventions have been widely implemented to prevent tobacco use, incorporating diverse approaches such as health education, peer-led activities, and policy-based curricula ⁹⁸. A previous systematic review suggested that school-based interventions are effective in reducing tobacco use initiation; however, the focus of the review was primarily on high-income countries and smoking tobacco ⁹⁹. In contrast, smokeless tobacco use is highly prevalent in many LMICs and poses significant health risks, necessitating greater attention in tobacco prevention strategies ^{6 113 114 118}. Other studies have explored the functions of school-based tobacco prevention interventions, including their theoretical foundations, cultural

adaptations, and associations with psychosocial predictors of smoking among adolescents ^{107 119}. Despite these contributions, a comprehensive systematic review and meta-analysis focusing exclusively on the effectiveness of school-based tobacco prevention interventions in LMICs, including both smoking and smokeless tobacco use, remains lacking.

To address this gap, the present systematic review and meta-analysis synthesise evidence from randomised trials evaluating school-based tobacco prevention interventions in LMICs. The findings aim to provide valuable insights for researchers, policymakers, and stakeholders involved in tobacco control efforts. Specifically, this review evaluates the effectiveness of school-based interventions in reducing tobacco use initiation among adolescents in LMICs and examines the impact of different intervention components on their effectiveness.

2.2 Methods

2.2.1 Search strategy and selection criteria

Following the PRISMA guidelines ¹²⁰, a systematic search was conducted across seven databases – MEDLINE (Ovid SP), The Cochrane Library, EMBASE (Ovid SP), CINAHL Plus, ERIC, ASSIA, and PsycINFO (Ovid SP) – from the earliest available date until 20 April 2024. Search terms were organised into six categories: adolescents, school-based interventions, tobacco use, prevention programmes, study design, and LMICs (see Appendix 2.1). The tobacco use category included both smoking and smokeless tobacco products. To ensure comprehensive coverage of all relevant geographical settings, the LMIC category incorporated the Cochrane Groups LMIC Databases, as well as country and economy names from the World Bank list of economies ^{121 122}. Details of the search strategy for the MEDLINE (Ovid SP) database are provided in the appendix 2.1. Additionally, three clinical trial registries were searched for ongoing studies: government registries (www.clinicaltrials.gov and www.clinicaltrialsregister.eu), controlled clinical trials (www.controlled-trials.com), and WHO registries (www.who.int/trialsearch). Further efforts to

identify relevant studies included a search of the grey literature (i.e., unpublished resources and conference proceedings) and an examination of reference lists from retrieved studies. All references were imported into a database for eligibility assessment.

Studies were eligible for inclusion if they were randomised controlled trials (RCTs) or cluster-randomised controlled trials (C-RCTs) in which participants were assigned to either a tobacco-use prevention programme or a control condition. For C-RCTs, trials were considered eligible if the unit of allocation was at the class, school, or institution level. Eligible studies included participants aged 10–19 years at recruitment who were enrolled in full-time education ¹⁶. All school-based interventions aimed at preventing the initiation of smoked and/or smokeless tobacco use were included. These interventions encompassed educational, counselling, and therapeutic approaches, as well as those addressing psychosocial determinants (e.g., enhancing self-efficacy to refuse tobacco products) or life skills development to support abstinence. Studies that focused on the prevention of multiple substances (e.g., alcohol and cannabis) were included if tobacco use outcomes were reported.

I conducted the literature search and screened titles, abstracts, or descriptors of all articles identified in the literature searches using a screening checklist to select potentially eligible studies. A second reviewer, Harry Tattan-Birch (HTB, a PhD student at UCL), independently screened 25% of the identified articles. Agreement for full-text screening was 84.21% (Cohen's $\kappa=0.58$). Discrepancies between HTB and me were resolved through consensus by jointly screening the full text of articles, with further consultation from my PhD supervisors (Emma Beard and Lion Shahab) when necessary.

2.2.2 Data extraction and risk of bias (RoB) assessment

Data extraction was performed using a pre-developed data extraction form (see Appendix 2.2). Study authors were contacted to obtain any missing or unpublished data where necessary. HTB independently extracted data from 25% of the included studies. The overall agreement between reviewers was

over 95% (Cohen's $\kappa=0.83$). Any discrepancies were discussed and resolved through consensus.

No restrictions were placed on the mode of intervention delivery or the personnel involved in delivering the intervention. Interventions could be delivered individually, in small groups, in classroom settings, via text messages, or through print media (e.g., leaflets, notebooks). Delivery personnel could include researchers, classroom or schoolteachers, health science teachers, healthcare or public health professionals, undergraduate or graduate students, adolescent peers, or other facilitators. An ontology for specifying and classifying intervention deliverers was followed ¹²³. Any duration or intensity of delivery was accepted.

Intervention components were classified based on the behaviour change technique taxonomy v1 (BCTTv1) ¹²⁴. The following categories were used:

- i. **Information-only curricula:** Providing adolescents with information to oppose tobacco use.
- ii. **Social competence curricula:** Focusing on social learning processes.
- iii. **Life skills development:** Enhancing problem-solving and decision-making abilities.
- iv. **Cognitive skills training:** Strengthening self-control, self-esteem, coping strategies, and social/assertive skills to help adolescents refuse tobacco offers.
- v. **Social influence curricula:** Raising awareness of social influences on tobacco use and training adolescents to resist peer pressure and high-risk situations.
- vi. **Combined social influence and social competence approaches:** Incorporating elements from both the social influence and social competence curricula.
- vii. **Multimodal school-based programmes:** Incorporating school tobacco control policies, including programmes for parents and teachers.

Behaviour change techniques (BCTs) included in the interventions were identified, extracted, and coded using the BCTTv1 framework to determine the components targeting tobacco prevention ¹²⁴.

To assess potential threats to study validity, the Risk of Bias 2 (RoB 2) tool was used following Cochrane Handbook recommendations ¹²⁵. The domains assessed included sequence generation, allocation concealment, blinding of outcome assessment, incomplete outcome data, selective outcome reporting, and additional threats such as identification/recruitment bias in C-RCTs. Each study was categorised as having either “low risk”, “some concerns”, or “high risk” of bias in accordance with Cochrane Handbook guidelines ¹²⁵.

2.2.3 Measures

The primary outcome was tobacco use initiation, assessed as the proportion of participants who reported ever using tobacco at the longest follow-up point. Data were extracted in the form of absolute numbers (n) and/or odds ratios (ORs) where available. For trials that did not appropriately account for clustering, individual-level results were adjusted using reported or imputed intra-class correlation coefficients (ICCs) and design effects.

Among the 20 studies included in the meta-analysis: seven adjusted for clustering and reported ICCs, two reported ORs adjusted for clustering but did not report ICCs, nine neither reported ICCs nor cluster-adjusted results, two reported ICCs but did not provide ORs adjusted for clustering. To account for clustering, sensitivity analyses were conducted by excluding studies that neither reported ICCs nor cluster-adjusted results. A mean ICC of 0.030 was calculated from the nine studies that reported ICCs and was imputed for the remaining 11 studies. Design effects were then calculated to adjust standard errors accordingly.

For studies with more than two randomised arms, relevant prevention and control groups were combined. Where available, intention-to-treat analyses

using multiple imputation for missing outcome data were included; otherwise, data from participants with complete outcome data were used.

Following intervention characteristics were assessed in this review:

- i. **Intervention provenance:** Newly developed vs. culturally adapted.
- ii. **Intervention focus:** Tobacco-only vs. multi-focus interventions.
- iii. **Intervention category:** Social influence and competence-based vs. other approaches.
- iv. **Tobacco type:** Smoked tobacco only vs. smokeless/both.
- v. **Mode of delivery:** Classroom-based vs. multimodal.
- vi. **Intervention operator:** Peer leader and/or schoolteacher vs. other facilitators.
- vii. **Number of sessions delivered:** ≤11 vs. >11 sessions.
- viii. **Control condition:** Active control vs. inactive control.
- ix. **Follow-up duration:** ≤6 months vs. >6 months.
- x. **Total contact time:** ≤592.5 minutes vs. >592.5 minutes.
- xi. **Intensity of session delivery:** ≤4 minutes/day vs. >4 minutes/day.
- xii. **Risk of bias:** Low vs. high/some concerns.
- xiii. **Number of BCTs used:** <6 vs. ≥6.

2.2.4 Data analysis

Adjusted ORs were calculated for the primary outcome, with interventions considered effective if the intervention group had lower tobacco use compared to the control group (OR <1). Meta-analyses were conducted using STATA version 18.5, employing a random-effects model to estimate pooled ORs with 95% confidence intervals (CIs).

Subgroup analyses examined intervention effectiveness based on intervention components, comparison groups, setting, and study quality. Multivariable meta-regression analyses, adjusted for study follow-up duration, were conducted to explore whether intervention characteristics influenced effect sizes. Based on a priori knowledge of the natural progression of tobacco use, longer study follow-

up is expected to result in lower effect sizes and is therefore treated as a covariate in our meta-regression of intervention characteristics.

Heterogeneity was assessed using the I^2 statistic, interpreted following Cochrane Handbook guidelines ¹²⁵. Publication bias was evaluated through visual inspection of funnel plots and Egger's regression test. This study was registered with PROSPERO (Registration number: CRD42022330329).

2.3 Results

Titles and abstracts from the 2,133 articles identified in the literature search were screened, of which 104 proceeded to full-text screening. Ultimately, 27 studies ^{105 106 126-149} published between 2002 and 2024 met the inclusion criteria and were included in this systematic review (see Figure 2.1 and Table 2.1).

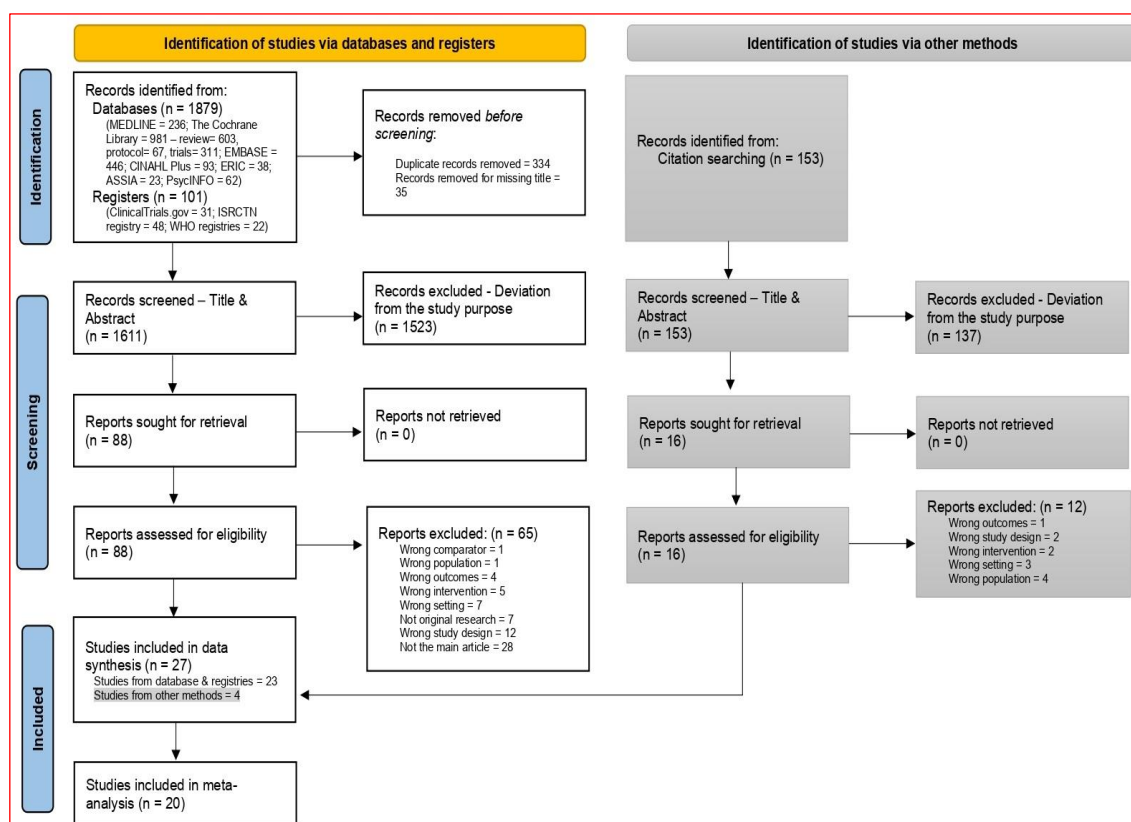


Figure 2.1: Study selection (PRISMA flowchart)

All included studies were cluster randomised, involving a combined total of 57,292 participants. Individual study sample sizes ranged from 170 to 14,063 participants, with a median of 1,353. The distribution of studies across WHO-defined regions was as follows: two (7.4%) in Africa, two (7.4%) in Europe, four (14.8%) in the Western Pacific, six (22.2%) in the Americas, six (22.2%) in the Eastern Mediterranean, and seven (25.9%) in South-East Asia (more details can be found in Table 2.1).

Among the included studies, five (18.5%) were conducted in Brazil^{133 138 143-145} and India^{106 129 137 148 149}. Three (11.1%) were conducted in China^{105 131}, and two (7.4%) were conducted in Pakistan^{135 142}. One study (3.7%) was conducted in Czech Republic¹²⁷, Indonesia¹⁴⁷, Iran¹⁴⁰, Jordan¹³², Lebanon¹⁴¹, Mexico¹³⁶, Nigeria¹⁴⁶, Romania¹²⁸, Saudi Arabia¹³⁹, South Africa¹²⁶, Taiwan¹³⁴, and Thailand¹³⁰ (Figure 2.2).

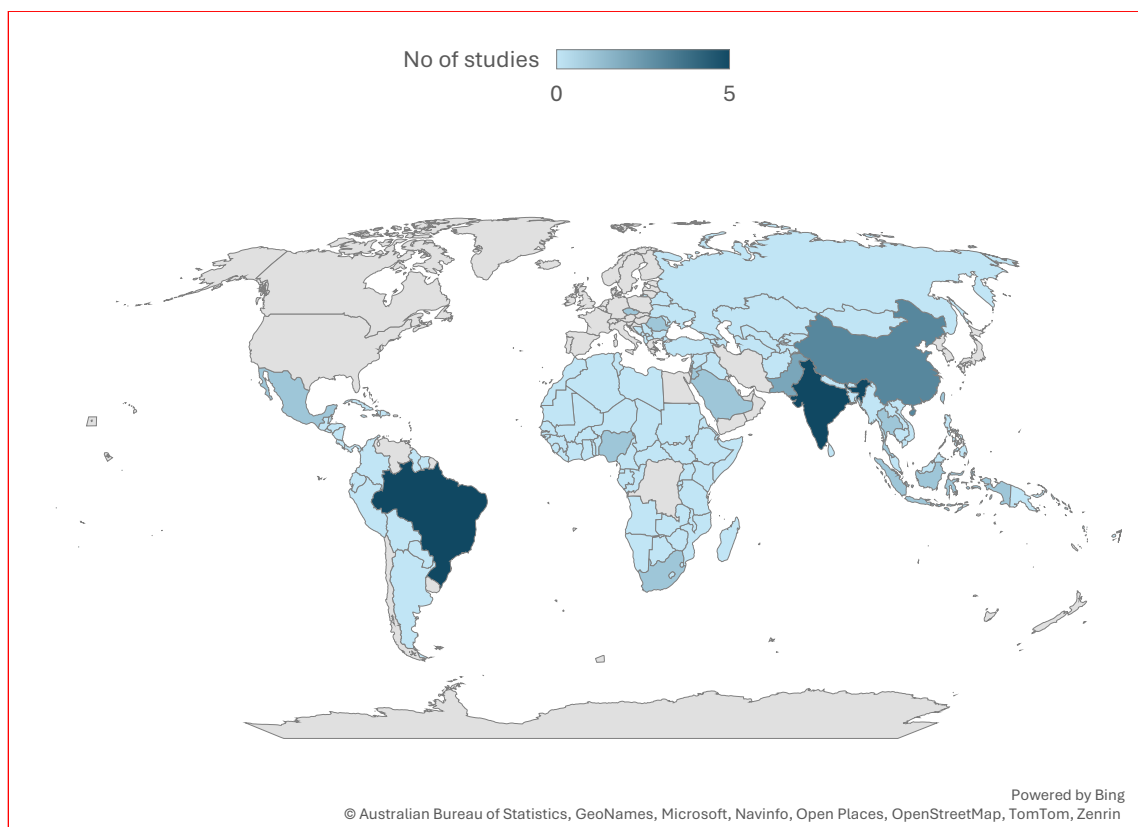


Figure 2.2: Distribution of school-based tobacco prevention interventions for adolescents in LMICs as of March 2024

Table 2.1: Included studies and their characteristics (n=27)

Author	Country	WHO Region	Study design	Outcome measure	Number randomised	Mean age, years ($\pm$ SD)	Grade	Sex, male%
Resnicow et al. (2008)	South Africa	African Region	C-RCT	30-day point prevalence	3267	14.1 ($\pm$ 1.2)	8	50.5%
Chou et al. (2006)	China	Western Pacific Region	C-RCT	Ever tobacco use prevalence	2454	12.5	7	52.3%
Gabrhelik et al. (2012)	Czech Republic	European Region	C-RCT	30-day point prevalence	1744	11.38 ($\pm$ 0.6)	6	50.4%
Lotrean et al. (2010)	Romania	European Region	C-RCT	7-day point prevalence	959	13.7 ($\pm$ 0.3)	7	48.8%
Perry et al. (2009)	India	South-East Asia Region	C-RCT	30-day point prevalence	14063	11.21	6 & 8	51.6%
Reddy et al. (2002)	India	South-East Asia Region	C-RCT	Ever tobacco use prevalence	4452	11.9	7	50.5%
Seal et al. (2006)	Thailand	South-East Asia Region	C-RCT	60-day point prevalence	170	15.55 ($\pm$ 2.3)	7 to 12	89.4%
Wen et al. (2010)	China	Western Pacific Region	C-RCT	Ever tobacco use prevalence	859	12.8 ($\pm$ 0.8)	7	48.2%
Wen et al. (2010)	China	Western Pacific Region	C-RCT	Ever tobacco use prevalence	983	13.9 ($\pm$ 0.5)	8	49.7%
Al-Sheyab et al. (2018)	Jordan	Eastern Mediterranean Region	C-RCT	4-month point prevalence (biochemically validated)	433	12.5 ($\pm$ 0.5)	7 & 8	100%
Filho et al. (2019)	Brazil	Region of the Americas	C-RCT	30-day point prevalence	1085	11 - 18	7 to 9	51.5%

Author	Country	WHO Region	Study design	Outcome measure	Number randomised	Mean age, years ($\pm$ SD)	Grade	Sex, male%
Guo et al. (2015)	Taiwan	Western Pacific Region	C-RCT	30-day point prevalence	1675	13.41 ($\pm$ 0.6)	7	51.1%
Hussain et al. (2018)	Pakistan	Eastern Mediterranean Region	C-RCT	30-day point prevalence	1971	11 - 16	6 to 10	59%
Kulis et al. (2021)	Mexico	Region of the Americas	C-RCT	30-day point prevalence	1129	11.9	7	50.8%
Mall et al. (2017)	India	South-East Asia Region	C-RCT	Ever tobacco use prevalence	631	NS	6 to 9	59%
Lisboa et al. (2019)	Brazil	Region of the Americas	C-RCT	30-day point prevalence	1353	14.8	7 to 11	49.3%
Mohammed et al. (2016)	Saudi Arabia	Eastern Mediterranean Region	C-RCT	7-day point prevalence	1047	13.88 ($\pm$ 0.6)	8	100%
Mohammadi et al. (2019)	Iran	Eastern Mediterranean Region	C-RCT	30-day point prevalence	1807	15.1 ($\pm$ 0.8)	7 to 9	50.3%
Nakkash et al. (2018)	Lebanon	Eastern Mediterranean Region	C-RCT	30-day point prevalence	1279	12.27 ($\pm$ 1.1)	6 & 7	48.7%
Rozi et al. (2019)	Pakistan	Eastern Mediterranean Region	C-RCT	Change in knowledge	1076	14.2 ($\pm$ 0.1)	6 to 10	60%
Sanchez et al. (2020)	Brazil	Region of the Americas	C-RCT	30-day point prevalence	3883	13.2 ($\pm$ 0.8)	8	50.1%
Sanchez et al. (2018)	Brazil	Region of the Americas	C-RCT	30-day point prevalence	3619	13.0	7 & 8	49.1%

Author	Country	WHO Region	Study design	Outcome measure	Number randomised	Mean age, years ($\pm$ SD)	Grade	Sex, male%
Sanchez et al. (2021)	Brazil	Region of the Americas	C-RCT	Ever tobacco use prevalence	1733	12.28 ($\pm$ 0.7)	7	51.5%
Vigna-Taglianti et al. (2021)	Nigeria	African Region	C-RCT	30-day point prevalence	2657	14.2 ($\pm$ 0.8)	7 to 9	61.5%
Tahlil et al. (2015)	Indonesia	South-East Asia Region	C-RCT	30-day point prevalence	427	11 - 14	7 & 8	41.2%
Saraf et al. (2015)	India	South-East Asia Region	C-RCT	Ever tobacco use prevalence	2074	12.4 ($\pm$ 1.1)	6 & 7	53.5%
Kaur et al. (2024)	India	South-East Asia Region	C-RCT	30-day point prevalence	462	13.45 ($\pm$ 1.5)	8	55%

SD=Standard deviation. C-RCT=Cluster randomised controlled trial.

Table 2.2: Intervention characteristics of the included studies (n=27)

Author	Int. provenance	Int. focus	Int. category	Int. condition	No of sessions	Duration per session (mins)	Int. Period (day)	Delivered by	Control condition
Resnicow et al. (2008)	Culturally adapted	Multi-drug	Social influences & Social competence	Decision-making for harm reduction and life skills for substance use prevention	16	45	730	School Teacher (ST)	Education against tobacco
Chou et al. (2006)	Culturally adapted	Tobacco only	Social influences	Fostered anti-smoking norms, teaching resistance skills, and emphasizing household smoke avoidance	13	45	98	Health Educator (HE)	No intervention
Gabrhele et al. (2012)	Culturally adapted	Multi-drug	Social influences & Social competence	Emphasized knowledge, interpersonal, and intrapersonal skills	12	45	365	ST	Minimal prevention program
Lotrean et al. (2010)	Culturally adapted	Tobacco only	Social influences & Social competence	Video-led lessons focused on social influences, refusal skills, and peer activities	5	45	60	ST + Peer Leader (PL)	No intervention
Perry et al. (2009)	Culturally adapted	Tobacco only	Social influences	Fun and interactive knowledge components, skills building, and normative education	13	70	120	ST + PL	Delayed intervention
Reddy et al. (2002)	Newly developed	Tobacco and alcohol	Social influences	Resist influences, refusal skills, and passive smoking education	3	45	55	ST + PL	No intervention

Author	Int. provenance	Int. focus	Int. category	Int. condition	No of sessions	Duration per session (mins)	Int. Period (day)	Delivered by	Control condition
Seal et al. (2006)	Culturally adapted	Multi-drug	Social influences & Social competence	Life skills training, substance health risks booklet	10	60	180	Research Team (RT)	Education against tobacco & drug
Wen et al. (2010)	Newly developed	Tobacco only	Multi-level	Anti-smoking textbook, lectures, films, role plays, coping strategies, parent/teacher pamphlet, school posters and community persuasion efforts	22	60	330	HE + School nurse (SN)	Education against tobacco
Wen et al. (2010)	Newly developed	Tobacco only	Multi-level	Anti-smoking textbook, lectures, films, role plays, coping strategies, parent/teacher pamphlet, school posters and community persuasion efforts	16	60	240	HE + SN	Education against tobacco
Al-Sheyab et al. (2018)	Culturally adapted	Tobacco only	Pledge & Social influences	Class smoke-free pledge, health lessons, resistance skills, role-playing and quiz show	3	30	6	PL	Education against tobacco
Filho et al. (2019)	Newly developed	Multiple (NCD risk factors)	Social influences & Social competence	Focused on teacher training, health education, and environmental changes, addressing substance use	NS	NS	NS	ST	No intervention

Author	Int. provenance	Int. focus	Int. category	Int. condition	No of sessions	Duration per session (mins)	Int. Period (day)	Delivered by	Control condition
Guo et al. (2015)	Newly developed	Multi-drug	Social influences & Social competence	Theoretical constructs include attitude, subjective norm, perceived behavioural control, and life skills	16	45	70	ST	Education against tobacco & drug
Hussain et al. (2018)	Newly developed	Tobacco only	Social influences & Social competence	Identify harmful effects, set quit date, manage urges, and withdrawal symptoms	2	30	27	RT	No intervention
Kulis et al. (2021)	Culturally adapted	Multi-drug	Social influences	Life skills training includes emotional regulation, assertiveness, and drug resistance strategies	12	45	84	ST	Education against tobacco & drug
Mall et al. (2017)	Culturally adapted	Tobacco only	Social influences	Training covered health risks, communication skills, personal development using interactive methods and diaries	10	60	70	PL	No intervention
Lisboa et al. (2019)	Culturally adapted	Tobacco only	Education against tobacco	Interactive stations cover tobacco risks, facial aging, health effects, and peer pressure resistance using Smoker face app	1	90	1	Medical student	No intervention
Mohammed et al. (2016)	Culturally adapted	Tobacco only	Social influences & Social competence	Training covers teamwork, smoking refusal, health effects, peer pressure, alternatives, and nonsmoking commitment	5	45	35	PL	No intervention

Author	Int. provenance	Int. focus	Int. category	Int. condition	No of sessions	Duration per session (mins)	Int. Period (day)	Delivered by	Control condition
Mohammedi et al. (2019)	Newly developed	Tobacco only	Social influences	Lectures, role-play, and group discussions to discourage smoking, improve knowledge, and change attitudes	4	60	28	PL	No intervention
Nakkash et al. (2018)	Newly developed	Tobacco only	Social influences	Face-to-face sessions covered tobacco health risks, media analysis, decision-making, refusal skills, and student projects	10	50	150	RT	No intervention
Rozi et al. (2019)	Newly developed	Tobacco only	Education against tobacco	Educational session covered tobacco hazards, short/long-term effects, quitting strategies, and reinforcement via posters, booklet, and video game	2	30	28	Physician	Self-reading educational leaflets
Sanchez et al. (2020)	Culturally adapted	Multi-drug	Social influences & Social competence	Lessons on drug attitudes, social skills, personal skills, with life skill activities	12	50	84	ST	No intervention
Sanchez et al. (2018)	Culturally adapted	Multi-drug	Social influences & Social competence	Lectures on drug attitudes, social skills, and personal skills	12	50	84	ST	No intervention
Sanchez et al. (2021)	Culturally adapted	Multi-drug	Social influences	social emotional learning theory skills taught through animated narratives, skill practice, homework, and comic book reinforcement	10	50	70	Police officer	No intervention

Author	Int. provenance	Int. focus	Int. category	Int. condition	No of sessions	Duration per session (mins)	Int. Period (day)	Delivered by	Control condition
Vigna-Taglianti et al. (2021)	Culturally adapted	Multi-drug	Social influences & Social competence Education	Interactive curriculum develops personal and social skills, focusing on normative education and substance consequences	12	60	365	ST	No intervention
Tahlil et al. (2015)	Newly developed	Tobacco only	Education against tobacco	Interactive lectures on smoking prevention knowledge focused on health and religion	8	120	56	ST & Health professionals	No intervention
Saraf et al. (2015)	Newly developed	Multiple	Multi-level	Encompassed school, classroom, and family components, integrating health committees, lectures, PT classes, and family orientations	4	38	240	RT	No intervention
Kaur et al. (2024)	Newly developed	Multiple	Multi-level	Interactive classroom sessions focused on health effects of tobacco & alcohol, peer awareness, and positive behaviour reinforcement	7	30	180	RT	Low intensity standard of care intervention

Int.=Intervention. NS=Not specified. ST=School Teacher. HE=Health Educator. PL=Peer Leader. RT=Research Team. SN=School nurse

2.3.1 Intervention characteristics

Regarding intervention design, 12 (44%) of the 27 studies evaluated newly developed interventions ^{129 131 133-135 140-142 147-149}, while 15 (56%) examined culturally adapted pre-existing interventions ^{105 106 126 128 130 132 136-139 143-146 150}. In terms of targeted health behaviours, 14 (52%) focused solely on tobacco prevention ^{105 106 128 131 132 135 137-142 147}. Nine (33%) addressed multi-drug substance prevention along with tobacco ^{126 127 130 134 136 143-146} while four (15%) focused on multiple non-communicable disease risk factors in addition to tobacco prevention ^{129 133 148 149}. For more information about the intervention characteristics, please see the Table 2.2 above.

2.3.2 Risk of bias assessment

Among the included studies, 26% were rated as low RoB, 15% were categorised as having some concerns, and 59% were judged to have high risk of bias (see Appendix 2.3). In terms of randomisation and recruitment processes, 92% of studies were assessed as having a low risk of bias (see Figure 2.3). However, concerns were identified regarding deviations from intended interventions in 52% of studies and outcome measurement in 32% of studies. Most studies (60%) were judged to have a high risk of bias in outcome measurement, primarily due to the use of inappropriate measurement methods and the lack of blinded outcome assessors. Reporting bias was identified as high in 12% of studies, with 16% categorised as having some concerns.

Seven studies were excluded from the primary meta-analysis on the basis that they

- i. Failure to measure the primary outcome ¹⁴².
- ii. Insufficient data at follow-up (<10 cases per group) ^{132 136 140 141 147}.
- iii. Extremely high intra-class correlation coefficient (ICC) ¹³³.

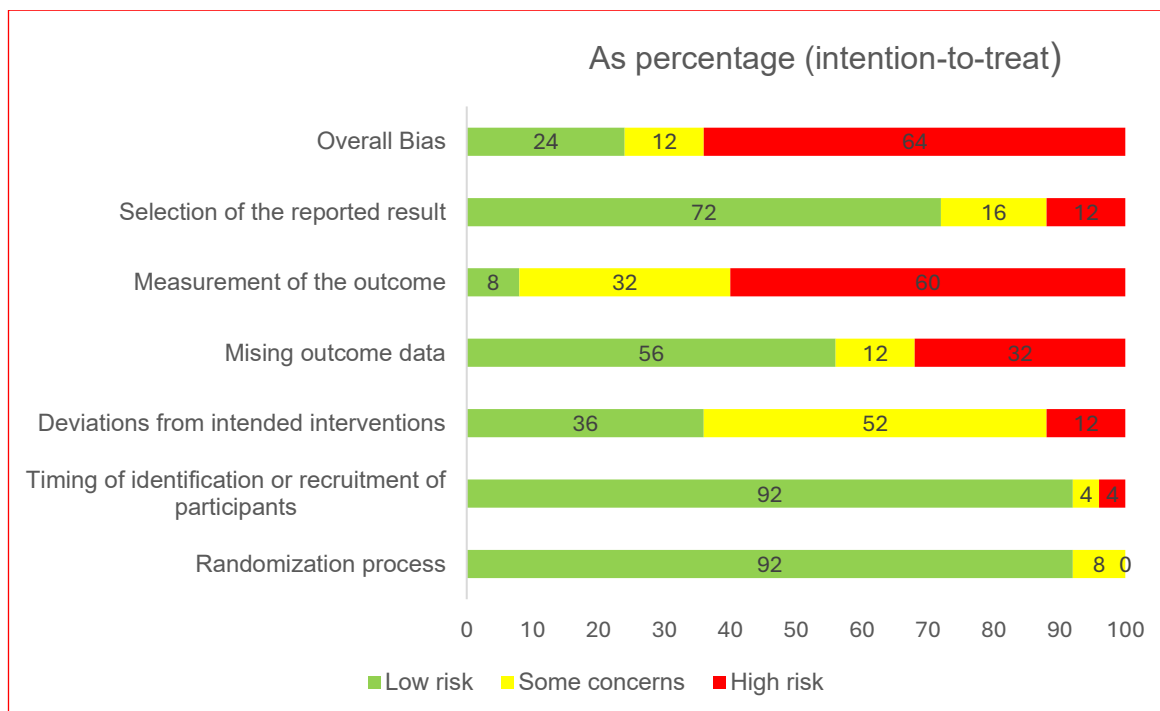


Figure 2.3: Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies, whether or not they had analysable data

2.3.3 Meta-Analysis findings

A forest plot (Figure 2.4) for the 20 studies^{105 106 126-131 134 135 137-139 143-146 148 149} included in the meta-analysis indicates that participants exposed to school-based interventions had 24% lower odds of initiating tobacco use compared with those in control groups (OR 0.76, 95% CI: 0.64–0.91) that were meta-analysed for the primary outcome. Moderate heterogeneity was observed ($I^2 = 47\%$), suggesting some variability in intervention effects. Despite some outliers, the funnel plot was symmetric (more details can be found in Appendix 2.4). Egger's test ($z = -0.32$, $p = 0.75$) did not indicate strong evidence of publication bias. The Egger's test ($z = -0.32$, $p\text{-value} = 0.75$) did not find strong evidence to suggest that publication bias influenced the results. When considering only studies with low RoB, the intervention was associated with 34% lower odds of trying or take up tobacco (OR 0.66, 95% CI: 0.50–0.87; $I^2 = 14\%$; 6 studies, Figure 2.5).

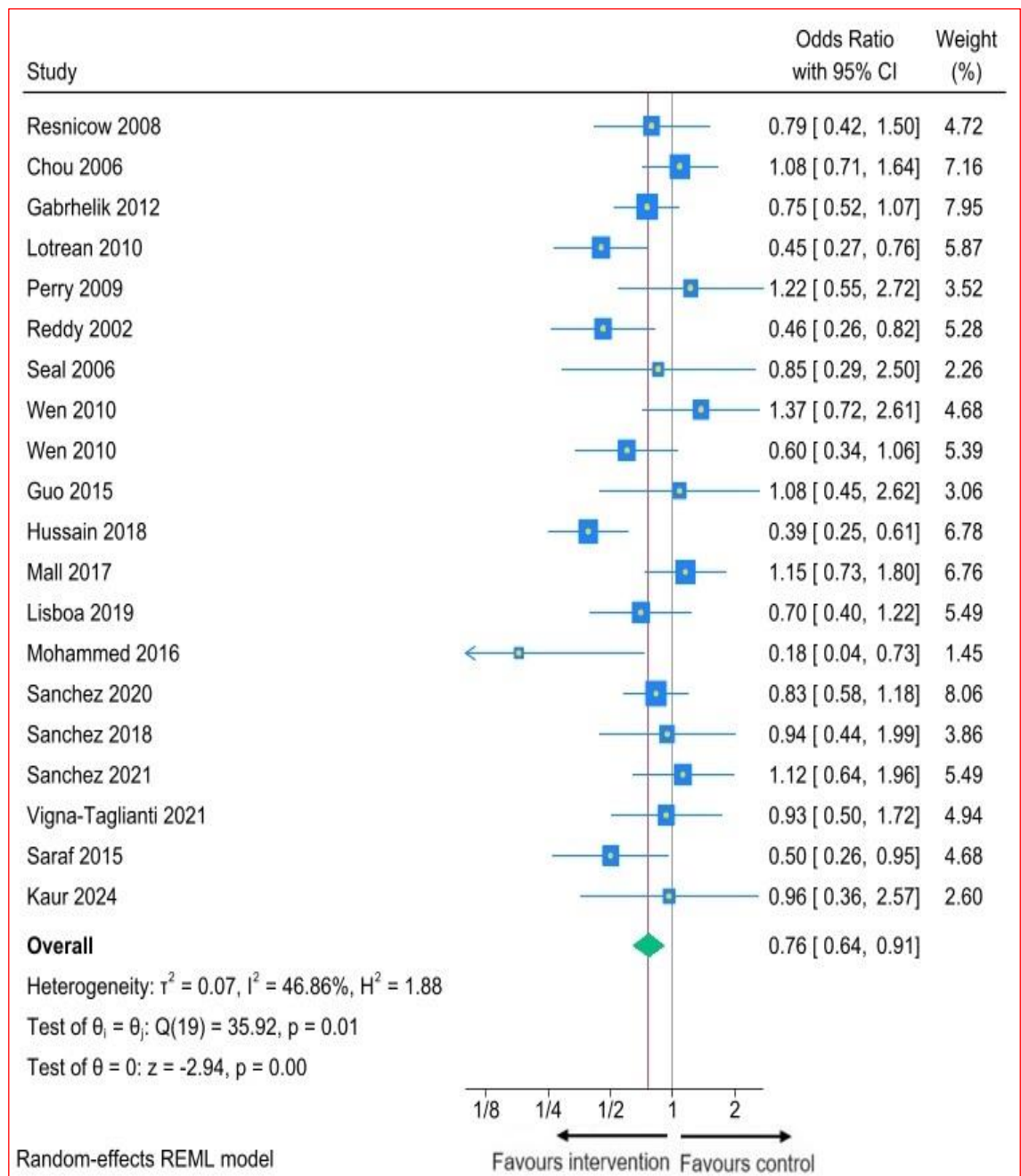


Figure 2.4: Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents

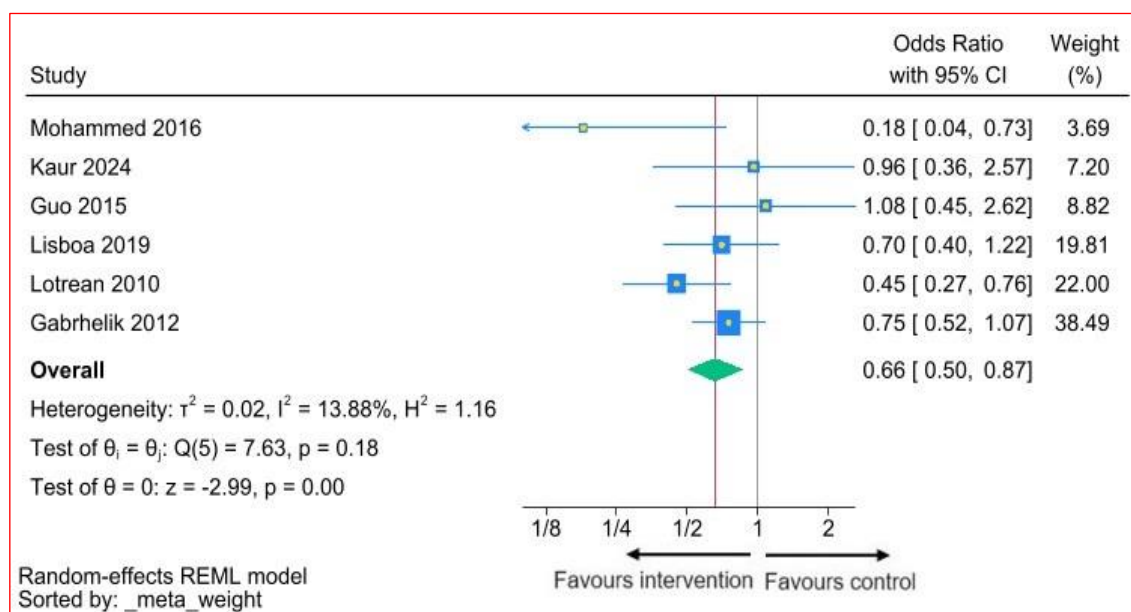


Figure 2.5: Forest plot for meta-analysis of studies with low risk of bias, showing the effect of interventions on tobacco use prevention among adolescents

2.3.4 Subgroup and sensitivity analyses

Subgroup analysis (see Table 2.3) demonstrated a reduction in tobacco use across most intervention subgroups. Multivariable meta-regression models, adjusted for follow-up length, indicated that total contact time was significantly associated with intervention effectiveness. A lower effect on tobacco initiation was observed for interventions with high contact time compared with those with low contact time (adjusted OR 1.36, 95% CI: 1.01–1.84, $p = 0.045$, $I^2 = 22\%$; 20 studies).

To assess the robustness of the findings, a sensitivity analysis was conducted restricted to studies where the design effect for cluster adjustment was not imputed. The overall pooled effect size in this sensitivity analysis (see Appendix 2.5) was an OR of 0.83 (95% CI: 0.67–1.03) which was similar to the main analysis with all studies (OR = 0.76, 95% CI: 0.64–0.91), as was the heterogeneity; I^2 was 31.6% in the sensitivity analysis and 46.9% in the main analysis. The findings from further subgroup analyses of studies directly accounting for the design effect were consistent with those from the subgroup analysis of all studies (see Appendix 2.5.1 to Appendix 2.5.11).

Table 2.3: Multivariable meta-regression results with subgroup analysis, showing associations between intervention factors and effect size of intervention on tobacco use

Intervention characteristics	Categories	No of studies	Subgroup analysis		Meta-regression analysis*			
			Odds ratio (95% CI)	I ²	β (SE)	Moderation odds ratio (95% CI) #	p value	I ²
Intervention provenance ^a								
	Newly developed	7 studies	0·65 (0·45, 0·93)	56·13%	-0·27 (0·15)	0·76 (0·56, 1·03)	0·078	13·28%
	Culturally adapted	13 studies	0·84 (0·71, 0·99)	15·19%		1·00		
Intervention focus ^b								
	Tobacco only	9 studies	0·72 (0·51, 1·03)	70·25%	-0·01 (0·17)	0·99 (0·71, 1·37)	0·948	33·44%
	Multiple substances	11 studies	0·79 (0·66, 0·93)	0·00%		1·00		
Intervention category ^c								
	Both social influence and social competence	10 studies	0·68 (0·53, 0·87)	42·77%	-0·09 (0·18)	0·91 (0·64, 1·30)	0·614	31·33%
	Other categories	10 studies	0·86 (0·67, 1·10)	43·76%		1·00		
Tobacco type ^d								
	Smoked tobacco only	16 studies	0·80 (0·67, 0·94)	24·60%	0·08 (0·21)	1·08 (0·72, 1·63)	0·707	32·94%
	Smokeless tobacco/both smoking and smokeless tobacco	4 studies	0·66 (0·38, 1·15)	72·10%		1·00		
Intervention mode of delivery ^e								
	Classroom session	15 studies	0·75 (0·61, 0·92)	51·94%	0·005 (0·21)	1·00 (0·67, 1·51)	0·982	32·71%
	Multimodal	5 studies	0·81 (0·53, 1·22)	39·55%		1·00		
Intervention operator ^f								

Intervention characteristics	Categories	No of studies	Subgroup analysis		Meta-regression analysis*			
			Odds ratio (95% CI)	I ²	β (SE)	Moderation odds ratio (95% CI) #	p value	I ²
Number of sessions ^g	Peer leader and/or schoolteacher	11 studies	0.77 (0.62, 0.95)	34.12%	-	0.99 (0.72, 1.37)	0.965	33.30%
	Others	9 studies	0.76 (0.56, 1.04)	56.75%	0.007 (0.17)	1.00		
	≤ 11 sessions	10 studies	0.62 (0.46, 0.85)	58.00%	-0.25 (0.17)	0.78 (0.56, 1.09)	0.147	28.99%
	> 11 sessions	10 studies	0.88 (0.75, 1.04)	0.00%		1.00		
Control condition ^h	Active control	6 studies	0.81 (0.64, 1.03)	0.00%	0.03 (0.19)	1.03 (0.71, 1.49)	0.888	33.55%
	Inactive control	14 studies	0.73 (0.58, 0.93)	57.29%		1.00		
Total contact time ^{i,p}	High (> 592.5 min)	10 studies	0.93 (0.77, 1.11)	0.00%	0.32 (0.15)	1.36 (1.01, 1.84)	0.045	22.25%
	Low (≤ 592.5 min)	10 studies	0.63 (0.48, 0.83)	59.07%		1.00		
Delivery intensity ^{j,q}	High (> 4 min/day)	9 studies	0.94 (0.79, 1.13)	0.00%	0.27 (0.16)	1.32 (0.97, 1.79)	0.079	12.47%
	Low (≤ 4 min/day)	11 studies	0.65 (0.51, 0.82)	43.63%		1.00		
Risk of bias ^k	Low	6 studies	0.66 (0.50, 0.87)	13.88%	-0.14 (0.18)	0.87 (0.61, 1.25)	0.462	30.41%
	High	14 studies	0.81 (0.65, 1.01)	52.09%		1.00		
Number of BCTs ^l	BCTs ≥ 6	10 studies	0.90 (0.76, 1.06)	0.00%	0.27 (0.20)	1.31 (0.88, 1.95)	0.177	30.69%
	BCTs < 6	10 studies	0.61 (0.45, 0.82)	52.53%		1.00		

* Adjusted for the length of follow-up, categorised as '1' (>6 months) and '0' (≤6 months). The subgroup analysis shows that follow-up length > 6 months (OR=0.85, 95% CI: 0.72, 0.99, 14 studies) compared to ≤ 6 months (OR=0.55, 95% CI: 0.37, 0.83, 6 studies).

Calculated by exponentiating log-transformed estimates of intervention effect.

a Newly developed vs culturally adapted from existing intervention.

b Tobacco only vs multiple (tobacco and/or alcohol/substance use/NCD risk factors).

c Both social influence and social competence vs other categories (only social influence/education against tobacco/multi-level).

d Smoked tobacco only vs smokeless tobacco/both smoking and smokeless tobacco.

e Classroom session vs multimodal.

f Peer leader and/or schoolteacher vs others (research team/health educator/nurse/medical student/police officer).

g Number of sessions delivered in intervention ≤ 11 vs > 11 . The categorisation was based on the median value of the variable.

h Active control vs inactive control.

i Total contact time with the participants high vs low.

j High delivery intensity vs low delivery intensity.

k Low risk of bias vs high or some concerns over risk of bias.

l Number of BCTs used in the intervention ≥ 6 vs < 6 .

// The total contact time was calculated by multiplying the number of sessions by the duration of each session. The categorisation was based on the median value of the variable (high = greater than the median).

¶ Delivery intensity was calculated by dividing the total contact time (in minutes) by the period (in days) for all session deliveries. The categorisation was based on the median value of the variable (high = greater than the median).

BCTs = Behaviour change techniques.

2.3.5 BCTs mapping

BCTs used to enhance anti-tobacco behaviours were identified across the included interventions and are summarised in Table 2.4. Individual study-level BCTs are detailed in Appendix 2.6. A total of 18 of the 93 BCTs from the BCTTv1 framework were identified across the interventions. The BCTTv1 organises these 93 techniques into 16 groups, based on shared behavioural components ¹²⁴. Among the included studies, 11 of these 16 groups were present. The number of BCTs incorporated into each intervention ranged from 2 to 12, with an average of 5.8 BCTs per intervention.

Table 2.4: Frequency of BCTs identified in school-based tobacco use prevention interventions in LMICs

BCTs category	BCTs	n	%
1. Goals and planning	1.2. Problem solving	15	79
	1.3. Goal setting (outcome)	6	32
	1.9. Commitment	5	26
2. Feedback and monitoring	2.3. Self-monitoring of behaviour	1	5
3. Social support	3.1. Social support (unspecified)	3	16
4. Shaping knowledge	4.1. Instruction on how to perform the behaviour	3	16
	4.2. Information about Antecedents	2	11
5. Natural consequences	5.1. Information about health consequences	15	79
	5.2. Salience of consequences	7	37
	5.3. Information about social and environmental consequences	7	37
	5.6. Information about emotional consequences	8	42
6. Comparison of behaviour	6.1. Demonstration of the behaviour	3	16
9. Comparison of outcomes	9.2. Pros and cons	2	11
11. Regulation	11.2. Reduce negative emotions	7	37
12. Antecedents	12.2. Restructuring the social environment	9	47
	12.3. Avoidance/reducing exposure to cues for the behaviour	5	26
	13.1. Identification of self as role model	2	11
13. Identity			
15. Self-belief	15.1. Verbal persuasion about capability	11	58

2.4 Discussion

The findings of this systematic review and meta-analysis suggest that school-based tobacco prevention interventions are effective in reducing tobacco use initiation among adolescents in LMICs. The pooled analysis of 20 studies indicated that participants exposed to such interventions had 24% lower odds of initiating tobacco use compared with those in the control group. This highlights the potential of school-based programmes in addressing adolescent tobacco initiation, a population at high risk for adopting tobacco use behaviours. However, moderate heterogeneity ($I^2 = 47\%$) was observed, suggesting that intervention effectiveness varied across studies.

The analysis further revealed that interventions with a follow-up duration longer than six months were associated with a smaller effect size (OR = 0.85, 95% CI: 0.72–0.99; 14 studies) compared with interventions having a shorter follow-up period (≤ 6 months: OR = 0.55, 95% CI: 0.37–0.83; 6 studies). This suggests that the protective effects of these interventions may diminish over time, potentially due to peer influence, lack of continued support, and the natural increase in tobacco experimentation during adolescence. These findings highlight the challenge of sustaining intervention effects and underscore the need for continuous reinforcement strategies to maintain behaviour change. One-off interventions may be insufficient to achieve long-term tobacco prevention effects in school-based settings. Given the well-documented association between follow-up duration and abstinence rates in tobacco use intervention trials ¹⁵¹, follow-up length was treated as a key confounder and was controlled for in the meta-regression analysis.

The multivariable meta-regression analysis identified total contact time with participants as the only intervention characteristic significantly associated with effect size. Interventions with longer contact time were associated with a smaller effect on reducing tobacco initiation. It is possible that longer interventions may lead to participant fatigue, reduced engagement, or dilution of key intervention content, thereby diminishing effectiveness. These findings

suggest that optimising intervention length and ensuring engagement without overburdening participants may be critical for achieving sustained effects.

The subgroup analysis demonstrated that school-based interventions were generally effective in reducing the odds of tobacco use initiation across most subgroups. However, the meta-regression results were uncertain, with confidence intervals including the possibility of both negative and positive associations. This highlights the need for further research to examine which specific intervention components contribute most significantly to effectiveness.

The findings of this review build on and extend the existing literature, particularly the Cochrane review by Thomas et al. (2013), which primarily synthesised evidence from high-income countries and focused on smoking-related interventions^{98 99}. While this review concluded that school-based interventions may have a modest effect in delaying tobacco initiation, their relevance to LMIC contexts – where the epidemiological profile of tobacco use is more diverse – was limited. Similarly, Ba-Break et al.'s (2023) systematic review focused on intervention functions, theoretical constructs and cultural adaptations of school-based smoking prevention programmes but did not include a meta-analysis and excluded studies addressing smokeless tobacco use¹¹⁹. By contrast, the present review addresses a critical gap by providing the first known meta-analytic synthesis of school-based tobacco prevention interventions conducted in LMICs, encompassing both smoking and smokeless tobacco use. This focus reflects the specific sociocultural and behavioural patterns of tobacco use in these settings and offers more contextually relevant evidence for intervention design and policy.

Several limitations should be acknowledged. First, a substantial proportion of the included studies were judged to have a high RoB, particularly in outcome measurement and reporting. Such biases could inflate or deflate intervention effects. However, the sensitivity analysis, restricted to studies with low RoB, showed that participants had 34% lower odds of initiating tobacco use, suggesting that the intervention effect remains robust even when considering high-quality studies. Moreover, meta-regression did not identify significant

differences between high and low RoB studies, indicating that the overall effect was relatively consistent across studies with varying levels of bias.

Second, moderate heterogeneity was observed across studies, likely influenced by differences in intervention design, delivery modes, cultural contexts, and targeted populations ¹⁵²⁻¹⁵⁵.

Third, although all included studies were C-RCTs, not all studies properly accounted for clustering effects in their analyses. To address this, a crude adjustment was applied by imputing an ICC based on the mean ICCs reported in other included studies. However, if the actual ICC values in these studies differ from the imputed values, this could introduce bias ¹⁵⁶. Nonetheless, the effect estimates remained stable when restricting the analysis to studies that accounted for clustering appropriately.

Fourth, all included studies relied on self-reported tobacco use data, which may introduce performance bias due to social desirability effects (i.e., students may have been inclined to misreport their tobacco use status) ^{157 158}. The lack of biochemical verification of tobacco abstinence in these studies represents an important limitation, as it may lead to underestimation or overestimation of the true intervention effect.

Fifth, while the meta-regression findings indicated that interventions with shorter contact time were associated with greater effectiveness, this outcome was not derived from direct head-to-head comparisons between intervention lengths. As such, the observed association should be interpreted with caution. Future research would benefit from experimental design directly comparing short versus long interventions to better understand the role of intensity in intervention effectiveness.

Sixth, although this review aimed to examine the effectiveness of interventions in preventing tobacco use, the analysis was primarily based on tobacco use prevalence as the key outcome measure. This was largely due to the limited availability of longitudinal data and the relatively short duration of follow-up in most included trials. Ideally, prevention effectiveness would be measured by assessing transitions from non-use to initiation among adolescents who were tobacco-free at baseline. However, the majority of studies included both users and non-users at baseline, and few provided disaggregated data. Consequently,

tobacco use prevalence was adopted as a pragmatic proxy for evaluating prevention effect.

These findings emphasise the complexity of adolescent tobacco use and the various factors influencing tobacco initiation. While school-based interventions provide a promising strategy for tobacco prevention, they should be integrated into comprehensive, multi-sectoral approaches that address broader determinants of tobacco use, including social, economic, and environmental factors^{159 160}. The effectiveness of these interventions is likely to be enhanced when combined with community-wide efforts, including stronger policy enforcement, public awareness campaigns, and youth engagement strategies. Furthermore, collaborative efforts involving schools, healthcare providers, policymakers, and communities are imperative to create supportive environments that foster sustainable tobacco-free behaviours among adolescents^{160 161}. Future research should focus on:

- i. Extending the follow-up period and adopting more precise outcome measures focused on incidence among baseline non-users.
- ii. Identifying the most effective components of school-based interventions that contribute to long-term behaviour change.
- iii. Evaluating culturally adapted and context-specific approaches to tobacco prevention in LMICs.
- iv. Incorporating biochemical verification measures to strengthen the validity of tobacco abstinence outcomes.
- v. Exploring digital and hybrid models of intervention delivery to enhance engagement and scalability.

2.5 Conclusion

This systematic review provides evidence that school-based tobacco prevention interventions are effective in reducing the likelihood of tobacco use initiation among adolescents in LMICs. Shorter interventions seem to offer practical benefits, indicating that concise yet engaging programmes incorporating specific BCTs, such as providing information on emotional consequences and

strategies for reducing negative emotions, may enhance their effectiveness. Nonetheless, the evidence surrounding long-term tobacco use prevention remains inconclusive. Additionally, the limited research available on certain tobacco products, particularly smokeless forms, underscores the need for cautious interpretation and further investigation. The insights from this review support the widespread implementation of school-based tobacco prevention interventions across LMICs. By using these findings, stakeholders, policymakers, and researchers can collaboratively develop context-specific, evidence-based interventions aimed at curbing the tobacco epidemic and promoting adolescent health and well-being in LMIC settings.

2.6 Implications of the findings for intervention development

Based on the findings of this systematic review and meta-analysis, following six recommendations can be put forward for the intervention development of this thesis (see Chapter – 4):

i. Ground the intervention in behaviour change theory

- a. The intervention should be guided by established frameworks, including the BCTs, to ensure targeted and effective behaviour modification.

ii. Designing brief and engaging interventions

- a. The intervention should balance conciseness and engagement to avoid participant fatigue while maximising impact.
- b. Sessions should be short yet interactive, incorporating peer discussions, digital tools, and engaging content.

iii. Adapt to cultural contexts for relevance

- a. Interventions should be culturally tailored to local contexts, using community co-design approaches to enhance acceptability.

iv. Optimise delivery for impact

- a. The intervention should be delivered by trained facilitators (e.g., public health professionals) to enhance scalability and sustainability.
- b. Hybrid delivery models should be considered, ensuring intervention fidelity while promoting long-term feasibility.

v. Maintain follow-up and reinforcement

- a. A minimum follow-up period of six months is recommended to assess long-term effectiveness.
- b. Booster sessions or refresher components should be incorporated to sustain behavioural change without overburdening participants.

vi. Ensure process evaluation for feasibility and effectiveness

- a. A process evaluation should assess implementation challenges, cost-effectiveness, acceptability, delivery quality, and intervention fidelity to facilitate real-world application.

By integrating these evidence-based recommendations, a brief, effective, and scalable school-based tobacco prevention intervention can be developed, ensuring sustained reductions in adolescent tobacco initiation in LMICs.

Chapter 3 – School-based survey on tobacco and health among adolescents in Dhaka, Bangladesh (Study 2)

3.0 Chapter summary

Tobacco use remains a considerable public health concern in Bangladesh, particularly among adolescents who are highly susceptible to initiation. This study investigated the prevalence, determinants, and mental health associations of tobacco use among school adolescents in Dhaka, Bangladesh. In addition to quantitative measures, the study explored adolescents' perceptions of a school-based tobacco prevention intervention, including their preferred structure, content, and delivery approach.

A cross-sectional online survey was conducted between June and September 2022 among 2,593 school adolescents aged 11–18 years, recruited from 24 schools in Dhaka. Data were collected using a semi-structured questionnaire that assessed socio-demographics, tobacco use behaviours, second-hand smoke exposure, advertising exposure, knowledge and anti-tobacco education, depression, anxiety, and opinions on tobacco prevention interventions. Logistic regression analyses were performed to identify factors associated with tobacco use and mental health outcomes. Additionally, a thematic analysis was performed to identify adolescents' preference on programme structure, delivery preferences, and intervention components.

The prevalence of ever and current tobacco use was 16.0% and 7.3%, respectively, with cigarette smoking (10.4%) being the most common form of tobacco use. Males had significantly higher odds of both ever tobacco use (AOR: 1.75, 95% CI: 1.34–2.29) and current tobacco use (AOR: 4.11, 95% CI: 2.42–6.98) compared to females. Older adolescents (aged 17–18 years) were more likely to be current users (AOR: 3.26, 95% CI: 1.36–7.82) compared to younger students. Environmental factors played a crucial role, with SHS

exposure at home and in public places significantly increasing the likelihood of tobacco use. Exposure to tobacco advertisements was also associated with higher odds of ever and current tobacco use, while receiving anti-tobacco education was associated with a 30% and 50% reduction in the odds of ever and current use, respectively.

Tobacco use was significantly associated with depression and anxiety. Ever and current tobacco users had higher odds of depression (AOR = 1.74 and 1.95, respectively) and anxiety (AOR = 1.48 and 1.87, respectively) compared with never-users.

Qualitative findings revealed strong support for school-based tobacco prevention interventions, with 86% of students favouring implementation. Participants preferred a structured school-based intervention, favouring a brief format (four sessions, 30 minutes each), delivered by public health professionals rather than teachers or peers. Key suggested components included peer resistance training, mental health support, family engagement, and culturally relevant educational content.

This study highlights the high prevalence of adolescent tobacco use, its key environmental and social determinants, and its association with poor mental health outcomes. The findings support the need for targeted school-based interventions that address peer influence, SHS exposure, mental well-being, and family involvement.

3.1 Introduction

As established in the general introduction (see Chapter 1), tobacco use, both in smoking and smokeless forms, remains a major public health concern worldwide, contributing substantially to morbidity and mortality. The World Health Organization (WHO) estimates that over 8 million deaths annually are attributable to tobacco use, including approximately 1.3 million non-smokers who succumb to second-hand smoke (SHS) exposure ¹. The burden of tobacco-related diseases is particularly pronounced in low- and middle-income countries (LMICs), where approximately 80% of the world's 1.3 billion tobacco users reside ¹. In South and Southeast Asia, smokeless tobacco (SLT) use presents additional challenges, accounting for over 85% of the global SLT-related disease burden ⁵. SLT products, such as betel quid, gutkha, and khaini are widely consumed and are strongly associated with oral cancer and other non-communicable diseases ⁵. The high prevalence of tobacco use in LMICs is often linked to weaker regulatory frameworks, limited public health resources, and aggressive marketing strategies by the tobacco industry ¹⁶²⁻¹⁶⁴.

Adolescents represent a particularly vulnerable group for tobacco initiation ⁴⁴. Initiation at this development stage significantly increases the likelihood of continued and long-term tobacco use. The WHO estimates that approximately 38 million adolescents aged 13 to 15 years currently use tobacco globally, with prevalence rates varying by region and tobacco type ⁸⁹. Adolescent tobacco use is further compounded by environmental and social influences, including peer behaviour, familial exposure, and industry-driven marketing strategies ¹⁶⁵⁻¹⁶⁹. SHS exposure is a notable risk factor, with rates of exposure among adolescents ranging from 16.4% to 85.4% globally, with particularly high levels observed in LMICs ³⁶. Evidence suggests that SHS exposure not only increases susceptibility to tobacco initiation but also exacerbates health risks, including respiratory and cardiovascular diseases ^{167 168}. Adolescents are also directly targeted through various marketing channels, and systematic reviews consistently connect tobacco marketing with increased use of tobacco ^{165 170}. Exposure to point-of-sale promotions in various settings is associated with

higher tobacco use ^{167 171}, while support for smoke-free policies is linked to reduced tobacco use among adolescents ^{168 172}.

The association between tobacco use and mental health is an emerging area of concern ⁶⁷. Tobacco consumption has been linked to the onset and exacerbation of mental health conditions such as depression and anxiety ^{67 173}. While some studies suggest that individuals may use tobacco as a form of self-medication ¹⁷⁴ to alleviate depressive symptoms, other research indicates that tobacco use may contribute to the development of mental health disorders ^{82 175-179}. The causal directionality of this relationship remains contested ⁷³, with potential shared genetic and environmental risk factors implicated ¹⁸⁰. While much of the existing literature on this association focuses on adults, research on adolescents remains comparatively limited, despite the importance of early intervention in preventing long-term mental health and addiction-related consequences ¹⁸¹.

Bangladesh, a densely populated LMIC in South Asia, ranks among the top ten countries with the highest tobacco use prevalence. Both smoked and smokeless tobacco products are widely consumed ¹⁸², and enforcement of tobacco control measures remains a significant challenge ^{44 183}. The most recent Global School-based Student Health Survey (GSHS) conducted by WHO in 2014 reported that 9.8% of school-going adolescents – 13.8% of boys and 2.0% of girls – used tobacco regularly ⁴⁷. Moreover, SHS exposure among adolescents was alarmingly high, with 31.1% exposed at home and 59.0% in enclosed public spaces ⁴⁸. Despite the enactment of national tobacco control legislation in 2005 (updated in 2015), enforcement remains weak, and adolescent tobacco use persists as a pressing issue.

With an adolescent population comprising approximately 22% of the total population ¹⁸⁴, Bangladesh's long-term public health outlook is closely tied to curbing adolescent tobacco use. However, contemporary data on adolescent tobacco use and SHS exposure in Bangladesh remain scarce, limiting the ability to design effective prevention strategies. Understanding the contextual determinants influencing adolescent tobacco use is essential for developing

culturally and contextually relevant interventions. This chapter presents findings from a school-based survey conducted in Dhaka, Bangladesh, aimed at addressing this knowledge gap by examining the prevalence, patterns, and influencing factors of adolescent tobacco use, as well as its association with depression and anxiety symptoms.

3.2 Methods

3.2.1 Study design, area and participants

A cross-sectional study was conducted in Dhaka, Bangladesh, between June and September 2022, targeting school adolescents. This study design was selected to provide a comprehensive snapshot of tobacco use behaviours and their associated socio-environmental determinants within a diverse school environment. Schools were purposively sampled to include a range of institutional types (e.g., public, private, boys-only, girls-only, and co-educational), ensuring representation across different socio-economic backgrounds within a limited timeframe.

3.2.2 Study procedures

3.2.2.1 Sample and recruitment

The study targeted school adolescents in Dhaka, Bangladesh, who met the following eligibility criteria: students enrolled in school Years 8 to 11, aged between 13 and 18 years, and proficient in reading and understanding Bangla.

Participants were recruited using an opportunistic sampling approach, whereby schools were selected based on their accessibility and willingness to participate. This approach was taken due to logistical constraints and the specific objectives of the study. While opportunistic sampling carries inherent limitations, such as potential selection bias and reduced representativeness, measures were implemented to mitigate these concerns. To enhance sample diversity and improve generalisability, a list of 32 schools was compiled to represent a broad cross-section of the socio-economic and educational landscape of Dhaka city.

Schools were purposively selected based on three main criteria: (i) geographic location, using local government administrative boundaries to ensure representation across different areas of the city; (ii) monthly school fees and academic performance, as reflected in school-level passing rates, to capture variation in socio-economic background and educational quality; and (iii) school type and sex composition, ensuring the inclusion of girls-only, boys-only, and co-educational institutions. All selected schools followed the National Curriculum and Textbook Board curriculum in Bangla, ensuring consistency with the broader educational framework of the country. Although the sampling design was non-random, purposive selection was undertaken to maximise contextual representativeness by incorporating schools serving students from a range of socio-economic and demographic backgrounds. This approach was considered appropriate given the exploratory nature of the study and the practical constraints associated with accessing a fully randomised school sampling frame within Dhaka.

Following school selection, formal invitations were sent to school authorities to seek permission for study participation. A sample copy of the invitation letter is attached in Appendix 3.1. Of the 32 schools approached, 24 (75%) consented to participate and provided the necessary approvals to conduct the survey among their students. The school authority then circulated a recruitment leaflet for the survey (a copy of the leaflet can be found in Appendix 3.2). Parents or guardians of eligible students were subsequently invited to provide consent via an information letter detailing the study's purpose, procedures, and potential risks and benefits. The letter included links to an online parental information sheet (see Appendix 3.3), participant information sheet (see Appendix 3.4), consent forms (see Appendix 3.5 to Appendix 3.7), and the survey questionnaire (see Appendix 3.8).

To ensure ethical integrity, an opt-in electronic informed consent process was followed. Consent was obtained via secure online forms submitted by parents or legal guardians prior to student participation. For students in Years 8 and 9, electronic parental consent was mandatory, and students provided separate assent. Older students (Years 10 and 11) provided electronic consent

themselves in accordance with ethical guidelines. All participants received information about the study, including confidentiality and the voluntary nature of participation, and were informed of their right to withdraw at any time without consequence. Based on an estimated average class size of 35 students, approximately 77% of eligible students completed the survey, although a full student roster was not available for verification.

3.2.2.2 Sample size and power analysis

The sample size calculation was based on data from the GSHS 2014, which reported that 9.8% (95% CI: 6.3–15.0) of Bangladeshi school-going adolescents (aged 13 to 17 years) had used a tobacco product in the past 30 days ⁴⁷. Assuming a similar prevalence rate, a target sample size of approximately 1,382 participants was estimated to achieve a 95% confidence interval with a margin of error between $\pm 1.5\%$ and $\pm 3\%$.

3.2.2.3 Data collection procedures

Data were collected online using the Research Electronic Data Capture (REDCap) platform ^{185 186}, hosted within the UCL Data Safe Haven, which complies with the General Data Protection Regulation to ensure data security and confidentiality.

I initially developed a draft version of the survey questionnaire, which included both open and closed-ended questions. To ensure validity and reliability, tobacco use behaviour-related questions were adapted from the Global Youth Tobacco Survey, a widely recognised instrument developed by WHO for assessing adolescent tobacco use ¹⁸⁷. The questionnaire underwent multiple rounds of expert review by specialists in behavioural sciences, incorporating recommendations to enhance clarity and relevance. Following the expert review, the questionnaire was translated into Bangla to ensure accessibility for all participants. The translation process involved initial translation by a bilingual expert, back-translation into English by two local university graduates to verify consistency, and final review by the lead author to ensure linguistic and conceptual equivalence.

A pilot testing was conducted with a small sample of adolescents (n=8) to assess the feasibility and clarity of the questionnaire. Participants were purposively selected to reflect variations in age and socio-economic background. The pilot tested the usability of the online platform, comprehensibility of survey items, and estimated completion time. Feedback was incorporated to refine the final questionnaire, including simplifications of complex questions, clarification of ambiguous terms, and formatting adjustments to enhance user experience. The final English version of the questionnaire is included in the appendix 3.8.

Sensitive information related to a participant's self-harm/suicidal risk was identified through their response to question 9 (E3.9) of the Patient Health Questionnaire (PHQ-9) measure: "Thoughts that you would be better off dead or hurting yourself in some way" in the data collection tool when it was completed and submitted electronically by the participant. I checked questionnaire submissions on a daily basis and was therefore alerted if a participant indicated a response of 3 to question 9 of the PHQ-9. In such instances, I was responsible for contacting the relevant school, responsible teacher, or wellbeing lead where the participant was enrolled and making them aware of this. The school, responsible teacher, or wellbeing lead would then attempt to contact the legal guardians (i.e., the parents) of the participant and take further necessary actions as per their policy. However, I provided the school, teacher, or wellbeing lead with a risk flow chart (see Appendix 3.9) to follow in managing these risk cases.

3.2.2.4 Ethics approval

Local ethical approval for this study was obtained from the 'Biosafety, Biosecurity & Ethical Committee' of Jahangirnagar University in Dhaka, Bangladesh (Ref No: BBEC, JUI M-2022 (4) 3). International ethics approval was also secured from University College London (UCL), with the UCL Research Ethics Committee Approval ID Number 22645/001. Both ethics approval letters can be found in Appendix 3.10.

3.2.3 Measures

3.2.3.1 Socio-demographic information

Participants provided socio-demographic details through a combination of open-ended and close-ended questions. These included age, sex, religion, weekly pocket money expenditure, and place of residence. Additional variables included the number of siblings and parental education levels. More details can be found in Appendix 3.8.

3.2.3.2 Tobacco use behaviours

In terms of tobacco use, the participants who were classified as follows:

Current user: Used at least one tobacco product (smoked or smokeless) within the past 30 days.

Ever user: Had used at least one tobacco product at any point in their lifetime.

Never user: Had never used any tobacco product.

Tobacco use patterns were further explored by assessing the frequency and average daily consumption over the past 30 days. Age of initiation and reasons for tobacco initiation were also explored. Full questionnaire can be found in Appendix 3.8.

3.2.3.3 Exposure to SHS, tobacco advertisement and/or promotion

Exposure to SHS was defined as experiencing tobacco smoke exposure at least once in the past seven days. The places of SHS exposure were categorised as home, enclosed public places, and indoor public places. Exposure to tobacco-related advertisements and promotions was assessed through six questions. See the Appendix 3.8 for the questions.

3.2.3.4 Tobacco education and regulatory knowledge

Participants' exposure to anti-tobacco education and awareness of tobacco control regulations in Bangladesh were assessed by asking whether they had

received information about the risks of tobacco use or anti-tobacco education, and whether they were aware of the country's smoking and tobacco use regulations. Responses to the first question were recorded as Yes/No, while responses to the second question were recorded using a four-point Likert scale (strongly agree, agree, disagree, strongly disagree) and later categorised as Yes/No for analysis.

3.2.3.5 Physical and mental health

The perception of the participants' physical health condition was assessed using a five-point Likert scale (very good, good, moderate, poor, very poor) to measure self-rated health (SRH). In terms of mental health, the symptoms of two common mental disorders, depression and anxiety, were explored. Depressive symptoms were assessed using a validated Bangla version of the nine-item Patient Health Questionnaire (PHQ-9), which aligns with diagnostic criteria for major depressive disorders ^{184 188}. Participants indicated how often they experienced each symptom over the past 14 days, using a four-point Likert scale: not at all, several days, more than half the days, nearly every day. Scores ranged from 0 to 27, with higher scores indicating more severe depressive symptoms. A PHQ-9 score of ≥ 10 was classified as depression-positive for analytical purposes ¹⁸⁹. Similarly, anxiety severity was measured using a validated Bangla version of the seven-item Generalised Anxiety Disorder (GAD-7) scale ^{190 191}. Scores ranged from 0 to 21, with higher scores reflecting greater anxiety severity. A GAD-7 score of ≥ 10 was classified as anxiety-positive for analysis ¹⁸⁹.

3.2.3.6 Opinion on school-based tobacco prevention intervention

To explore perceptions of potential tobacco prevention interventions, participants were presented with a hypothetical scenario:

“Imagine that someone is designing a school-based tobacco use prevention programme for adolescents like you. How should this programme be structured?”

They were then asked to provide written responses on the following aspects:

- i. **Session content and duration:** What topics should be covered, and how long should each session be?
- ii. **Effective strategies:** What information, activities, or tasks would most effectively prevent tobacco initiation?
- iii. **Mode of delivery:** How should the intervention be delivered?
- iv. **Relevance:** How necessary is such a programme at school and at home?

This qualitative component aimed to capture adolescents' perspectives on designing an effective, engaging, and contextually relevant school-based tobacco prevention programme.

3.2.4 Data analysis

3.2.4.1 Quantitative analysis

The analysis plans for the two manuscripts derived from this chapter were preregistered on the Open Science Framework and are accessible at (i) <https://osf.io/pvduj/> and (ii) <https://osf.io/mb4y6/>. Data analysis was conducted using STATA version 18.5 and SPSS version 29. All statistical tests were two-sided, with a p-value of <0.05 considered statistically significant.

Descriptive statistics summarised participants' socio-demographic characteristics and tobacco use behaviours. Continuous variables, such as age, were reported as means with standard deviations (SDs), while categorical variables (e.g., sex, grade) were presented as frequencies and percentages.

Bivariate analyses were performed to explore associations between socio-demographic variables and tobacco use status (ever and current tobacco use), as well as between tobacco use status and mental health disorders. Chi-square (χ^2) tests were used for categorical variables, while analysis of variance (ANOVA) was employed for continuous variables. The proportional odds

assumption was assessed using the Brant test. If this assumption was violated, adjacent categories were collapsed into binary variables for further analysis.

To identify factors independently associated with ever and current tobacco use, univariable and multivariable logistic regression analyses were conducted. The multivariable models adjusted for all significant variables identified in the univariable analyses. Both unadjusted odds ratios (ORs) and adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported. Separate logistic regression models were run for smoked and smokeless tobacco use.

3.2.4.2 Qualitative analysis

A thematic analysis approach was employed to analyse the qualitative responses in this survey, following the methodology outlined by Braun and Clarke (2006) ¹⁹². Initially, all responses were translated from Bangla to English to facilitate data management. The transcripts were read repeatedly to ensure familiarity with the data. At the second stage, transcripts relevant to the development of the intervention were inductively coded, identifying meaningful text segments. Once coding was completed, the codes were collated into potential themes. These themes and corresponding codes were subsequently reviewed and discussed during supervisory meetings. The principal supervisor, Professor Lion Shahab, refined the theme mapping and ensured that codes were allocated to the most appropriate themes. In addition to thematic analysis, descriptive statistics (e.g., means, standard deviations, and percentages) were used to summarise participants' opinions regarding a potential school-based tobacco prevention intervention.

3.3 Results

3.3.1 Quantitative findings

3.3.1.1 Socio-demographic characteristics

A total of 2,593 adolescents participated in the survey. The mean age was 15.6 (± 1.6) years, with 55.6% (n=1,442) male (Table 3.1). Most participants were in grade 11 (50.3%), identified as Muslim (91.9%), and had two or more siblings

(53.1%). Paternal education was predominantly university level (65.3%), while maternal education was most commonly up to Year 12 (53.7%). The majority lived in rented accommodation with parents (54.2%), and 49.4% had low monthly pocket money expenditure.

Table 3.1: Participants' sociodemographic characteristics distributed by tobacco use status (N=2,593)

Characteristics	Total, % (n)	Ever tobacco user			Current tobacco user		
		Yes, % (n)	No, % (n)	χ^2 - value (p- value)	Yes, % (n)	No, % (n)	χ^2 - value (p- value)
School grade							
8 (Eight)	15.4 (400)	6.0 (25)	17.2 (375)	49.05 (<0.001)	5.3 (10)	16.2 (390)	35.35 (<0.001)
9 (Nine)	13.7 (354)	10.8 (45)	14.2 (309)		9.0 (17)	14.0 (337)	
10 (Ten)	20.7 (536)	19.5 (81)	20.9 (455)		15.4 (29)	21.1 (507)	
11 (Eleven)	50.3 (1303)	63.6 (264)	47.7 (1039)		70.2 (132)	48.7 (1171)	
Age (in years)							
11-13 years	12.5 (324)	5.3 (22)	13.9 (302)	61.66 (<0.001)	3.2 (6)	13.2 (318)	75.04 (<0.001)
14-16 years	50.0 (1296)	41.2 (171)	51.7 (1125)		30.3 (57)	51.5 (1239)	
17-18 years	37.5 (973)	53.5 (222)	34.5 (751)		66.5 (125)	35.3 (848)	
Mean age ($\pm$ SD)	15.6 (± 1.6)	16.2 (± 1.5)	15.5 (± 1.7)	<0.001	16.5 (± 1.4)	15.5 (± 1.6)	<0.001
Sex							
Male	55.6 (1442)	73.3 (304)	52.2 (1138)	62.29 (<0.001)	88.8 (167)	53.0 (1275)	90.61 (<0.001)
Female	44.4 (1151)	26.7 (111)	47.8 (1040)		11.2 (21)	47.0 (1130)	
Religion							
Muslim	91.9 (2383)	90.4 (375)	92.2 (2008)	1.57 (0.210)	88.8 (167)	92.1 (2216)	2.57 (0.109)
Other	8.1 (210)	9.6 (40)	7.8 (170)		11.2 (21)	7.9 (189)	
Total siblings							
0-1	46.9 (1215)	43.9 (182)	47.4 (1033)	1.79 (0.181)	43.1 (81)	47.2 (1134)	1.16 (0.282)
≥ 2	53.1 (1378)	56.1 (233)	52.6 (1145)		56.9 (107)	52.8 (1271)	
Highest level of education of the father							
No university	34.7 (900)	36.1 (150)	34.4 (750)	0.45 (0.503)	36.2 (68)	34.6 (832)	0.19 (0.662)

Characteristics	Total, % (n)	Ever tobacco user			Current tobacco user		
		Yes, % (n)	No, % (n)	χ^2 - value (p- value)	Yes, % (n)	No, % (n)	χ^2 - value (p- value)
University education	65.3 (1693)	63.9 (265)	65.6 (1428)		63.8 (120)	65.4 (1573)	
Highest level of education of the mother							
No university	53.7 (1393)	54.4 (1185)	50.1 (208)	2.58 (0.108)	46.8 (88)	54.3 (1305)	3.90 (0.048)
University education	46.3 (1200)	45.6 (993)	49.9 (207)		53.2 (100)	45.7 (1100)	
Living accommodation							
Hostel & Other	8.6 (224)	13.5 (56)	7.7 (168)	25.01 (<0.001)	18.1 (34)	7.9 (190)	46.96 (<0.001)
Owned house with parents	37.1 (963)	41.9 (174)	36.2 (789)		49.5 (93)	36.2 (870)	
Rented house with parents	54.2 (1406)	44.6 (185)	56.1 (1221)		32.4 (61)	55.9 (1345)	
Monthly pocket money expenditure							
Low (<500 taka)	49.4 (1280)	29.4 (122)	53.2 (1158)	88.10 (<0.001)	19.7 (37)	51.7 (1243)	95.07 (<0.001)
Lower middle (501-1500 taka)	21.8 (566)	28.2 (117)	20.6 (449)		27.7 (52)	21.4 (514)	
Middle (1501-3000 taka)	16.3 (422)	20.7 (86)	15.4 (336)		22.3 (42)	15.8 (380)	
High (>3000 taka)	12.5 (325)	21.7 (90)	10.8 (235)		30.3 (57)	11.1 (268)	

Note: 1 USD = 85 Bangladeshi taka (BDT) in 2022

3.3.1.2 Prevalence and patterns of tobacco use

Among participants, 16% (n=415) had ever used tobacco, with 10.4% (n=270) smoking cigarettes, 7.6% (n=198) using smokeless tobacco, and 3.3% (n=85) using other smoked tobacco products (e.g., cigars, waterpipes, bidis) (Figure 3.1). Of these, 45% (n=188) were current users (past 30-day use), predominantly male (73%).

The prevalence of current tobacco use was 7.3% (n=188), with 5.9% (n=154) smoking cigarettes and 1.9% (n=48) using smokeless tobacco (Figure 3.2).

Among current users, 87.2% (n=164) were male.

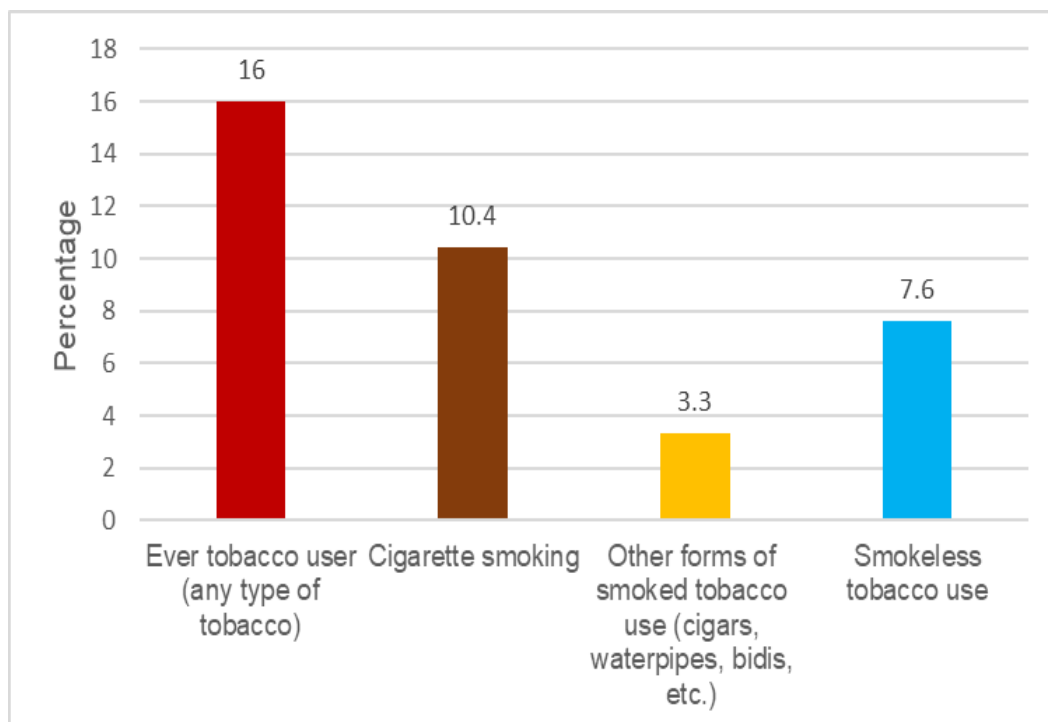


Figure 3.1: Adolescents' tobacco use behaviour (ever) in Dhaka, Bangladesh in 2022 (N = 2,593)

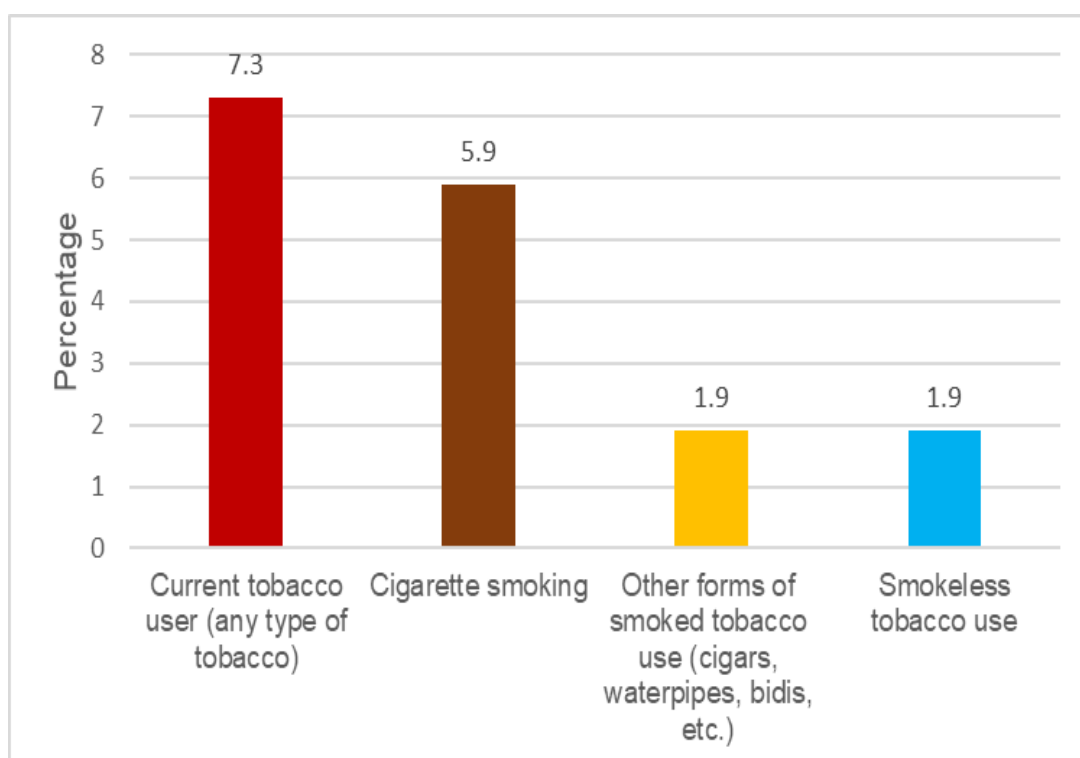


Figure 3.2: Adolescents' tobacco use behaviour (current) in Dhaka, Bangladesh in 2022 (N = 2,593)

The mean age of tobacco initiation was 13.4 (± 2.9) years, with 44.7% (n=84) initiating use between 13–15 years (Table 3.2). Smokeless tobacco users reported an earlier initiation age (10.8 ± 2.9 years) compared to cigarette smokers (13.9 ± 2.8 years). Frequent use varied across products, with 14.2% of cigarette smokers, 32.6% of other smoked tobacco users, and 20.9% of smokeless tobacco users consuming tobacco more than 10 times per day.

Table 3.2: Age of initiation and patterns of current tobacco use among school adolescents in Dhaka, Bangladesh, distributed by types of tobacco (n=188)

Characteristics	Total, % (n)	Cigarette smoking, % (n)	Smoked tobacco other than cigarette, ^a % (n)	Smokeless tobacco, ^b % (n)
Initiation age				
≤9 years	12.8 (24)	9.1 (14)	28.6 (14)	35.4 (17)
10 – 12 years	17.6 (33)	13.0 (20)	18.4 (9)	37.5 (18)
13 – 15 years	44.7 (84)	48.7 (75)	46.9 (23)	20.8 (10)
≥16 years	25.0 (47)	29.2 (45)	6.1 (3)	6.3 (3)
Mean age of initiation ($\pm$SD)	13.4 (± 2.9)	13.9 (± 2.8)	11.7 (± 3.4)	10.8 (± 2.9)
Monthly tobacco use (in days)				
1–2 days	28.2 (53)	22.1 (34)	34.7 (17)	45.8 (22)
3–9 days	19.1 (36)	17.5 (27)	18.3 (9)	22.9 (11)
10–19 days	12.2 (23)	14.3 (22)	8.2 (4)	4.2 (2)
20–29 days	9.0 (17)	10.4 (16)	8.2 (4)	6.2 (3)
Everyday	31.4 (59)	35.7 (55)	30.6 (15)	20.8 (10)
Daily tobacco use (times per day)				
Non-daily	33.5 (63)	29.9 (46)	24.5 (12)	50.0 (24)
One time	19.1 (36)	16.9 (26)	26.5 (13)	20.8 (10)
2–10 times	33.0 (62)	39.0 (60)	16.3 (8)	8.4 (4)
>10 times	14.4 (27)	14.2 (22)	32.6 (16)	20.9 (10)

Note:

^aSmoked tobacco products other than cigarette were pipes, cigars, waterpipes, hookah, shisha, bidis.

^bSmokeless tobacco products were zorda with pan, tobacco leaf, gul, khaini, panmasala.

3.3.1.3 Factors and determinants of tobacco use

The most commonly self-reported reason for tobacco initiation was curiosity (60%), followed by peer influence (22%), mental health conditions (21.9%), and family history of tobacco use (15.2%) (Figure 3.3).

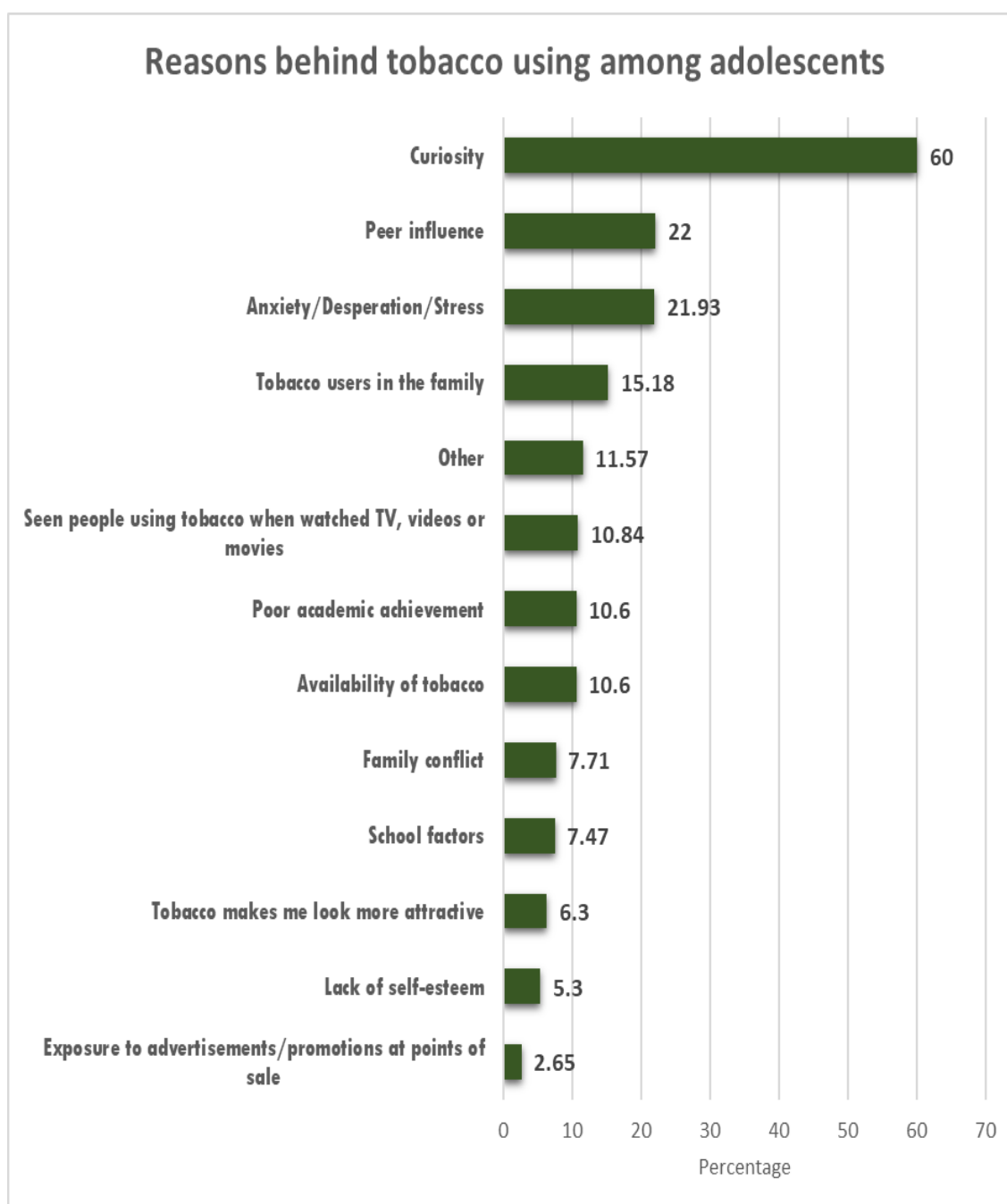


Figure 3.3: Self-reported factors associated with adolescents' tobacco use*

*The factors were not mutually exclusive, rather tobacco users selected multiple reasons.

The association between socio-demographics and tobacco use is presented in Table 3.3. Tobacco use increased with age and school grade, tripling from 6.8% in 11–13-year-olds to 22.8% in 17–18-year-olds. Males had significantly higher rates of ever (21.1%) and current (11.6%) tobacco use than females. Students living in hostels had higher usage rates (25.0% ever; 15.2% current) than those living with parents. Higher pocket money expenditures were associated with increased tobacco use, with 27.7% of students receiving >3,000 taka per month reporting ever use.

Multivariable logistic regression showed that male adolescents had 1.75 times higher odds of ever using tobacco and four times higher odds of current use compared to females (see Table 3.3). Older adolescents (17–18 years) had significantly higher odds of both ever (AOR = 2.66) and current (AOR = 3.26) tobacco use compared to younger participants. Living in a hostel and higher pocket money expenditure were also significant predictors. Exposure to SHS at home increased the odds of ever (AOR = 1.60) and current (AOR = 1.73) tobacco use. While social media tobacco promotions were not significantly associated with tobacco use, media exposure (TV, movies, videos) and point-of-sale advertisements were strongly linked to increased use. Receiving free tobacco products doubled the odds of current tobacco use (AOR = 2.12). Conversely, receiving anti-tobacco education significantly reduced the odds of ever use (by 30%) and current use (by nearly 50%).

In addition, the association of study variables with smoked and smokeless tobacco use was examined separately and presented in Appendices 3.11 and 3.12.

Table 3.3: Association of sociodemographic characteristics and related key determinants with any tobacco use behaviour of school adolescents in Dhaka, Bangladesh

Variable	Ever tobacco use ^a				Current tobacco use ^b			
	Unadjusted model OR (95% CI)	p- value	Adjusted model ^c AOR (95% CI)	p- value	Unadjusted model OR (95% CI)	p- value	Adjusted model ^d AOR (95% CI)	p- value
Demographics								
Sex								
Male	2.50 (1.98–3.16)	<0.001	1.75 (1.34–2.29)	<0.001	7.05 (4.45–11.17)	<0.001	4.11 (2.42–6.98)	<0.001
Female	1.00		1.00		1.00		1.00	
Age (in years)								
17-18 years	4.06 (2.57–6.42)	<0.001	2.66 (1.60–4.42)	<0.001	7.81 (3.41–17.90)	<0.001	3.26 (1.36–7.82)	0.008
14-16 years	2.09 (1.32–3.31)	0.002	1.81 (1.10–2.99)	0.021	2.44 (1.04–5.11)	0.040	1.41 (0.58–3.43)	0.456
11-13 years	1.00		1.00		1.00		1.00	
Living accommodation								
Hostel & other	2.20 (1.57–3.09)	<0.001	1.42 (0.96–2.11)	0.081	3.95 (2.53–6.16)	<0.001	2.53 (1.47–4.36)	<0.001
Owned house with parents	1.46 (1.16–1.82)	0.001	1.32 (1.02–1.71)	0.034	2.36 (1.69–3.29)	<0.001	2.34 (1.56–3.52)	<0.001
Rented house with parents	1.00		1.00		1.00		1.00	
Monthly pocket money expenditure								
Middle and high	2.07 (1.67–2.57)	<0.001	1.47 (1.14–1.90)	0.003	3.02 (2.23–4.07)	<0.001	1.70 (1.17–2.46)	0.005

Variable	Ever tobacco use ^a				Current tobacco use ^b			
	Unadjusted model		Adjusted model ^c		Unadjusted model		Adjusted model ^d	
	OR (95% CI)	p-value	AOR (95% CI)	p-value	OR (95% CI)	p-value	AOR (95% CI)	p-value
Low and lower middle	1.00		1.00		1.00		1.00	
Father's educational level								
Bachelor's degree and above	0.93 (0.75–1.16)	0.503	1.08 (0.84–1.39)	0.549	0.93 (0.69–1.27)	0.662	0.75 (0.46–1.21)	0.238
Higher secondary and below	1.00		1.00		1.00		1.00	
Mother's educational level								
Bachelor's degree and above	1.19 (0.96–1.47)	0.109	1.27 (0.99–1.62)	0.057	1.35 (1.00–1.82)	0.049	1.54 (1.06–2.21)	0.022
Higher secondary and below	1.00		1.00		1.00		1.00	
Exposure to SHS, advertisement, or promotion								
Exposed to second-hand smoke								
Yes	2.99 (1.75–5.11)	<0.001	2.58 (1.11–6.00)	0.028	3.12 (1.36–7.11)	0.007	1.89 (0.42–8.57)	0.412
No	1.00		1.00		1.00		1.00	
Exposed to tobacco smoke at home								
Yes	2.19 (1.73–2.77)	<0.001	1.60 (1.23–2.09)	<0.001	2.61 (1.89–3.60)	<0.001	1.73 (1.17–2.55)	0.006
No	1.00		1.00		1.00		1.00	
Exposed to tobacco smoke in an enclosed public place								
Yes	1.94 (1.42–2.66)	<0.001	1.22 (0.80–1.85)	0.350	2.21 (1.36–3.60)	0.001	1.34 (0.68–2.64)	0.402
No	1.00		1.00		1.00		1.00	

Variable	Ever tobacco use ^a				Current tobacco use ^b			
	Unadjusted model		Adjusted model ^c		Unadjusted model		Adjusted model ^d	
	OR (95% CI)	p- value	AOR (95% CI)	p- value	OR (95% CI)	p- value	AOR (95% CI)	p- value
Exposed to tobacco smoke in an outdoor public place								
Yes	1.87 (1.33–2.64)	<0.001	0.83 (0.53–1.32)	0.436	2.86 (1.58–5.20)	<0.001	1.41 (0.58–3.42)	0.450
No	1.00		1.00		1.00		1.00	
Witnessed tobacco use in/outside of school premises								
Yes	1.93 (1.55–2.41)	<0.001	1.22 (0.95–1.57)	0.121	2.53 (1.82–3.51)	<0.001	1.38 (0.93–2.04)	0.112
No	1.00		1.00		1.00		1.00	
Observed tobacco use on TV, in videos, or in movies								
Yes	2.16 (1.64–2.85)	<0.001	1.49 (1.09–2.04)	0.014	2.57 (1.66–3.96)	<0.001	1.77 (1.04–3.01)	0.034
No	1.00		1.00		1.00		1.00	
Exposed to point-of-sale tobacco advertisement or promotion								
Yes	2.31 (1.84–2.90)	<0.001	1.64 (1.25–2.15)	<0.001	2.67 (1.95–3.67)	<0.001	1.61 (1.08–2.39)	0.019
No	1.00		1.00		1.00		1.00	
Exposed to online (social media platforms) tobacco advertisement or promotion								

Variable	Ever tobacco use ^a				Current tobacco use ^b			
	Unadjusted model		Adjusted model ^c		Unadjusted model		Adjusted model ^d	
	OR (95% CI)	p- value	AOR (95% CI)	p- value	OR (95% CI)	p- value	AOR (95% CI)	p- value
Yes	1.56 (1.20–2.03)	<0.001	0.83 (0.60–1.14)	0.248	1.90 (1.33–2.70)	<0.001	0.74 (0.47–1.18)	0.204
No	1.00		1.00		1.00		1.00	
Ever used non-tobacco products with tobacco company or tobacco product name, brand logo or picture on it								
Yes	3.44 (2.38–4.99)	<0.001	1.64 (0.98–2.75)	0.062	4.74 (3.06–7.33)	<0.001	1.92 (0.97–3.80)	0.063
No	1.00		1.00		1.00		1.00	
Currently using non-tobacco products with tobacco company or tobacco product name, brand logo or picture on it								
Yes	3.51 (2.28–5.39)	<0.001	1.23 (0.67–2.25)	0.507	4.78 (2.90–7.86)	<0.001	1.43 (0.64–3.18)	0.388
No	1.00		1.00		1.00		1.00	
Got offer and/or received complimentary tobacco products								
Yes	3.32 (2.30–4.78)	<0.001	1.59 (1.03–2.44)	0.036	5.65 (3.72–8.57)	<0.001	2.12 (1.25–3.59)	0.005
No	1.00		1.00		1.00		1.00	
Tobacco education and regulatory knowledge								

Variable	Ever tobacco use ^a				Current tobacco use ^b			
	Unadjusted model		Adjusted model ^c		Unadjusted model		Adjusted model ^d	
	OR (95% CI)	p- value	AOR (95% CI)	p- value	OR (95% CI)	p- value	AOR (95% CI)	p- value
Have received health education on the risks of tobacco use								
Yes	0.69 (0.51–0.92)	0.012	0.70 (0.51–0.97)	0.033	0.57 (0.38–0.85)	0.006	0.52 (0.33–0.83)	0.006
No	1.00		1.00		1.00		1.00	
Have knowledge about country's tobacco control rules and regulations								
Yes	0.48 (0.37–0.61)	<0.001	0.57 (0.44–0.76)	<0.001	0.48 (0.34–0.69)	<0.001	0.67 (0.45–1.02)	0.062
No	1.00		1.00		1.00		1.00	

Note. OR – odds ratio; AOR – adjusted odds ratio; CI – confidence interval; SHS – second hand smoke.

^a Estimates are based on binary logistic regression with ever tobacco use (any form of tobacco) as dependent variable.

^b Estimates are based on binary logistic regression with current tobacco use (any form of tobacco) as dependent variable.

^c Adjusted for all significant variables in the unadjusted model of ever tobacco use.

^d Adjusted for all significant variables in the unadjusted model of current tobacco use.

3.3.1.4 Prevalence of self-rated health, depression, and anxiety

Approximately two-thirds (66.8%, n=1,460) of adolescents rated their health as good/very good, while 26.1% (n=570) reported moderate health status, and 6.1% (n=158) rated their health as poor/very poor (Figure 3.4).

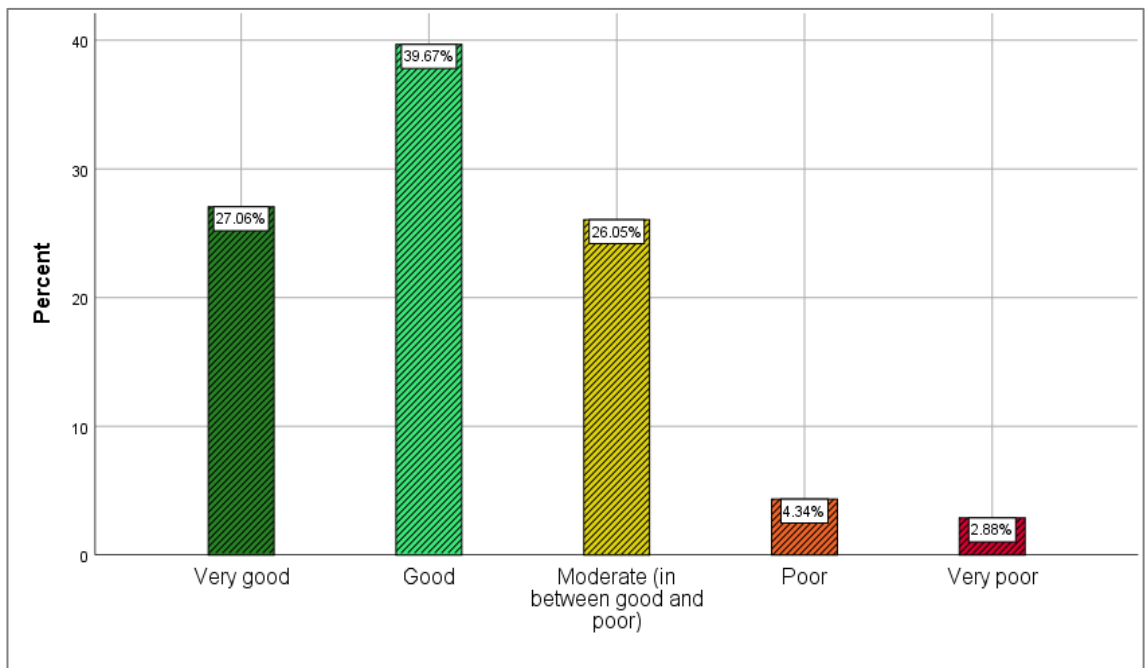


Figure 3.4: Self-rated physical health condition among adolescents in Dhaka, Bangladesh (N = 2,188)

The prevalence of depressive symptoms was 47.3%, with 8.8% (n=187) experiencing severe depression, 12.6% (n=267) moderate depression, and 7.8% (n=165) moderately severe depression (Figure 3.5).

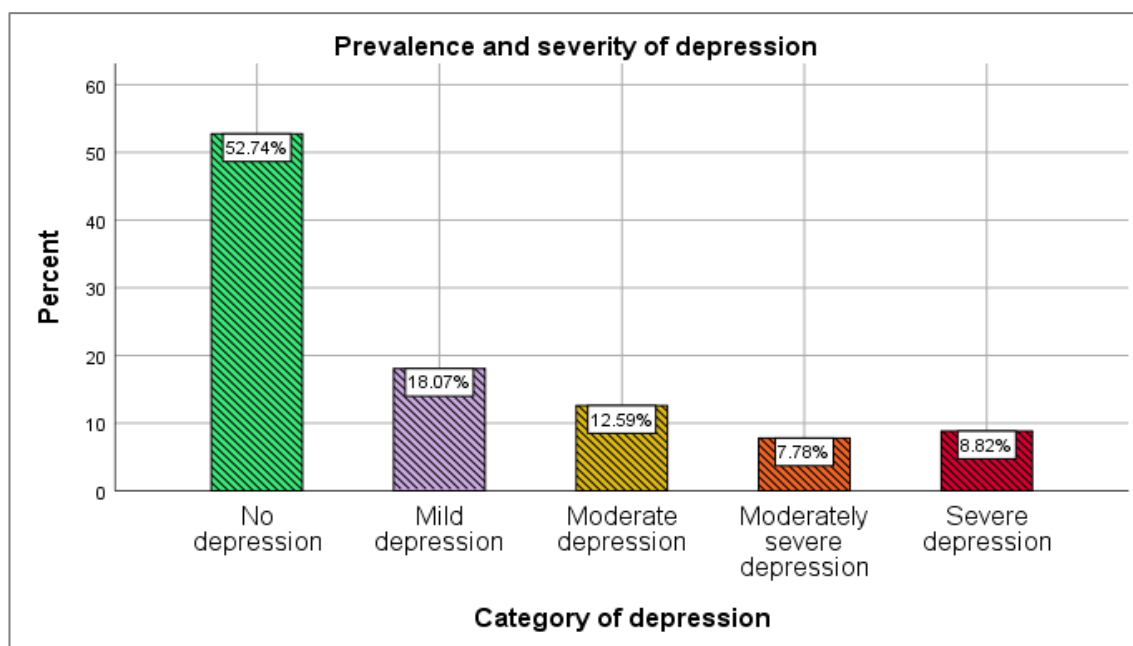


Figure 3.5: Prevalence of depressive symptoms among adolescents in Dhaka, Bangladesh (N=2,120)

On the other hand, the prevalence of anxiety disorder symptoms was 44.3%, with 9.7% (n=205) experiencing severe anxiety, 14.3% (n=302) moderate anxiety, and 20.3% (n=431) mild anxiety (Figure 3.6).

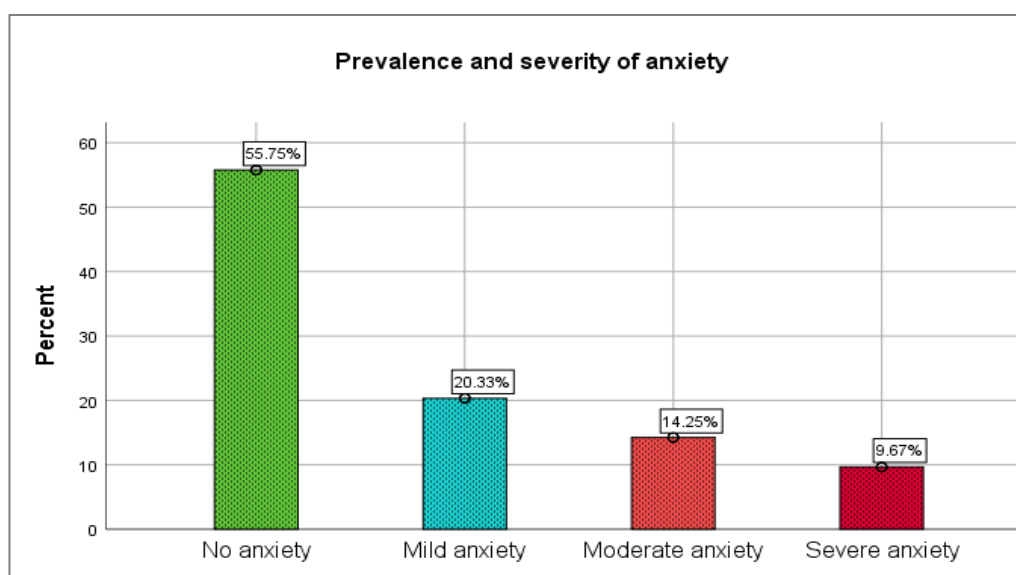


Figure 3.6: Prevalence of anxiety disorder symptoms among adolescents in Dhaka, Bangladesh (N=2,120)

3.3.1.5 Association of tobacco use with depression and anxiety

The logistic regression analysis revealed significant associations between tobacco use and depression and anxiety among school adolescents in Dhaka, Bangladesh, after adjusting for age, sex, monthly pocket money expenditure, and knowledge of the country's tobacco control rules and regulations. Ever tobacco users had higher adjusted odds of depression (AOR = 1.74, 95% CI: 1.35–2.25, $p < 0.001$) and anxiety (AOR = 1.48, 95% CI: 1.13–1.93, $p = 0.005$) compared to non-users (Table 3.4). Ever smoked tobacco users also had increased adjusted odds of depression (AOR = 1.93, 95% CI: 1.42–2.63, $p < 0.001$) and anxiety (AOR = 1.90, 95% CI: 1.39–2.62, $p < 0.001$). Ever smokeless tobacco users had higher adjusted odds of depression (AOR = 1.51, 95% CI: 1.09–2.10, $p = 0.014$), but not anxiety (AOR = 1.22, 95% CI: 0.85–1.73, $p = 0.280$).

Table 3.4: Logistic regression of ever tobacco use with depression and anxiety among school adolescent in Dhaka, Bangladesh

	Depression ^a		Anxiety ^b	
	Adjusted ^c ORs (95% CI)	p- value*	Adjusted ^c ORs (95% CI)	p- value*
Ever tobacco user				
No	1.00		1.00	
Yes	1.74 (1.35– 2.25)	<0.001	1.48 (1.13– 1.93)	0.005
Ever smoked tobacco user				
No	1.00		1.00	
Yes	1.93 (1.42– 2.63)	<0.001	1.90 (1.39– 2.62)	<0.001
Ever smokeless tobacco user				
No	1.00		1.00	
Yes	1.51 (1.09– 2.10)	0.014	1.22 (0.85– 1.73)	0.280

^a Estimates are based on binary logistic regression with depression, PHQ-9 ≥ 10 scores, as a dependent variable.

^b Estimates are based on binary logistic regression with anxiety, GAD-7 ≥ 10 scores, as a dependent variable.

^c adjusted for (age, sex, monthly pocket money expenditure, and knowledge about country's tobacco control rules and regulations)

* p-value is significant at 0.05 level

Similarly, current tobacco users had significantly higher adjusted odds of depression (AOR = 1.95, 95% CI: 1.35–2.83, $p < 0.001$) and anxiety (AOR = 1.87, 95% CI: 1.28–2.74, $p = 0.001$; Table 3.5). Current smoked tobacco users had increased adjusted odds of depression (AOR = 2.33, 95% CI: 1.57–3.45, $p < 0.001$) and anxiety (AOR = 2.22, 95% CI: 1.48–3.32, $p < 0.001$), while current smokeless tobacco users did not show significant associations with depression (AOR = 1.17, 95% CI: 0.59–2.33, $p = 0.656$) or anxiety (AOR = 1.20, 95% CI: 0.59–2.44, $p = 0.623$).

Table 3.5: Logistic regression of current tobacco use with depression and anxiety among school adolescent in Dhaka, Bangladesh

	Depression ^a		Anxiety ^b	
	Adjusted ^c ORs (95% CI)	p- value [*]	Adjusted ^c ORs (95% CI)	p- value [*]
Current tobacco user				
No	1.00		1.00	
Yes	1.95 (1.35– 2.83)	<0.001	1.87 (1.28– 2.74)	0.001
Current smoked tobacco user				
No	1.00		1.00	
Yes	2.33 (1.57– 3.45)	<0.001	2.22 (1.48– 3.32)	<0.001
Current smokeless tobacco user				
No	1.00		1.00	
Yes	1.17 (0.59– 2.33)	0.656	1.20 (0.59– 2.44)	0.623

^a Estimates are based on binary logistic regression with depression, PHQ-9 ≥ 10 scores, as a dependent variable.

^b Estimates are based on binary logistic regression with anxiety, GAD-7 ≥ 10 scores, as a dependent variable.

^c adjusted for (age, sex, monthly pocket money expenditure, and knowledge about country's tobacco control rules and regulations)

* p-value is significant at 0.05 level

3.3.2 Qualitative findings

3.3.2.1 Opinion on tobacco use prevention programme in schools

In response to the question “Do you think a tobacco use prevention programme is needed in your school?”, a total of 1,852 participants provided comments. The majority (86%, n=1,591) expressed support for implementing such a programme in their schools. Some students highlighted the misconceptions surrounding tobacco use among their peers and the normalisation of smoking in school settings:

“My school surely needs this programme. Because many students in my school have a misconception about tobacco use but they are far away from the cold truth. They think smoking is ‘cool’ somehow and they brag that they smoke and advise their friends to smoke or even to consume energy drinks which have a percentage of alcohol in them. Other than that I saw some students (mostly senior students) in the washroom who were smoking and sometimes even vaping. ... So my school definitely needs this program.” (ID: 2260; Student of Year 9)

Others emphasised the educational role of schools in promoting health awareness:

“Because school is a place from where I can learn many things along with school education. If the programme gives knowledge about the bad effect of smoking, then we will be able to attend the programme and we can learn many things from it... A school is an enjoyable place for both education and for gaining different knowledge about many things...” (ID: 3423; Student of Year 8)

Additionally, participants were asked whether the programme should also address household tobacco use. A majority (82.4%, n=1,505/1,826) agreed that family members should also be included in prevention efforts. One participant commented:

“This is how the family members will approach the issue and picture its consequences. As a result, he or she abstains from using tobacco products everywhere, including at home.” (ID: 5939; Student of Year 9)

Several respondents highlighted the role of parental tobacco use in influencing adolescent initiation and suggested engaging both parents and children in tobacco prevention interventions:

“Yes, because there are many families where at least one person uses cigarettes, their children may be attracted to it, both parents and children should be engaged in such program to know about the dangers of cigarettes smoking.” (ID: 4371; Student of Year 10)

3.3.2.2 Preferred mode of delivery

In response to the question “To whom would you prefer to see as the trainer of the intervention programme?”, the majority of respondents (58%, n=1,075/1,844) preferred a public health expert. Some participants expressed discomfort with being instructed by peers or teachers:

“I prefer an expert because being taught about tobacco use is embarrassing if done by a friend or class teacher.” (ID: 876; Student of Year 11)

Others emphasised the importance of professional expertise:

“A professional who is aware of all the causes and impacts, can effectively deliver a proper awareness speech to initiate prevention.” (ID: 5996; Student of Year 8)

Regarding session structure, responses varied. The preferred number of sessions ranged between 1 and 12, with a mean of 4.32 (± 3.56) sessions.

Additionally, the preferred duration for each session ranged between 10 and 60 minutes, with a mean of 30.77 (± 15.38) minutes.

3.3.2.3 Potential intervention contents

Participants were asked “What information, tasks, or activities do you think would be most effective in preventing adolescents from using tobacco?”. A total of 945 participants provided responses. Thematic analysis identified seven key categories of suggested intervention content, reflecting the diverse perspectives of school adolescents on effective tobacco prevention strategies:

- i. **Awareness-raising:** Students emphasised the need for education on the addictive nature, harmful health effects, and long-term consequences of tobacco use, incorporating both offline and online awareness programmes. They also suggested focusing on social, mental, and family-related harms to enhance understanding.
- ii. **Psychological skill development:** Many highlighted the importance of stress resilience, coping strategies, and problem-solving skills to help resist peer pressure. Developing self-efficacy, self-control, and informed decision-making was seen as crucial for preventing tobacco initiation.
- iii. **Encouragement of healthy alternative activities:** Adolescents proposed increased access to sports, recreational activities, and co-curricular engagements to discourage tobacco use. A healthy lifestyle, including good nutrition and active participation in social activities, was suggested as a protective measure.
- iv. **Supportive environment:** The need for peer and adult support, family involvement, and school-based cessation assistance was frequently mentioned. Participants also called for positive peer influence, teachers’ guidance, and a school environment that discourages tobacco use.

- v. **Increased behavioural monitoring:** Strengthening parental supervision, family monitoring, and teacher oversight was identified as a necessary to prevent adolescents tobacco initiation. Some participants suggested confidential reporting mechanisms and stricter school surveillance to prevent tobacco use among students.
- vi. **Moral and religious guidance:** Ethical and religious perspectives were seen as influential in discouraging tobacco use, with recommendations for integrating moral education, religious teachings, and personal responsibility messages. Some students suggested linking tobacco-free living to social and family values.
- vii. **Family involvement:** Many students stressed the need for family-based interventions, parental awareness programmes, and household-level education to prevent tobacco initiation. They suggested that concerned parenting, family ethics, and motivation could reinforce anti-tobacco behaviours at home.

Further details on the thematic coding of responses for potential intervention content can be found in Appendix 3.13. Additional qualitative findings are presented in Appendix 3.14.

3.4 Discussion

This study investigated the prevalence, determinants, and mental health associations of smoked and smokeless tobacco use among school adolescents in Dhaka, Bangladesh. The findings provide critical insights into tobacco use behaviours, highlighting key socio-demographic and environmental influences, as well as the association between tobacco use, SHS exposure, and mental health outcomes.

When compared with findings from the most recent Global Youth Tobacco Survey (GYTS) ⁴⁸ conducted in Bangladesh in 2013, this study reveals both

similarities and differences in tobacco use prevalence among school-going adolescents. In the GYTS, 18.6% (95% CI: 14.1–24.1) of students aged 13–15 reported ever using any tobacco product, whereas in this study, conducted among students aged 13–18 in urban Dhaka, 16% reported ever use. While the overall prevalence is slightly lower in this sample, the confidence intervals suggest broad comparability between the two estimates. It is also important to note that the GYTS included a nationally representative sample, while this study focused exclusively on an urban population, and the GYTS reported significantly higher rates among boys. In terms of current use, 6.9% (95% CI: 4.8–9.8) of students in the GYTS reported current tobacco use, including 4.5% (95% CI: 2.9–7.0) for smokeless tobacco and 2.9% (95% CI: 1.5–5.4) for smoked tobacco. In this study, the overall prevalence of current tobacco use was 7.3%, which falls within the GYTS confidence interval and indicates consistency between the two data sources despite the differing sampling frames and years. Notably, the current study found 5.9% of students currently smoked cigarettes and 1.9% used smokeless tobacco – an inverse pattern to the GYTS findings, where smokeless tobacco use was more common. These differences may reflect temporal shifts in product availability and marketing, or specific urban influences, including peer networks and changing consumption norms.

Tobacco use remains a significant concern among adolescents in Bangladesh ⁴⁴
¹⁹³. Consistent with global patterns, male students had a significantly higher prevalence of tobacco use, reflecting cultural norms that reinforce gender disparities in smoking behaviours ¹⁹⁴⁻¹⁹⁷. However, the absence of a significant gender difference in smokeless tobacco use warrants further exploration, particularly given the cultural acceptance and accessibility of smokeless tobacco products in South Asia ^{6 28}. Factors such as low cost, social acceptance, and limited awareness of health risks may contribute to this trend ^{198 199}.

Tobacco initiation was primarily driven by curiosity (60%) and peer influence (22%), reinforcing existing literature on the social contagion effect of tobacco use ^{183 194 196 200}. The association between increasing age and higher tobacco use prevalence aligns with prior research ^{183 201 202}, which suggests that early

initiation increases the likelihood of sustained use and dependence ^{201 203}.

Adolescence represents a critical window for intervention, as individuals who do not initiate tobacco use by age 25 are unlikely to become lifelong users ¹⁴. This highlights the importance of school-based prevention efforts to delay or prevent early experimentation with tobacco.

Adolescents with higher pocket money allowances were significantly more likely to use tobacco, a trend observed in other LMICs ²⁰⁴. Increased disposable income enhances access to tobacco products, underscoring the need for stronger price control policies and retail regulations ²⁰⁵. The link between socio-economic factors and adolescent health behaviours suggests that interventions must address both economic and environmental determinants of tobacco use ²⁰⁶.

SHS exposure was significantly associated with adolescent tobacco use, particularly in household settings. Similar to findings in other LMICs ^{36 207}, adolescents exposed to SHS at home had a higher likelihood of tobacco initiation, suggesting that a home environment permissive to smoking normalises tobacco use. Despite Bangladesh's ratification of the Framework Convention on Tobacco Control, enforcement of smoke-free laws remains inconsistent ¹⁹³. Strengthening home-based interventions and public awareness campaigns could reduce SHS exposure and deter adolescent tobacco initiation.

Exposure to tobacco advertising and promotion was also a strong predictor of tobacco use ^{170 207 208}. Despite partial bans on point-of-sale and media advertisements, tobacco marketing remains pervasive in urban areas, particularly through digital platforms. Evidence from high-income countries suggests that comprehensive bans on tobacco advertising, sponsorships, and promotions significantly reduce adolescent smoking prevalence ²⁰⁹. Bangladesh must strengthen its advertising restrictions, particularly in online spaces where adolescents frequently encounter tobacco-related content.

This study found a significant association between tobacco use and adverse mental health outcomes, with both ever and current tobacco users exhibiting

higher odds of depression and anxiety. These findings align with prior research demonstrating that nicotine exposure disrupts neurochemical pathways ²¹⁰, contributing to mood disorders ^{112 173 176 178 211}. The bidirectional relationship between tobacco use and mental health suggests that some adolescents may use tobacco as a coping mechanism for stress and emotional distress ¹⁷⁴, while others may develop mental health issues as a consequence of tobacco use.

The findings have important public health implications, particularly for tobacco control and adolescent mental health policies in Bangladesh. Adolescents with greater awareness of tobacco control laws were less likely to use tobacco, emphasising the need for educational interventions to strengthen legal literacy and discourage tobacco use. School-based anti-tobacco education emerged as a protective factor ²¹², aligning with global evidence ^{131 138 139 150} that comprehensive prevention programmes – particularly those integrating social competence and resistance training ⁹⁹ – are highly effective in reducing tobacco initiation.

This study has several strengths, including its large sample size, which provides a good representation of school adolescents in Dhaka. Additionally, by examining both smoked and smokeless tobacco use, it offers a comprehensive perspective on adolescent tobacco behaviours. However, several limitations should be acknowledged. First, the cross-sectional design of this survey precludes causal inference, restricting the ability to determine the directionality of associations observed between psychosocial factors and tobacco use. Second, the reliance on self-reported measures may introduce response bias and underreporting, particularly in the context of a stigmatised behaviour such as tobacco use. Third, although schools were purposively selected from a range of socio-economic areas in Dhaka to enhance diversity, a probability-based sampling strategy (such as stratified random sampling) was not used. This decision was made due to logistical constraints, including limited access to a full sampling frame and the practical challenges of securing timely institutional approvals. As a result, the sample may not be fully representative, and findings should be interpreted with caution. Fourth, the study was conducted exclusively in urban Dhaka. While this setting was chosen for feasibility and relevance to

the broader objectives of the research, it limits the generalisability of the findings to adolescents in rural areas, where patterns of tobacco use, particularly smokeless tobacco use, may differ markedly due to sociocultural and economic factors. Future research should aim to include both urban and rural populations and employ randomised sampling methods where possible to improve representativeness and external validity.

3.5 Conclusion

This study highlights the prevalence and key determinants of adolescent tobacco use in Dhaka, Bangladesh, underscoring the critical role of peer influence, socio-economic factors, and environmental exposures. The strong association between tobacco use, SHS exposure, and mental health outcomes reinforces the need for integrated interventions targeting both tobacco prevention and mental health support. Strengthening tobacco control policies, enforcing advertising restrictions, and implementing school-based prevention programmes could significantly reduce adolescent tobacco use and improve overall public health outcomes in Bangladesh.

3.6 Implications of the findings for intervention development

Based on the findings of this study, five key recommendations can be proposed for the development of a school-based tobacco prevention intervention:

- i. **Short-term, structured intervention:** Participants indicated a preference for a brief, structured intervention consisting of four sessions with an average duration of 30 minutes per session. This suggests that the programme should be concise, engaging, and efficiently delivered to maintain adolescent attention and ensure feasibility within the school curriculum.
- ii. **Incorporating household tobacco use prevention:** Given the strong association between household tobacco exposure and adolescent tobacco initiation, the intervention should include family-focused

components. Raising parental awareness, promoting smoke-free homes, and involving parents in anti-tobacco education may enhance the intervention's effectiveness by addressing tobacco use norms within the home environment.

- iii. **Integrating mental well-being strategies:** Mental health emerged as a significant predictor of tobacco use, highlighting the need for psychosocial elements in the intervention. Incorporating stress management, resilience-building, and peer support mechanisms could help adolescents develop healthier coping strategies, reducing their likelihood of turning to tobacco as a means of stress relief.
- iv. **Emphasising peer influence and social norms:** As peer pressure was a key driver of tobacco initiation, the intervention should integrate peer-led components to encourage positive social influences. Student-led discussions, role-playing activities, and mentorship programmes could help reshape social norms and strengthen resistance skills against tobacco use.
- v. **Addressing tobacco marketing and accessibility:** With exposure to tobacco advertisements and easy accessibility being major risk factors, the intervention should include media literacy education to equip students with critical thinking skills for resisting tobacco industry tactics. Additionally, advocating for stronger school-level policies on restricting tobacco sales near schools could complement these efforts.

By incorporating these elements, the intervention can be more holistic, contextually relevant, and impactful in preventing adolescent tobacco use.

Chapter 4 – Development and refinement of the Intervention for Adolescent Tobacco Initiation Prevention (IATIP): Designing a brief school-based programme and prioritising core components

4.0 Chapter summary

There is a need for a school-based intervention to prevent tobacco use among adolescents in Bangladesh. The “Intervention for Adolescent Tobacco Initiation Prevention (IATIP)” has been developed to address this need. The goal of this chapter is to present the development and refinement of the IATIP intervention, highlighting the theoretical frameworks and participatory processes that guided its design. The chapter aims to provide a comprehensive overview of how behavioural determinants were addressed through evidence-based methods and how expert feedback informed refinements.

The Medical Research Council’s (MRC) guidance on developing and evaluating complex interventions and the Behaviour Change Wheel (BCW) framework were used to inform the development, refinement, and evaluation of the IATIP intervention. The development of a behaviour change intervention for tobacco use prevention should be an iterative process that forms a cycle with feedback loops, beginning with the use of a theoretical model to inform the selection of potential intervention components. The COM-B model of behaviour, which proposes that behaviour is determined by capability, opportunity, and motivation, was used as a broad framework to understand adolescent tobacco initiation. The Theoretical Domains Framework (TDF), which complements the COM-B model, provided a detailed approach for identifying behavioural determinants and potential change levers. This behavioural analysis informed the selection of intervention components, which were further aligned with the BCW to ensure a systematic design.

The initial behavioural analysis highlighted key behavioural determinants, such as capability, opportunity, and motivation, that were targeted through specific behaviour change techniques (BCTs). The theoretical approach guided the selection of core components, including interactive peer discussions, role-play activities, and culturally sensitive examples. Additionally, the Arena Blended Connected (ABC) model was utilised to guide the integration of blended learning components, ensuring that the intervention delivery was adaptable and engaging, with a focus on personalised, collaborative, and practice-based learning experiences.

Following the initial development phase, a comprehensive refinement workshop was conducted to optimise the intervention content. Expert feedback led to significant revisions, including the simplification of academic language, the merging of overlapping sub-sessions, and the inclusion of culturally relevant peer support activities. Quantitative findings, collected using Mentimeter as a tool for real-time polling, were used to guide expert consensus on the prioritisation of intervention components, including health-related content, resistance skills, role-plays, emotional coping strategies, and goal setting. These components were selected not only for their theoretical alignment but also for their engagement potential, cultural relevance, and feasibility in the school setting.

The final version of the IATIP intervention is an evidence-based, context-specific programme designed to engage adolescents and promote tobacco-free behaviours.

4.1 Guidance for development of school-based behaviour change interventions

School-based behaviour change interventions are often regarded as complex interventions due to several factors: (i) they comprise multiple interacting components (e.g., curriculum integration, teacher-led sessions, peer discussions), (ii) they target behaviours, such as tobacco initiation, which are influenced by various social, cognitive, and environmental factors, (iii) they seek to influence multiple mechanisms of action, such as improving knowledge, enhancing self-efficacy, and reshaping social norms, (iv) they involve a range of outcomes, including changes in behavioural intentions, self-reported tobacco use, and observed classroom engagement, and (v) they may require adaptation based on contextual factors, such as school policies, cultural relevance, and resource availability ²¹³⁻²¹⁵. The Medical Research Council's (MRC) guidance and the Behaviour Change Wheel (BCW) framework for developing and evaluating complex interventions provide a structured approach to inform the development and evaluation of school-based behaviour change interventions. These frameworks offer valuable insights for designing evidence-based, context-specific interventions that maximise effectiveness and scalability.

4.1.1 Medical Research Council guidance

The MRC's guidance on developing and evaluating complex interventions provides a comprehensive framework for designing, testing, and implementing behavioural health interventions ^{213 215}. This guidance outlines a four-stage process – development or identification of the intervention, feasibility, evaluation, and implementation – that forms a continuous feedback loop to refine the intervention at each stage. These stages are summarised as follows:

- i. **Development or identification of the intervention:** This stage involves identifying existing evidence, developing or selecting theoretical frameworks, and modelling processes and outcomes. The development phase sets the foundation for the intervention by determining which components will address the targeted behaviour effectively.

- ii. **Feasibility:** This phase focuses on testing the acceptability, feasibility, and practicality of the intervention in a smaller, controlled environment. Feasibility studies help to estimate recruitment and retention rates, refine implementation strategies, and determine the appropriate sample size for full-scale evaluations. For school-based interventions, this stage may also involve adjustments based on the classroom environment and student engagement.
- iii. **Evaluation:** The evaluation stage involves assessing the intervention's effectiveness, cost-effectiveness, and the mechanisms of change through rigorous study designs, such as randomised controlled trials (RCTs) ^{216 217}. This phase ensures that the intervention's components collectively lead to the desired behavioural outcomes.
- iv. **Implementation:** This stage focuses on the wider dissemination, monitoring, and long-term follow-up of the intervention to assess its sustainability and scalability. Implementation requires collaboration with policymakers, teachers, and school administrators to ensure the intervention is effectively integrated into existing school practices.

Each phase includes essential core elements such as considering the context, developing and refining the programme theory, engaging stakeholders, identifying key uncertainties, refining the intervention, and addressing economic considerations (Figure 4.1). These elements should be taken into account early on and revisited regularly throughout the research process, particularly before transitioning between phases, such as from feasibility testing to evaluation.

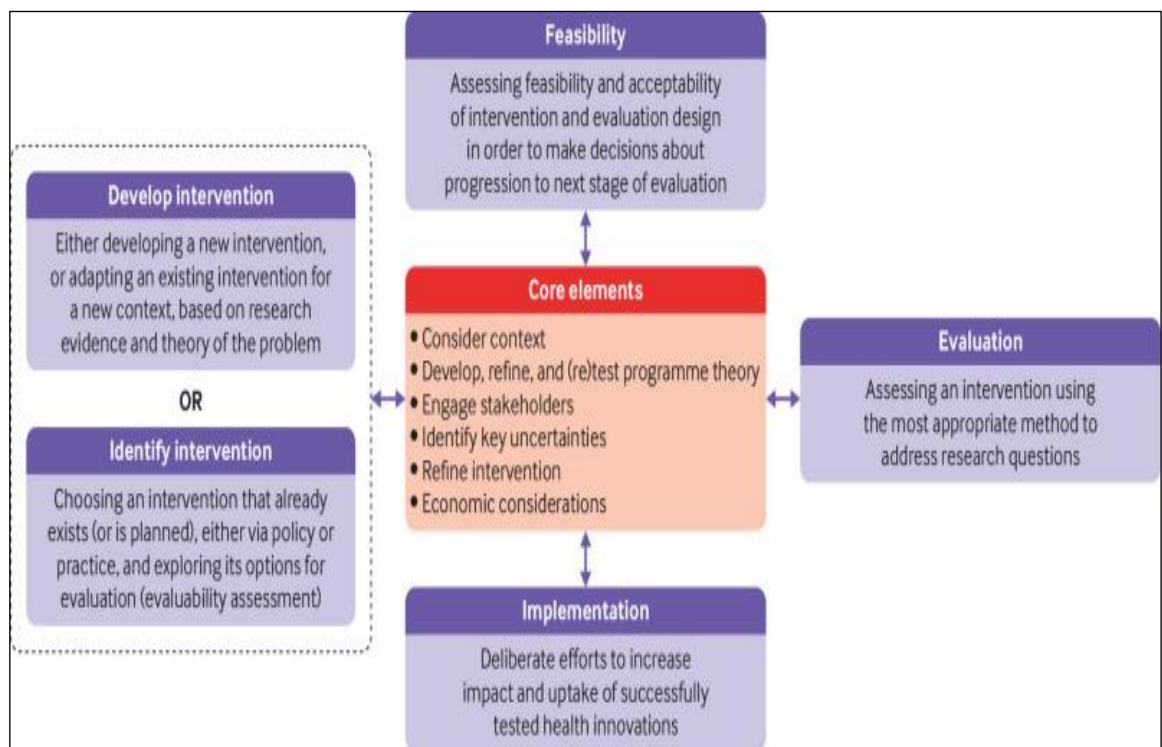


Figure 4.1: Key elements of the development and evaluation process (reproduced from Skivington et al., 2021) ²¹⁵

4.1.2 Frameworks informing overall staged approach to intervention development

A comprehensive and widely used framework for guiding intervention development is the Behaviour Change Wheel (BCW), which incorporates a model of behaviour known as the COM-B (Capability, Opportunity, Motivation – Behaviour) model ²¹⁸. The BCW synthesises insights from 19 frameworks of behaviour change ²¹⁸ and is broad enough to be applied to various behaviours and settings ²¹⁹. This makes it particularly relevant for school-based interventions targeting adolescent health behaviours. The BCW was developed to facilitate the design of interventions, with particular focus on integrating theory and evidence synthesis as outlined by the MRC guidance ²¹⁹. It comprises three layers that guide the development of behaviour change interventions (Figure 4.2):

- i. **Sources of behaviour:** Identifies the key sources of behaviour that can be targeted for change, such as psychological or physical capabilities, social and environmental opportunities, and motivational factors.
- ii. **Intervention functions:** Defines the types of interventions (e.g., education, persuasion, enablement) that can be used to address the identified behavioural determinants.

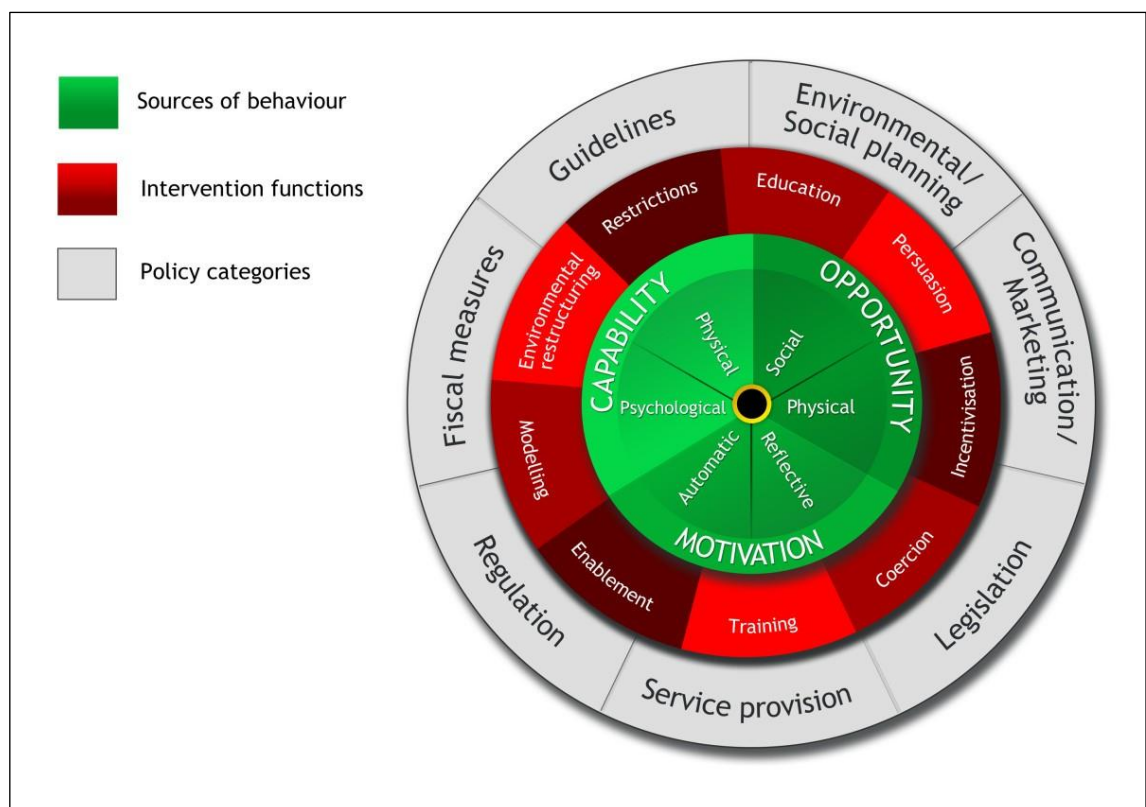


Figure 4.2: The Behaviour Change Wheel – a framework for intervention design (reproduced from Michie et al., 2011 ²¹⁸).

- iii. **Policy categories:** Describes the policy approaches (e.g., guidelines, service provision) that can support the implementation of the intervention functions.

While the guidance covers the entire lifecycle of complex interventions, this chapter focuses specifically on the development phase, highlighting the theoretical foundations, evidence-based design, and iterative development processes that informed the conception of the intervention. For the IATIP intervention, this phase was guided by the BCW and COM-B model, which provided a structured approach to linking behavioural analysis with intervention functions and specific behaviour change techniques (BCTs). Additionally, the MRC guidance emphasises the importance of engaging stakeholders and considering the broader context during intervention development. For school-based interventions like IATIP, this includes accounting for cultural relevance, classroom dynamics, and student engagement. The iterative nature of this phase allows for continuous refinement, ensuring that the intervention remains feasible, acceptable, and aligned with its intended objectives.

4.2 Use of theoretical models to guide intervention development

The use of theoretical models is an essential component in the development of behaviour change interventions ^{218 220 221}. These models provide a structured framework for understanding the underlying mechanisms that drive behavioural patterns and for identifying the specific factors that need to be targeted to achieve meaningful change ²²¹. The MRC guidance and BCW also underscore the importance of using theoretical models as a foundational step in developing behaviour change interventions ²²². These models inform the selection of potential intervention components and help explain the mechanisms through which the intervention is predicted to act. By grounding the intervention in theory, the development process gains structure, clarity, and coherence, which are essential for designing effective and sustainable behaviour change strategies.

In the context of school-based interventions for adolescent tobacco initiation prevention, theoretical models provide a means to understand the complex interaction of individual, social, and environmental influences on behaviour ²²³.

They help identify key determinants such as beliefs, social norms, capabilities, and motivations and offer pathways for targeting these determinants through tailored intervention components ²²⁴. Some models focus on individual-level changes, such as enhancing self-efficacy and knowledge, while others account for broader contextual factors, such as peer influence and school culture ²²¹. Integrating theoretical models ensures that the intervention is not only evidence-informed but also systematically aligned with the psychological, social, and environmental determinants of behaviour ²²⁵. This approach strengthens the intervention's potential to achieve sustained behavioural change and supports the development of a cohesive framework for evaluation.

In this section, three theoretical models – the COM-B Model of Behaviour, the Theoretical Domains Framework (TDF), and the Arena Blended Connected (ABC) Model – relevant to the development of the IATIP intervention and a related concept, the BCTs, to populate intervention content are discussed. These models were selected for their complementary strengths in addressing behaviour change processes and for their applicability to school-based interventions aimed at preventing tobacco use among adolescents.

4.2.1 The COM-B model of behaviour

The COM-B model conceptualises behaviour as part of an interacting system involving three key elements: Capability, Opportunity, and Motivation (COM), which together influence Behaviour (B) ^{218 226}. According to this model, for any behaviour to occur at a given moment, individuals must have the capability and opportunity to perform the behaviour, and their motivation to perform the behaviour must outweigh their motivation for competing behaviours ²²⁶.

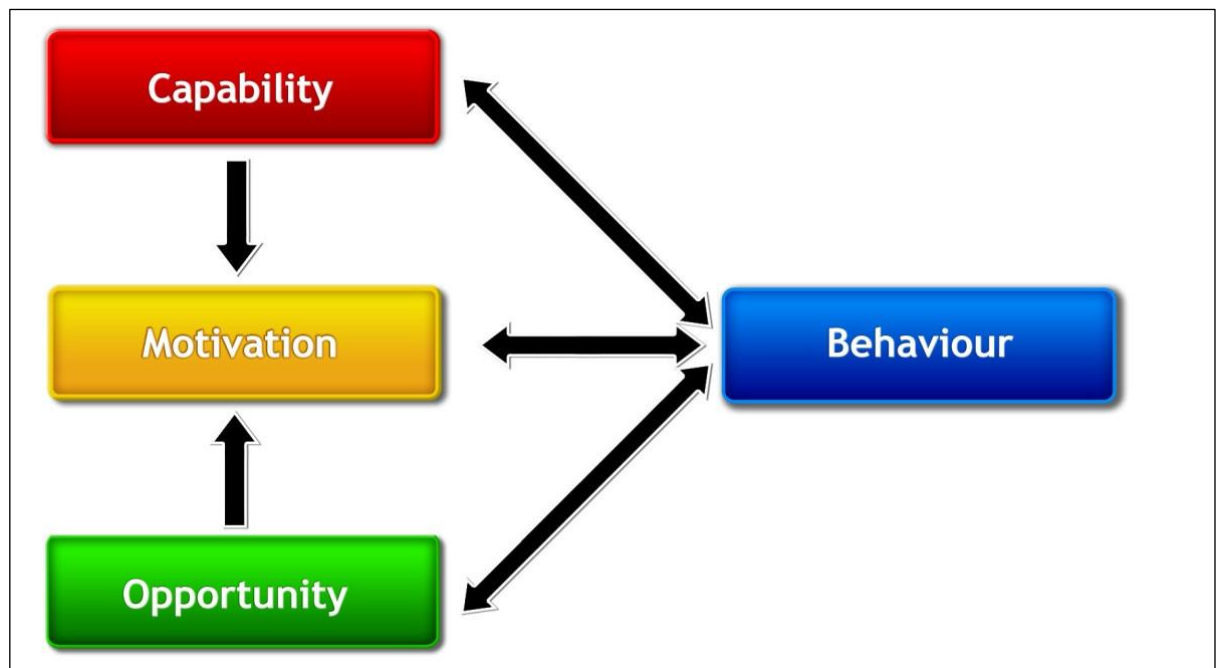


Figure 4.3: The COM-B model – a framework for understanding behaviour (reproduced from Michie et al., 2011 ²¹⁸)

Each component of the COM-B model is divided into two subtypes ^{218 219}:

- i. **Capability:** This refers to an individual's capacity to perform the behaviour. It can be:
 - (a) Physical capability: Involves the physical skills, strength, or stamina required to perform the behaviour.
 - (b) Psychological capability: Includes knowledge, skills, and the cognitive ability to engage in necessary thought processes.
- ii. **Opportunity:** This encompasses external factors that facilitate or hinder the performance of the behaviour. It can be:
 - (a) Physical opportunity: Factors within the physical environment, such as availability of resources, time, and absence of physical barriers.
 - (b) Social opportunity: Influences arising from the cultural and social environment, such as social norms, interpersonal influences, and cultural cues.

- iii. **Motivation:** Refers to the internal processes that energise and direct behaviour. It can be:
 - (a) Automatic motivation: Includes emotional reactions, impulses, desires, and habitual responses.
 - (b) Reflective motivation: Involves conscious planning, decision-making, and beliefs about the consequences of actions.

The COM-B model provides a broad yet straightforward framework for designing complex behaviour change interventions. Its strength lies in its ability to encompass a wide range of individual and environmental determinants of behaviour, making it suitable for use at individual, community, and population levels. Additionally, it is adaptable across various health-related behaviours.

Once the target behaviour is identified, the COM-B model is used to conduct a behavioural analysis to systematically determine which elements – capability, opportunity, or motivation – need to be addressed to facilitate the desired behaviour ²¹⁸. This analysis serves as a crucial first step in designing intervention components that are contextually relevant and evidence-based ²¹⁹. The COM-B model's flexibility also allows for integration with other theoretical frameworks. For example, the two types of motivation (reflective and automatic) correspond to the levels of motivation described in PRIME Theory, a comprehensive model of motivational processes ²²⁷. Furthermore, the COM-B components can be further elaborated by linking them with constructs from the TDF, which provides an expanded set of psychological and contextual factors relevant to behaviour change ^{219 228 229}. By applying the COM-B model, the IATIP intervention is designed to address the multifaceted influences on adolescent tobacco use and to develop targeted strategies that promote capability, enhance opportunities, and strengthen motivation for tobacco-free behaviour.

4.2.2 Theoretical Domains Framework

The Theoretical Domains Framework (TDF) is an integrative framework that combines key constructs from multiple behavioural theories into 14 distinct domains relevant to behaviour change ^{228 229}. It was developed collaboratively by psychologists and implementation researchers to provide a comprehensive structure for understanding the determinants of behaviour and to support the design of evidence-based interventions ^{228 229}. The TDF domains cover a wide range of factors influencing behaviour, including knowledge, beliefs about capabilities, social influences, and environmental context ²²⁰. Each domain includes theoretical constructs that describe specific behavioural drivers. For example, the domain 'Skills' relates to the physical or psychological abilities needed to perform a behaviour, while 'Social influences' captures the effects of social norms, peer pressure, and cultural expectations.

The COM-B model and TDF are often used together in behavioural analysis, as the TDF provides a more detailed breakdown of the components identified within the COM-B framework ^{220 228}. Each element of the COM-B model can be mapped to one or more TDF domains. A list of each domain in the TDF, along with their definitions and the theoretical constructs associated with each component of the COM-B model, is presented in Table 4.1. By using the TDF alongside the COM-B model, a more comprehensive analysis of behaviour is possible, allowing researchers to identify specific barriers and facilitators to behaviour change and to select intervention components that target these influences ²²⁴.

The use of the TDF in developing the IATIP intervention ensures that the behavioural analysis is systematic and comprehensive. This approach helps to ensure that the intervention addresses not only general factors influencing tobacco initiation among adolescents but also the specific cognitive, social, and environmental determinants that are most relevant in the school context.

Table 4.1: Theoretical Domains Framework linked to COM-B components and associated theoretical constructs (adapted from Cane et. al., 2012 ²²⁸)

COM-B component(s)	TDF domain linking to COM-B component	Definition of TDF domain	Theoretical constructs represented within TDF domain
Physical capability	Skills	An ability or proficiency acquired through practice	Skills; skills development; competence; ability; interpersonal skills; practice; skill assessment
Psychological capability	Behavioural regulation	Anything aimed at managing or changing objectively observed or measured actions	Self-monitoring; breaking habit; action planning
	Knowledge	An awareness of the existence of something	Knowledge (including knowledge of condition/ scientific rationale); procedural knowledge; knowledge of task environment
	Memory, attention and decision processes	The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives	Memory; attention; attention control; decision making; cognitive overload/ tiredness
Physical opportunity	Environmental context and resources	Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour	Environmental stressors; resources/ material resources; organisational culture/ climate; salient events/ critical incidents; person x environment interaction; barriers and facilitators

COM-B component(s)	TDF domain linking to COM-B component	Definition of TDF domain	Theoretical constructs represented within TDF domain
Social opportunity	Social influences	Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviours	Social pressure; social norms; group conformity; social comparisons; group norms; social support; power; intergroup conflict; alienation; group identity; modelling
Automatic motivation	Emotion	A complex reaction pattern involving experiential, behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event	Fear; anxiety; affect; stress; depression; positive/negative affect; burn out
	Reinforcement	Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus	Rewards (proximal/ distal, valued/ not valued, probable/ improbable); incentives; punishment; consequents; reinforcement; contingencies; sanctions
Reflective motivation	Beliefs about capabilities	Acceptance of the truth, reality, or validity about an ability, talent or facility that a personal can put to constructive use	Self-confidence; perceived competence; self-efficacy; perceived behavioural control; beliefs; self-esteem; empowerment; professional confidence
	Beliefs about consequences	Acceptance of the truth, reality, or validity about outcomes of a behaviour (in a given situation)	Beliefs; outcome expectancies; characteristics of outcome expectancies; anticipated regret; consequents

COM-B component(s)	TDF domain linking to COM-B component	Definition of TDF domain	Theoretical constructs represented within TDF domain
	Goals	Mental representations of outcomes or end states that an individual wants to achieve	Goals (distal/ proximal); goal priority; goal/target setting; goals (autonomous/ controlled); action planning; implementation intention
	Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way	Stability of intentions; stages of change model; transtheoretical model and stages of change
	Optimism	The confidence that things will happen for the best or that desired goals will be attained	Optimism; pessimism; unrealistic optimism; identity
	Social/ professional role and identity	A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting	Professional identity; professional role; social identity; identity; professional boundaries; professional confidence; group identity; leadership; organisational commitment

TDF = Theoretical Domains Framework; COM-B = 'Capability', 'Opportunity', 'Motivation', and 'Behaviour'

4.3.3 Behaviour Change Techniques

Having identified the intervention functions using the COM-B model and TDF, the next step in developing an effective school-based behaviour change intervention is to specify the content in terms of Behaviour Change Techniques (BCTs). BCTs are defined as the smallest, replicable, and observable components of an intervention that can bring about a change in behaviour ²³⁰. Each BCT targets specific determinants of behaviour, such as enhancing self-efficacy, providing social support, or prompting goal setting, and is designed to align with the mechanisms identified in the earlier behavioural analysis.

The use of BCTs ensures that the intervention content is systematically linked to the theoretical frameworks guiding the development process. For example, if the behavioural analysis identified a lack of knowledge (psychological capability) as a barrier to behaviour change, BCTs such as *'Information about Health Consequences'* or *'Instruction on How to Perform the Behaviour'* may be selected. Similarly, if automatic motivation is a key determinant, BCTs such as *'Habit Formation'* and *'Reward and Incentive'* can be employed.

To enhance coherence and applicability, the BCTTv1 provides a comprehensive list of 93 BCTs grouped into broader categories. This taxonomy helps ensure consistency and transparency in the selection and reporting of BCTs across interventions. In the context of the IATIP intervention, BCTs were mapped to the identified intervention functions (e.g., education, persuasion, enablement) and modes of delivery (e.g., classroom-based activities, peer discussions) to create an optimally structured programme. The integration of BCTs into the IATIP intervention ensures that the content is evidence-based and targeted towards addressing the multifaceted influences identified through the COM-B model and TDF. This structured approach enhances the intervention's potential to bring about meaningful changes in adolescent tobacco-related behaviours by reinforcing key capabilities, opportunities, and motivations.

The mode of delivery is also important in implementing BCTs effectively ²³¹. The intervention must be delivered in ways that are engaging, culturally relevant,

and appropriate for the school environment ²³²⁻²³⁴. For example, interactive role-plays and storytelling can enhance reflective motivation by fostering personal connections to the intervention content, while structured group activities can build social opportunity by reinforcing supportive peer norms. This aligns with the principles of the Arena Blended Connected model, which emphasises blended learning approaches and connected engagement to enhance motivation, opportunity, and capability through multi-modal delivery ²³⁵. The ABC model highlights the importance of combining digital and in-person elements to sustain behavioural changes, making it a complementary framework for effective intervention delivery.

4.3.4 The Arena Blended Connected model

The Arena Blended Connected (ABC) model provides a comprehensive approach to enhancing the delivery of behaviour change interventions by integrating both digital and in-person components ²³⁵. This model aligns well with the BCW, as it emphasises the need to foster capability, opportunity, and motivation through multi-modal engagement.

The ABC model recognises that behaviour change occurs most effectively when learning is personalised, interactive, and contextually relevant ²³⁵. The model is structured around three core principles:

- i. **Blended learning:** Combines face-to-face interaction (e.g., classroom discussions, teacher-led sessions) with digital learning tools (e.g., videos, interactive exercises) to reinforce behavioural skills and enhance accessibility.
- ii. **Connected engagement:** Encourages social connections and collaborative learning among peers, fostering a sense of community and mutual support, which aligns with the social opportunity component of the COM-B model.
- iii. **Arena framework:** Focuses on adaptive learning environments where intervention content is tailored to the needs of learners and contextual factors such as cultural relevance and school infrastructure.

Furthermore, the ABC model outlines six core learning types that support various dimensions of behaviour change ²³⁵:

- i. **Acquisition:** This type of learning focuses on knowledge transfer through materials such as lectures, readings, and instructional videos. In the context of the IATIP intervention, acquisition supports the development of psychological capability by providing foundational knowledge about the risks of tobacco use and strategies for resistance.
- ii. **Investigation:** Involves inquiry-based activities, such as research tasks or data collection, where students actively seek information and answers. This supports reflective motivation by engaging students in critical thinking about tobacco-related behaviours and their consequences.
- iii. **Collaboration:** Emphasises peer-to-peer interaction and group work, which aligns with social opportunities identified in the COM-B model. Group discussions and collaborative exercises foster social support and reinforce positive behavioural norms.
- iv. **Discussion:** Focuses on dialogic learning, where learners share perspectives and engage in guided debates. This learning type enhances both reflective motivation and social opportunity by promoting self-reflection and empathy through interaction.
- v. **Practice:** Provides repeated opportunities to apply learned skills in a safe environment, such as role-playing refusal scenarios. This supports behavioural regulation and builds both psychological and physical capabilities needed to resist peer pressure.
- vi. **Production:** Encourages learners to create tangible outputs, such as posters, presentations, or creative projects that demonstrate their understanding and commitment to change. This reinforces automatic

motivation by linking behavioural goals with creative expression and reward mechanisms.

By incorporating the ABC core principles and six learning types, this model ensures a comprehensive and engaging intervention design that integrates multiple behaviour change techniques. It also supports the effective implementation of BCTs identified in the IATIP intervention. For example, practice and discussion activities can reinforce key BCTs such as '*Behavioural rehearsal*' and '*Social support*', while production tasks support goal-setting and self-monitoring. Furthermore, the interactive modules delivered through blended learning can support reflective motivation by encouraging self-reflection, while gamified activities may enhance automatic motivation through rewards and positive reinforcement. The connected engagement approach strengthens social norms by facilitating group-based activities that align with TDF domains such as '*Social influences*' and '*Reinforcement*.'

The use of blended learning and connected engagement within the ABC model ensures that the intervention remains adaptable to various educational contexts and learner needs. By utilising both digital and in-person interactions, the intervention can overcome resource constraints and provide consistent support for teachers and students. This multi-modal approach enhances the delivery and sustainability of behaviour change interventions, making it an ideal framework for school-based programmes.

4.3 Behavioural analysis of adolescent tobacco initiation

Adolescent tobacco initiation is a multifaceted behaviour influenced by a combination of individual, social, and environmental factors ³⁵. A comprehensive behavioural analysis is a critical step in developing an evidence-based intervention for preventing adolescent tobacco initiation. Behavioural analysis involves identifying and systematically assessing the underlying factors that contribute to the adoption or avoidance of tobacco-related behaviours ²³⁶. For the IATIP intervention, this analysis process is guided by the COM-B model

(identifies determinants), the TDF (provides granularity), the BCTs (offer actionable techniques), and the ABC model (ensures delivery is engaging) to ensure that the intervention addresses key relevant behavioural determinants.

4.3.1 Identifying key behavioural determinants

According to the COM-B model, behaviour is influenced by an individual's capability, opportunity, and motivation ²¹⁹. The behavioural analysis used the COM-B model to systematically categorise key influences on adolescent tobacco initiation. Through this process, several key barriers and facilitators to behaviour change were identified. The following examples illustrate how COM-B components were mapped to intervention content:

- i. **Capability:** Adolescents often lack knowledge about the health risks of tobacco use (psychological capability) and may struggle with refusal skills in social settings (physical capability). To address these gaps, the intervention includes:
 - (a) "Information about health consequences" – This session provides clear and age-appropriate health information.
 - (b) "Refusal skills training" – Role-playing scenarios allow students to practice resisting peer pressure.
- ii. **Opportunity:** Social influences strongly shape adolescent tobacco use, particularly peer pressure and family environment (social opportunity), while accessibility to tobacco products can increase initiation risk (physical opportunity). The IATIP intervention tackles these by incorporating:
 - (a) "Social norm correction" – A session debunks misconceptions about how many peers actually use tobacco.
 - (b) "School policy reinforcement" – Discussions on tobacco-free school policies highlight the importance of compliance.

iii. **Motivation:** Adolescents often experience automatic motivation in the form of stress-induced smoking habits or emotional triggers, while reflective motivation involves their personal beliefs about tobacco use. The intervention includes:

(a) “Coping with stress and emotions” – Sessions teach alternative coping strategies such as breathing exercises.

(b) “Personal goal setting” – Encourages students to create tobacco-free personal pledges.

By mapping these components to the relevant TDF domains (e.g., ‘Knowledge’, ‘Social influences’, ‘Intentions’, and ‘Emotion’), a detailed picture of the behavioural determinants emerges. For instance, adolescents may face social pressures from peers who view smoking as a status symbol, highlighting the need for interventions that strengthen social support and foster positive peer influences (see Table 4.2 below for more details).

4.3.2 Applying behaviour change techniques

The behavioural analysis directly informed the selection of specific BCTs that align with the identified COM-B components. For example, because peer influence was identified as a major determinant (opportunity), techniques such as peer-led discussions, social norm correction, and role-plays were integrated to counteract these influences.

Another example is the identification of stress as a trigger for smoking/tobacco use (automatic motivation). This finding led to the inclusion of stress management techniques such as breathing exercises and mindfulness activities, ensuring that adolescents learn healthier coping mechanisms.

4.3.3 Contextual and environmental factors

Adolescent tobacco initiation does not occur in isolation but is shaped by broader contextual factors, such as cultural norms, socioeconomic status, and school policies ²³⁷. The behavioural analysis highlighted that students in resource-limited settings often lack formal exposure to anti-tobacco messages. The ABC model's emphasis on adaptive learning was incorporated to ensure that the intervention was not only informative but also engaging and accessible through storytelling, interactive exercises, and peer discussions.

4.4 Development of the IATIP

The development of the IATIP builds directly on the theoretical foundations and behavioural analysis described in the previous sections. The development process of IATIP began with two foundational stages: (i) review of existing literature (study 1; see Chapter 2) and (ii) needs assessment through a school-base survey (study 2; see Chapter 3). During the needs assessment, students shared their perspectives on potential school-based tobacco prevention programmes. These included opinions on the necessity of such interventions, their preferred modes of delivery, and recommendations for intervention content. This early input from adolescents directly influenced the IATIP intervention's structure, mode of engagement, and thematic priorities.

This chapter focuses on the subsequent stages of the process, namely (iii) selection of intervention components and framework integration, as detailed in Sections 4.1 to 4.3, (iv) expert consensus and refinement, which is addressed in Section 4.5, and (v) cultural adaptation, which addressed in Chapter 5. These stages ensured that the intervention was evidence-based, culturally relevant, and tailored to the needs of the target population. This section provides a detailed overview of the intervention mapping and how the intervention content, sessions, duration, and mode of delivery were designed.

4.4.1 Intervention mapping onto BCW, TDF and BCTs

To ensure consistency with the theoretical models guiding the IATIP intervention, this section provides a detailed mapping of BCW intervention functions to the COM-B components, relevant domains from the TDF, and BCTs. Table 4.2 summarises the theoretical mapping of the IATIP intervention. This structured approach highlights how each intervention component aligns with theoretical constructs, ensuring coherence with the broader framework of IATIP.

The BCW, TDF, and BCTs were used to systematically map the intervention components to the identified behavioural determinants. These determinants were identified through an integrated approach, drawing on both the systematic review of school-based tobacco prevention interventions (see Chapter 2) and the findings from the school-based survey conducted in Dhaka (see Chapter 3). This dual approach ensured that the intervention design was not only theoretically grounded but also empirically relevant to the target population. The systematic review highlighted that interventions incorporating normative feedback, refusal skills training, and social support mechanisms were particularly effective in reducing adolescent tobacco initiation. These components were therefore included to strengthen the theoretical and empirical foundations of IATIP. In parallel, the survey findings provided insight into local behavioural patterns and contextual influences on adolescent tobacco use – such as curiosity, peer influence, second-hand smoke (SHS) exposure, and associations with mental health – all of which helped inform the identification of relevant COM-B components and corresponding intervention strategies.

Furthermore, gaps in existing interventions, as identified in the systematic review, informed the addition of culturally contextualised and interactive elements. For example, while many interventions focused on knowledge dissemination, fewer integrated active learning or cultural relevance. To address this, IATIP incorporated peer-led discussions and storytelling tailored to local contexts, aligning with behavioural science literature and reflecting survey findings on adolescents' preferences and social influences.

Table 4.2: IATIP intervention mapping onto BCW, TDF, BCTs and behavioural determinants

SL	Content description	BCW intervention functions	COM-B component	TDF domain	BCTs	Behavioural determinant (Source)
1	Students will be informed about physical health impacts of tobacco use and effectiveness of tobacco avoidance.	Education; Persuasion	Psychological capability; Reflective motivation	Knowledge; Beliefs about consequences	Information about health consequences	Limited knowledge of physical harms of tobacco (School survey + Systematic review)
2	Students will be informed about mental health impacts of tobacco use and effectiveness of not to use tobacco.	Education; Persuasion	Psychological capability; Reflective motivation; Automatic motivation	Knowledge; Beliefs about consequences; Emotions	Information about emotional consequences	Misconception about emotional harms of tobacco; Tobacco as a stress-coping method; unawareness of mental health risk (School survey + Systematic review)
3	Students will be informed about the family, social, and environmental impacts of tobacco use, as well as the effectiveness of not using tobacco.	Education; Persuasion	Psychological capability; Social opportunity; Physical opportunity; Reflective motivation	Knowledge; Beliefs about consequences; Social Influences - (interpersonal & social); Environmental context and resources	Information about social and environmental consequences	Peer pressure; social approval of tobacco; community norms (School survey + Systematic review)
4	Students will be informed about ETS. Their attention will be drawn to the negative comments and feelings experienced by others when tobacco	Education; Persuasion	Psychological capability; Reflective motivation	Knowledge; Beliefs about consequences; Memory, attention & decision	Vicarious consequences	Low awareness of SHS harms; normalisation of smoking in public (School survey + Systematic review)

SL	Content description	BCW intervention functions	COM-B component	TDF domain	BCTs	Behavioural determinant (Source)
	(especially cigarettes) is used on the footpath.			processes; Behavioural regulation		
5	Students will be shown videos of patients suffering from various diseases (e.g., lung cancer) due to tobacco use.	Persuasion	Reflective motivation; Automatic motivation	Beliefs about consequences; Emotions	Salience of consequences	Lack of emotional impact from standard messages (School survey)
6	Students will be informed about religious impacts of tobacco use and effectiveness of not using tobacco.	Education; Persuasion	Psychological capability; Reflective motivation	Knowledge; Beliefs about consequences	Information about religious consequences (<i>New BCT</i>)	Perceived religious permissibility; lack of awareness of religious stance (School survey)
7	Students will be informed about national tobacco control laws and the consequences if violated	Education; Coercion	Psychological capability; Reflective motivation	Knowledge; Memory, attention & decision processes; Behavioural regulation	Future punishment	Low awareness of tobacco laws and policy (School survey)
8	An infographic/ a poster will be designed highlighting the tobacco use cause and effect and anti-tobacco sign and it will be displayed in some catchment areas in the	Environmental restructuring	Psychological capability; Physical opportunity	Memory, attention & decision processes; Environmental context and resources	Restructuring the social environment	Lack of visible anti-tobacco messaging; normalised local environments (Systematic review)

SL	Content description	BCW intervention functions	COM-B component	TDF domain	BCTs	Behavioural determinant (Source)
9	school. Encourage tobacco free housing Students will be informed about the factors influencing tobacco use behaviour and analyse the strategies to overcome the barriers. The five-step-plan to problem solving will be discussed. Besides, positive and healthy alternatives to using tobacco will be discussed.	Enablement	Psychological capability; Social opportunity; Reflective motivation	Behavioural regulation; Social Influences - (interpersonal & social); Beliefs about capabilities; Beliefs about consequences	Problem solving	Lack of self-efficacy to refuse tobacco; poor understanding of behaviour drivers (Systematic review)
10	Students will be given a target of not starting tobacco (for non-tobacco users) and cessation by now and not to use tobacco withing next 6 months (current tobacco users).	Enablement	Psychological capability; Reflective motivation	Behavioural regulation; Goals	Goal setting (behaviour)	Low intention to abstain from tobacco; lack of goal clarity (Systematic review)
11	Life skill training – how and when to perform life skills regarding self-awareness, decision-making, problem-solving,	Education; Training	Physical capability; Psychological capability; Reflective	Physical skills; Knowledge; Beliefs about consequences;	Instruction on how to perform the behaviour	Limited decision-making and coping skills; peer refusal difficulty (Systematic review)

SL	Content description	BCW intervention functions	COM-B component	TDF domain	BCTs	Behavioural determinant (Source)
	mental wellbeing, stress and coping, and refusal.		motivation; Automatic motivation	Optimism; Emotions		
12	Enhance students' personal development, including their confidence and self-esteem, empathy to say No to tobacco	Persuasion	Reflective motivation	Beliefs about capabilities; Optimism	Verbal persuasion about capability	Low confidence in resisting peer influence (School survey + Systematic review)
13	Students will be encouraged to seek support from non-tobacco user peers/ seniors/ teachers/ parents/ others in the family and community when there is problem with behaviour.	Enablement	Social opportunity; Reflective motivation	Social Influences - (interpersonal & social); Social professional role & identity	Social support (unspecified)	Lack of support systems for resisting or quitting tobacco (School survey + Systematic review)
14	Students will practise anxiety, depression, and stress management skills (e.g., breathing exercises).	Enablement	Psychological capability; Reflective motivation; Automatic motivation	Cognitive and interpersonal skills; Behavioural regulation; Beliefs about capabilities; Emotions	Reduce negative emotions	Misconception about emotional harms of tobacco; Tobacco as a stress-coping method; unawareness of mental health risk; limited coping skills (School survey + Systematic review)

SL	Content description	BCW intervention functions	COM-B component	TDF domain	BCTs	Behavioural determinant (Source)
15	Individual and group commitment will be taken from the students for “Not to use tobacco”, “Stop tobacco use” “To support others and enhance others not to use tobacco”.	Coercion	Reflective motivation	Intentions; Goals	Commitment	Low intention and peer modelling of tobacco refusal (Systematic review)
16	Students will be informed that their own behaviour may serve as an example to others. For instance, if they are non-users of tobacco and/or never consume any tobacco in the future, it will set a good example for their family, friends, and society.	Enablement	Social opportunity	Social Influences - (interpersonal & social)	Identification of self as role model	Lack of role models; low awareness of positive peer influence (Systematic review)

BCW = Behaviour Change Wheel; TDF = Theoretical Domains Framework; COM-B = ‘Capability’, ‘Opportunity’, ‘Motivation’, and ‘Behaviour’;

BCTs = Behaviour Change Techniques; SHS = Second-hand smoke

4.4.2 Session-specific content, learning types, and modes of delivery for the IATIP programme

Following the contents of effective school-based tobacco prevention interventions in low- and middle-income countries (see Chapter 2) and the findings of the school-based survey on the needs assessment of school adolescents in Dhaka (see Chapter 3), the contents of the IATIP intervention were selected. The sessions of the intervention were designed with specific content tailored to address the behavioural determinants identified during the mapping of the intervention. Each session was structured to balance knowledge acquisition, skills development, and peer engagement. The specific contents of the IATIP programme sessions (proposed) along with their learning types, and delivery methods are presented in Table 4.3. The proposed session-specific contents for the IATIP programme were designed to address key behavioural determinants, aligning with the theoretical frameworks discussed in earlier sections. Each session incorporated interactive discussions, role-plays, and collaborative group projects to foster engagement and enhance the retention of key messages.

Table 4.3: The IATIP contents, learning types, and delivery method (proposed)

Session number	Contents	Learning type	Delivery method	References
1	<i>Title: Insights into Tobacco, Tobacco Addiction, Consequences of Tobacco use, Religion and Law</i>			
1.1	General introduction: Tobacco & Tobacco products [‡]	Discussion, Acquisition	Open discussion	106 131
1.2	General introduction: Toxic part of tobacco [‡]	Investigation, Collaboration	Word cloud game (Group activity)	103
1.3	General introduction: Current facts and figures of tobacco use (frequency of adolescent tobacco use; annual mortality and morbidity etc.) [‡]	Discussion, Acquisition	Open questions – guess the numbers	103 134 143 150
1.4	Reasons why people use tobacco (direct tobacco use & indirect tobacco use – ETS) [‡]	Discussion, Acquisition	Opinion and Group discussion	106 128 139
1.5	Tobacco addiction: nicotine and nicotine dependence (Is tobacco really addictive? Who is most likely to become addicted? How does a tobacco user become an addict? Does the addict know that he is an addict? Can the addict get rid of his addiction if he wants? Discussions by groups.) [‡]	Acquisition	Lecture presentation	139 150
1.6	Natural consequences: Health consequences of tobacco use ^{‡, †}	Investigation, Collaboration, Discussion, Acquisition	Word cloud game, Video presentation	128 131 134 139 143 146 150 ; (also see Chapter 3)
1.7	Natural consequences: Social & Environmental consequences of tobacco use ^{‡, †}	Acquisition	Visual Displays and Exhibition	128 131 134 139 143 146 150 ; (also see Chapter 3)

Session number	Contents	Learning type	Delivery method	References
1.8	Natural consequences: Psychological consequences of tobacco use ^{‡, †}	Investigation, Collaboration, Discussion, Acquisition	Word cloud game, Video presentation	128 131 134 139 143 146 150 ; (also see Chapter 3)
1.9	Tobacco use and Religion [†]	Discussion, Acquisition	Group discussion & Lecture	(see Chapter 3)
1.10	Tobacco control Law in Bangladesh [†]	Practice	Role playing, & Video demonstration	(see Chapter 3)
2	<i>Title: Resistance to tobacco: how to perform the behaviour, goal setting and problem solving</i>			
2.1	Goal setting (being tobacco non-user and/or tobacco cessation) [‡]	Discussion, Practice	Presentation, Matching task, and Practice (peer support group)	105 135 143 146 150
2.2	Analyse different factors influencing tobacco use behaviour and select strategies to overcome the barriers [‡]	Discussion, Acquisition	Group work	105 134
2.3	Different types of pressure to use tobacco (mostly peer pressure), Decision making & Problem solving [‡]	Discussion, Collaboration, Practice, Production	Discussion, Role playing (Individual and Group), Production (Collaborative Project - Poster contest)	105 106 128 134 139 143 146 150
2.4	Skills to resist tobacco: assertiveness and refusal skills [‡]	Discussion, Collaboration, Practice, Production	Discussion, Role playing (Individual and Group), Production (Collaborative Project - Poster contest)	105 128 131 143 146 150
2.5	Skills to resist tobacco: self-awareness and empathy [‡]	Discussion, Collaboration, Practice, Production	Discussion, Role playing (Individual and Group), Production (Collaborative Project - Poster contest)	105 128 134 143

Session number	Contents	Learning type	Delivery method	References
2.6	Skills to resist tobacco: developing communication skills - including verbal and non-verbal communication skills [‡]	Discussion, Collaboration, Practice, Production	Discussion, Role playing (Individual and Group), Production (Collaborative Project - Poster contest)	134 143 146 150
2.7	Skills to resist tobacco: expression of feelings and ideas [‡]	Discussion, Collaboration, Practice, Production	Discussion, Role playing (Individual and Group), Production (Collaborative Project - Poster contest)	143 146
2.8	Skills to resist tobacco: group work & team building [‡]	Discussion, Collaboration, Practice, Production	Discussion, Role playing (Individual and Group), Production (Collaborative Project - Poster contest)	105 143 146
2.9	Seeking social support from non-tobacco user peers/ seniors/ teachers/ parents/ others in the family and community when there is problem with behaviour [‡]	Discussion, Investigation, Practice	Group discussion, Practical demonstration.	105 143
2.10	Building positive friendships: Qualities of good friends, Techniques to develop and keep good friends, Complimenting others [‡]	Discussion, Investigation, Practice	Group discussion, Practical demonstration.	105 106
2.11	Discover positive and healthy alternatives to using tobacco [‡]	Investigation, Collaboration, Production	Group work	105 106 134 139
2.12	Environmental restructuring: encourage tobacco-free housing and educational campus [‡]	Investigation, Collaboration, Production	Poster campaign/Human chain demonstration	106 131
3	<i>Title: Mental wellbeing, Commitment and Social Advocacy for No Tobacco use</i>			
3.1	Links between tobacco and mental health [‡]	Acquisition	Lecture	134 143

Session number	Contents	Learning type	Delivery method	References
3.2	Coping with emotions and mental illness: expression of negative feelings, dealing with challenges [‡] , [†]	Discussion, Practice, Production	Group discussion, Art and creative expression & Practice exercises	131 143
3.3	Coping with anxiety and depression: situations causing anxiety and depression, demonstration, and practice of techniques for coping with anxiety & depression [‡]	Discussion, Practice	Group discussion and Practice exercises	134 143
3.4	Learning stress management techniques: dealing with everyday life stressors [†]	Discussion, Practice	Group discussion and Practice exercises	(see Chapter 3)
3.5	Breathing exercise [‡]	Practice	Live demonstration and Practice	105 131 134 139
3.6	Personal commitment (pledge) not to use tobacco [‡]	Discussion, Practice, Production	Open discussion, Practice and Production	105
3.7	Provide monitoring to each other [‡]	Discussion	Group discussion	106 134 139
3.8	Social advocacy - Assistance to tobacco at-risk individuals; Speak out! Advocating for no tobacco use [‡]	Discussion, Practice	Role-playing	105
3.9	Being a role model [‡]	Practice	Practice	105

[‡]The evidence for this content was derived from the systematic review (Study 1).

[†]The evidence for this content was derived from the school-based survey (Study 2).

4.4.3 The IATIP implementation plan

At this development stage, the implementation plan for the IATIP intervention was proposed based on findings from the systematic review and school-based survey, both of which highlighted key considerations for optimising the intervention format. The school-based survey (Study 2) indicated that adolescents preferred a structured, school-based intervention delivered in a brief format, with an average of four sessions lasting approximately 30–40 minutes, facilitated by public health professionals rather than teachers or peers. Additionally, the systematic review (Study 1) suggested that less intensive interventions, particularly those designed to be brief, were more effective in achieving behavioural outcomes. Taking these findings into account, two alternative implementation plans were proposed (see Table 4.4), ensuring feasibility within the school setting while maximising engagement and effectiveness. These plans provide flexibility in session structuring, delivery modes, and participant engagement, enabling the intervention to be adapted to different school contexts while maintaining its core behavioural change components.

Table 4.4: Proposed implementation plan of the IATIP

	Proposed plan A	Proposed plan B
Experimental group		
Number of sessions	One	Three
Duration/session	120 minutes	40 minutes
Mode of delivery	Classroom-based	Classroom-based
Plan for intervention delivery	One day (3 40-minute consecutive sessions)	3 consecutive days (One 40-minute session)
Additional session for parents	One 40-minute session, either in-person or online	One 40-minute session, either in-person or online
Control group		

Activity	No intervention – usual school activities	No intervention – usual school activities

4.5 Refinement of the 'IATIP' contents

The refinement of the IATIP contents was conducted through a one-day scientific workshop aimed at finalising the intervention materials. This workshop followed a rigorous and systematic approach to ensure that the intervention contents were optimised based on expert feedback. Below I will discuss the refinement workshop in more detail.

4.5.1 Design

The design of the IATIP refinement workshop followed a mixed-method research approach, focusing on gathering both qualitative in-depth insights and perspectives from experts to improve the intervention content, as well as quantitative data for ranking the content based on importance.

4.5.2 Participants

The workshop included ten participants with expertise in behavioural science, health interventions, tobacco control, health psychology, and public health from the UCL Tobacco and Alcohol Research Group (UTARG). Of these participants, eight were international academic experts (including one of Bangladeshi origin), and two were PhD researchers. The group comprised eight females and two males.

4.5.3 Methods for refinement

The workshop was structured into four distinct segments and conducted following a rigorous format to ensure comprehensive refinement of the IATIP contents. The qualitative research approach used in this workshop prioritised the collection of in-depth insights and feedback from experts, thereby aligning

with best practices in intervention development ²³⁸. This section outlines the detailed procedures employed during the workshop.

4.5.3.1 Workshop structure and procedures

The first segment of the workshop involved an introduction to the IATIP programme, providing an overview of its objectives, theoretical foundations, core components, and a brief presentation of each session's content. This ensured that participants had a complete understanding of the intervention framework before exploring into the details. The subsequent segments were organised according to the three main sessions of the intervention. The second, third, and final segments focused on the contents of the first, second, and third sessions of the IATIP intervention, respectively.

Before each discussion, detailed presentations highlighted the session objectives, intended learning outcomes, and proposed activities. This step ensured that participants understood the structure, flow, and goals of each session. Following this, participants engaged in in-depth discussions where they provided feedback and recommendations for refining sub-sessions and overall session content. This approach aligns with the Delphi method's iterative feedback process, which has been shown to be effective for refining complex interventions ^{239 240}.

4.5.3.2 Materials provided to participants

All draft materials of the IATIP intervention, including session objectives, draft content, and session-specific learning outcomes, were distributed to participants before the workshop. This pre-distribution allowed participants adequate time to review the materials and come prepared for meaningful discussions.

4.5.3.3 Measures

During the workshop, feedback was systematically collected through structured discussions guided by a pre-designed set of questions. These questions addressed several key areas:

- i. **Clarity and relevance:** Participants were asked to evaluate whether the content was clear and relevant to the target audience.
- ii. **Cultural appropriateness and feasibility:** Discussions focused on the extent to which the content was appropriate for the socio-cultural context of the school environment in Dhaka.
- iii. **Behavioural determinants:** Participants provided feedback on potential gaps in addressing the key behavioural determinants of tobacco use, such as peer pressure, self-efficacy, and coping strategies.
- iv. **Interactive components and delivery methods:** Suggestions were gathered on how to enhance the interactivity of the sessions and optimise the delivery modes.

Specifically, participants were asked whether the session and sub-session titles, modes of delivery, session duration, and learning types were appropriate. When a participant responded negatively, they were asked to suggest alternatives. Participants were also asked to prioritise the session contents by ranking their importance and to suggest the preferred order of sub-sessions. Additionally, they were asked to evaluate whether the contents within sub-sessions aligned with the specified learning objectives.

To ensure that the feedback process was comprehensive, participants were encouraged to provide open-ended comments and suggestions beyond the structured questions. This approach reflects principles of grounded theory, where qualitative data collection benefits from capturing participants' perspectives without constraints ²⁴¹.

4.5.3.4 Workshop facilitation and tools

To enhance participant engagement and ensure an interactive environment, Mentimeter, a real-time interactive presentation software, was used. This tool allowed participants to share their thoughts anonymously, which helped

facilitate open and honest feedback. Studies have shown that the use of digital tools such as Mentimeter can improve engagement and data richness in group settings ²⁴². The entire workshop was audio recorded with participants' informed consent to ensure that all discussions were documented accurately for subsequent analysis.

4.5.3.5 Analysis

The analysis of the workshop data included both qualitative and quantitative approaches to capture key themes and summarise expert feedback. To analyse the qualitative data, a pragmatic approach was applied to systematically capture key themes from expert feedback. The discussions from the workshop were reviewed, and notes were taken from the audio recordings to identify relevant feedback related to the intervention content and structure. Rather than a formal thematic analysis, the approach focused on summarising key points and categorising feedback into areas such as content clarity, cultural appropriateness, and interactive components.

In addition to the qualitative review of discussions, basic quantitative analyses were performed, such as calculating mean scores, percentages, and rankings for session content priorities and participant responses. Quantitative data were compiled from participant rankings and feedback ratings provided through Mentimeter polls, helping to identify the most and least prioritised session components. This combination of methods allowed for a balanced interpretation of feedback.

The review process involved four main steps:

- i. **Review of audio notes and transcripts:** key feedback was noted and categorised.
- ii. **Grouping of feedback:** comments were grouped into broad categories reflecting strengths, areas for improvement, and actionable suggestions.
- iii. **Quantitative summary:** rankings and percentages were calculated to summarise trends in participant preferences.

- iv. **Integration of feedback:** Both qualitative insights and quantitative trends were used to refine the IATIP contents.

This mixed approach ensured that the feedback was systematically organised and that insights from both narrative discussions and numerical responses informed the final refinements.

Following the workshop, a follow-up supervisory meeting was conducted to review the preliminary findings, allowing for further reflection on key recommendations. Additionally, the results were presented to the thesis committee panel for further scrutiny, ensuring that the refinements were not only guided by expert feedback but also aligned with broader intervention goals. This post-workshop evaluation process facilitated additional refinements, reinforcing the iterative nature of the intervention development.

4.5.4 Results

The IATIP content refinement workshop included 10 participants, comprising professors, senior researchers, and PhD scholars with expertise in adolescent health, behavioural science, tobacco control, and health psychology. Their backgrounds in tobacco prevention interventions, behaviour change interventions, and public health ensured a comprehensive evaluation of the intervention. Experts in intervention design strengthened theoretical robustness, while specialists in tobacco control provided insights on regulatory and environmental considerations. This diverse expertise enabled a well-rounded refinement of the IATIP intervention, ensuring its feasibility and relevance in school settings.

Participants provided detailed feedback on the content structure and activities. Several participants suggested reducing the number of activities in sub-session 1.1-1.3 and focusing on a single interactive task: *“Not sure you need both an interactive task and the Q&A – perhaps stick to a verbal introduction to the topic and then one task.”* Others recommended replacing statistical prevalence data with impactful examples, such as odds ratios for health risks: *“Maybe add some*

jarring scary odds ratios like 'X times more likely to develop lung cancer.'" To avoid potential stigmatisation, participants advised against using negative imagery: *"Do not use stigmatising imagery of overweight smokers."* Instead, they suggested using relatable visuals and empowering language to foster engagement.

Feedback indicated a need to simplify and streamline content by merging overlapping sub-sessions. For example, one participant suggested: *"Drop reasons for use from session-1 and only include in session-2."* Additionally, participants supported the use of personal goal-setting exercises but emphasised privacy: *"Give some examples of a tobacco goal, then ask them to write down their own private goal – no need to share."* One hundred percent of participants agreed that the original session title was too formal and needed to be simplified: *"This title is more academic. Make it simpler and more straightforward for adolescents."*

Participants emphasised the importance of addressing mental well-being in a relatable way. They recommended avoiding clinical terminology: *"I would remove 'mental illness' from the title... focus on dealing with negative emotions."* There was also a call to include culturally relevant coping strategies, such as religious practices: *"Maybe add religion/prayer as a coping strategy; let them come up with their own strategies."* The advocacy component was viewed as overly ambitious by some participants, who suggested reframing it as peer support: *"Just make it about general support – making it about advocacy might feel a bit too much."*

The quantitative data collected during the workshop provided additional insights into participants' views. Regarding the appropriateness of session titles, 60% of participants agreed that the title for Session-1 was appropriate, while 40% did not. For Sessions 2 and 3, none of the participants agreed that the proposed titles were appropriate, and 100% recommended simpler, more relatable titles for adolescents. All participants unanimously agreed (100%) that the contents met the specified learning objectives. In terms of session duration, the average

time required for Session 1 was estimated to be 39 minutes, while the estimated duration for Sessions 2 and 3 was 45 minutes each.

Participants ranked sub-session contents based on perceived importance. In Session 1, health-related consequences and interactive discussions were considered the most important elements (Figure 4.4). For Session 2, role-play and decision-making exercises were rated as important components for building resistance skills (Figure 4.5). In Session 3, stress management techniques and personal goal-setting activities were prioritised over social advocacy components (Figure 4.6), indicating a preference for practical coping strategies over broader advocacy themes. This comprehensive feedback process ensured that the IATIP intervention content was refined to align with expert recommendations and the needs of adolescent participants.

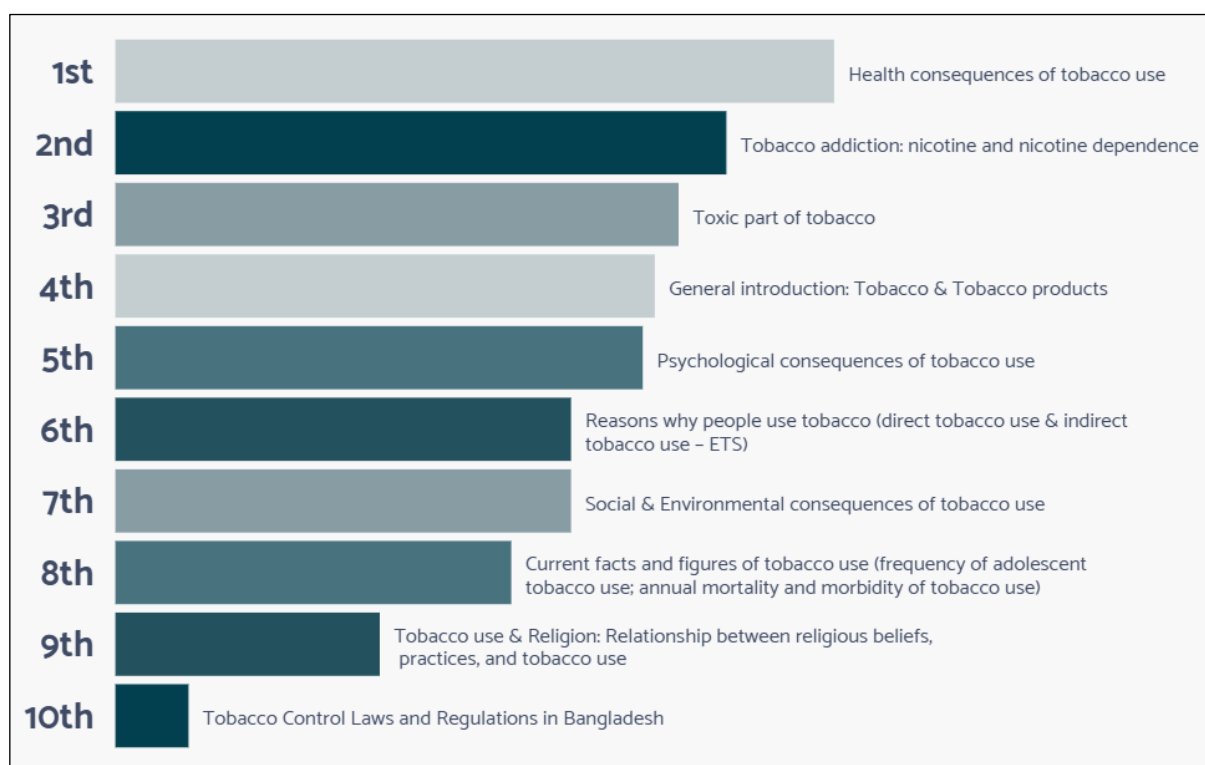


Figure 4.4: Prioritising the contents of IATIP intervention (Session 1) based on their importance by the workshop participants

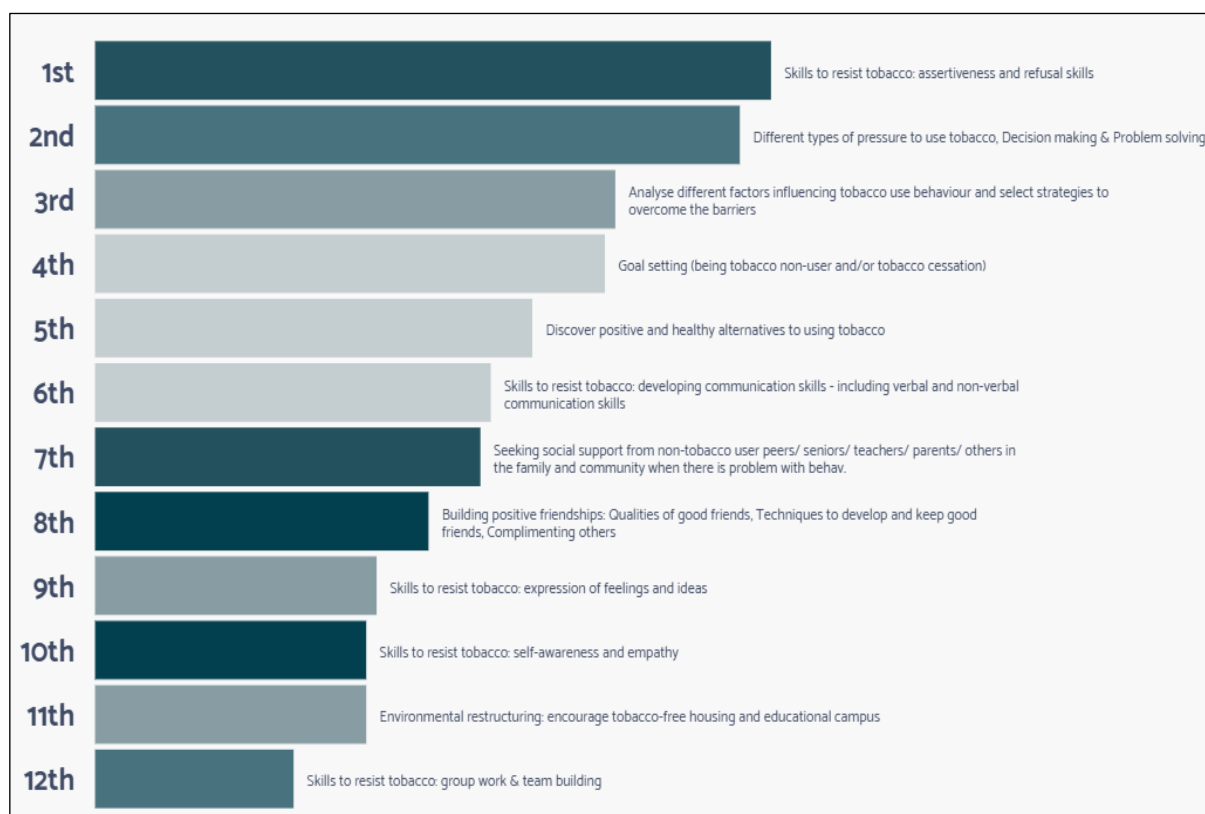


Figure 4.5: Prioritising the contents of IATIP intervention (Session 2) based on their importance by the workshop participants

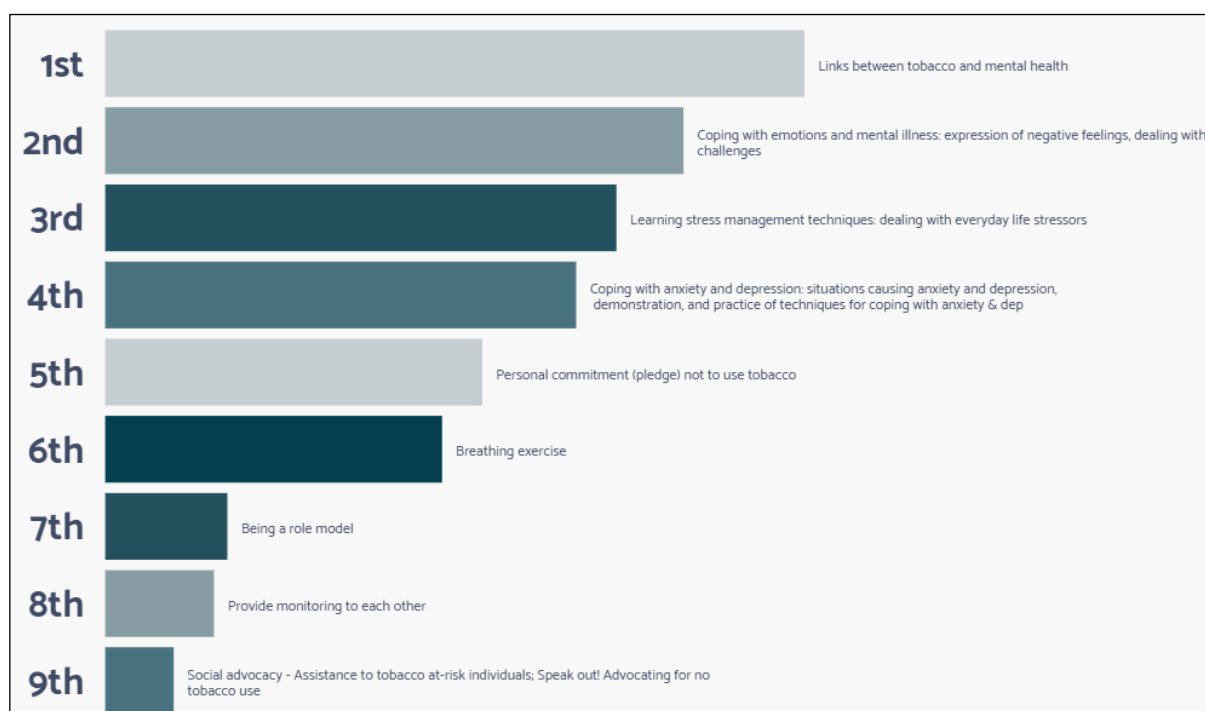


Figure 4.6: Prioritising the contents of IATIP intervention (Session 3) based on their importance by the workshop participants

The refinement process incorporated extensive feedback, leading to significant updates to the IATIP sessions and sub-sessions. While the initial refinements were based on the expert workshop, the refinement process continued beyond this event. A post-workshop meeting was held to discuss key outcomes and validate proposed modifications, ensuring that the intervention design remained both theoretically grounded and practically feasible. Additionally, the thesis committee panel reviewed the findings, providing further insights that contributed to the final adjustments. This staged approach ensured that the refinement process was comprehensive, iterative, and aligned with best practices in intervention development.

As an example, a sub-section on tobacco-related laws were integrated into broader discussions to avoid redundancy, ensuring that these important topics were covered contextually within other sub-sessions. The goal-setting activities originally placed in Session 2 were consolidated into Session 3 to streamline content and reinforce goal setting in the context of mental well-being and personal growth. Additionally, the advocacy components were simplified and reframed as peer support activities to reduce the perceived burden on students and foster mutual encouragement.

The session titles were revised based on participant feedback to make them more relatable and accessible to adolescents. *“Tobacco Talk: Understanding the Basics, Health Effects, and Perspectives”* replaced the original Session 1 title, emphasising an engaging and comprehensive approach to tobacco education. Session 2 was renamed *“Kick the Habit: Smart Decisions and Strong Skills for a Healthy Lifestyle”* to highlight its focus on decision-making and life skills. Finally, Session 3 was retitled *“Mind Matters: Navigating Emotions and Setting Goals for a Tobacco-Free Future,”* reflecting its emphasis on emotional regulation and personal goal setting.

Table 4.5: Description of the IATIP sessions, including their title, sub-sessions' taught and interactive components, learning outcomes and learning types (Refined version)

Se ssi on	Title	Sub- sessio n No	Taught components	Interactive components	Learning outcomes	Learning types
1	Tobacco Talk: Understanding the Basics, Health Effects, and Perspectives	1.1	Tobacco and Tobacco products	-	Students will acquire a basic understanding of the nature of tobacco, its compositions, and the various forms of tobacco products.	Acquisition
		1.2	Tobacco toxicity and Addiction	Word cloud game (Group activity)	Students will gain insight into the addictive nature of tobacco and the physiological and psychological mechanisms that lead to addiction.	Investigation Collaboration Acquisition
		1.3	Health effects of tobacco use	Word cloud game (Group activity), Video presentation, & Artwork (Poster contest)	Students will explore the detrimental health effects of tobacco use, including both short-term and long-term consequences.	Investigation Collaboration Discussion Acquisition
		1.4	Religious views on Tobacco use	-	Students will learn how different religion's view tobacco use and its implications on personal beliefs and values.	Acquisition

2	Kick the Habit: Smart Decision and Strong Skills for a Healthy Lifestyle	2.1	Why do people use tobacco?	-	Students will gain the ability to identify and critically analyse factors influencing tobacco use behaviour.	Acquisition
		2.2	Decision making & problem-solving skills to resist tobacco: assertiveness and refusal skills	Situational role playing to demonstrate skills (Individual and Group),	Students will be better equipped to make informed decisions regarding saying NO TO TOBACCO by developing essential life skills, including assertiveness and refusal skills.	Acquisition Practice
		2.3	Discover positive and healthy alternatives to using tobacco	Group discussion Word cloud game (Group activity)	Students will explore and identify positive and healthy alternatives to tobacco use.	Discussion Collaboration Production
3	Mind Matters: Navigating Emotions and Setting Goals for a Tobacco-Free Future	3.1	Links between tobacco and mental wellbeing	-	Students will gain an understanding of what mental well-being is, its significance, and how it relates to tobacco use prevention.	Acquisition
		3.2	Coping with emotions: expression of negative feelings, dealing with stress, depression and anxiety.	Deep breathing exercise	Students will develop skills to build emotional resilience, cope with stress, depression and anxiety, and manage emotions without turning to tobacco use.	Acquisition Practice

3.3	Goal setting and Personal commitment (pledge) not to use tobacco	Open discussion Written pledges, and Artwork (Poster contest)	Students will be able to set clear and achievable goals related to tobacco use behaviour, whether it is becoming a tobacco non-user or achieving tobacco cessation. And also, students will reinforce their commitment to a tobacco-free lifestyle and how it will contribute to their well-being.	Discussion Investigation Production

IATIP = Intervention for Adolescent Tobacco Initiation Prevention

Further revisions included merging overlapping sub-sessions, removing redundant activities, and enhancing interactive elements such as role-plays and peer discussions. These changes ensured that the intervention was not only evidence-based but also culturally appropriate and engaging for adolescents, addressing both behavioural determinants and practical skills for resisting tobacco use. Table 4.5 provides an overview of the revised session titles, sub-sessions, interactive components, learning outcomes, and learning types included in the IATIP intervention following the refinement process.

4.6 Discussion

The development and refinement of the IATIP intervention followed established best practices for designing behavioural health interventions. The overall approach was guided by the MRC framework for developing complex interventions and the MOST approach, which supports iterative optimisation through empirical evaluation ^{213 238 243}. Both approaches highlight the importance of grounding intervention development in theoretical frameworks. In this context, the COM-B model was used to conduct a behavioural analysis and guide the initial intervention design.

The COM-B model was chosen because it provides an integrative method for understanding the target behaviour in context, considering capability, opportunity, and motivation as key determinants ²¹⁸. This model ensured that the intervention addressed not only reflective motivation but also automatic motivation, alongside individual capability and environmental opportunity ²¹⁸. The Behaviour Change Wheel linked this behavioural analysis to intervention functions and behaviour change techniques (BCTs), which provided a structured yet flexible method for content design. However, as noted in intervention development literature, rigid adherence to theoretical steps is often impractical due to time constraints and iterative feedback ²¹³. Consequently, the development process applied guiding principles rather than strict step-by-step adherence to the BCW.

The behavioural analysis using the COM-B model and the TDF identified a comprehensive set of potential intervention components likely to address tobacco use behaviours among adolescents. This approach facilitated the selection of components that were theoretically grounded and contextually relevant. However, as highlighted by prior studies, relying solely on existing empirical evidence may limit innovation by excluding untested but potentially effective strategies ²⁴⁴. Therefore, the intervention development process triangulated findings from behavioural analysis with expert input to ensure a robust and holistic approach.

Following the development phase, the refinement process provided further insights. The workshop findings revealed that participants valued culturally relevant, interactive, and skills-based content. The significant revisions made to session titles, contents, and delivery modes reflect the necessity of tailoring language such as the simplification of academic language and examples to the adolescent audience, aligning with existing literature that emphasises the role of age-appropriate, engaging materials in health education ²¹⁸. For example, replacing formal language with relatable terminology and incorporating peer discussions and role-playing exercises addressed key motivational and social components of behaviour change.

The integration of both qualitative and quantitative data provided more comprehensive guidance on intervention refinement and allowed for a balanced assessment of the IATIP contents. Quantitative data, such as session duration and prioritisation rankings, provided insights into the practical feasibility of the intervention, while qualitative feedback captured detailed recommendations for improvement. This mixed-methods approach aligns with established practices in intervention refinement, which suggest that combining numerical trends with narrative insights enhances the validity of findings ^{244 245}.

One critical outcome of the refinement process was the emphasis on coping strategies for emotional well-being, with experts suggesting for the inclusion of culturally relevant coping mechanisms, such as religious practices. This

recommendation aligns with evidence that culturally adapted interventions are more effective in promoting sustained behavioural change ^{218 244}. Furthermore, the reframing of social advocacy components as peer support activities responds to concerns about placing excessive responsibility on adolescents, shifting the focus to mutual encouragement and self-efficacy. The consolidation of overlapping sub-sessions and the removal of redundant content further streamlined the programme, demonstrating the importance of efficiency in intervention design. By ensuring that each sub-session serves a distinct purpose, the IATIP intervention aims to maintain engagement and avoid cognitive overload – a key consideration in adolescent education ²⁴⁶.

Another notable observation was the decision to retain the content on religious views on tobacco use, despite its low ranking by the expert participants during the workshop. This decision was informed by findings from the school-based needs assessment survey (see Chapter 3), where this component received high importance ratings. This highlights the need to balance expert recommendations with contextual evidence from the target population when finalising intervention content.

While the refinement process of the IATIP intervention benefited from the structured input of a panel of academic and professional experts, several limitations must be acknowledged. First, the refinement process relied on a single expert consensus workshop. Although the session provided valuable insights and practical recommendations, the use of only one workshop may have constrained the diversity and depth of perspectives captured. Future iterations of intervention development would benefit from multiple rounds of consultation or Delphi-style procedures to triangulate insights and ensure a more comprehensive understanding of stakeholder priorities. Second, the workshop participants consisted solely of academic and professional experts; adolescents – the primary target group of the intervention – were not directly involved in the design or refinement of the intervention. While insights from adolescents were gathered during the school-based survey (Chapter 3) and used to inform the design implicitly, direct adolescent involvement through a structured co-design approach was not undertaken. This decision was

influenced in part by practical constraints, but also by developmental considerations: the target age group (11–17 years) may have limited capacity to engage meaningfully in complex design processes or articulate theoretical elements of behaviour change. Nevertheless, this remains a limitation in terms of participatory rigour. Future adaptation and implementation phases should incorporate more explicit adolescent co-design methods to improve relevance, acceptability, and cultural resonance. Third, logistical constraints limited the use of real-time validation processes such as follow-up workshops or member-checking, which could have helped confirm the consistency and clarity of the feedback provided. Finally, while the analysis of the workshop outputs involved both qualitative thematic synthesis and quantitative ratings, the inherently subjective nature of qualitative interpretation may introduce bias. Future research should consider employing inter-rater reliability checks and expanding the number and diversity of participants to improve the rigour and generalisability of findings.

Despite these limitations, the workshop provided a rich dataset of recommendations that informed significant improvements to the IATIP intervention. The refinement workshop served as a pivotal step in ensuring that the IATIP intervention is evidence-based, culturally relevant, and tailored to meet the needs of adolescents in Dhaka. The participatory and iterative approach adopted for this process enhances the intervention's robustness and potential effectiveness, providing a strong foundation for subsequent implementation and evaluation phases. This approach underscores the value of mixed-methods research in refining behavioural health interventions and highlights the importance of culturally sensitive, context-specific programme development to address adolescent tobacco use. Future stages, such as pilot testing with adolescents and incorporating input from teachers and parents, will further strengthen the ecological validity and sustainability of the intervention.

4.7 Conclusion

The development and refinement of the IATIP intervention illustrate a comprehensive, evidence-based, and context-specific approach to health behaviour change. The integration of theoretical models, such as the COM-B model, ensured that the intervention was systematically designed to address the behavioural determinants of tobacco use among adolescents. The participatory methodology, which included expert feedback and iterative refinements, enhanced the robustness and cultural relevance of the intervention, providing a strong foundation for future pilot testing and evaluation. This process also highlighted the importance of balancing structured frameworks with flexibility to adapt content based on stakeholder input. The refined intervention, which incorporates interactive, culturally sensitive, and skills-based components, represents a promising strategy for promoting tobacco-free behaviours in school settings. Future work will build on this foundation by incorporating additional feedback from students, teachers, and parents to further strengthen the programme's feasibility and effectiveness in real-world contexts.

Chapter 5 – Exploring the suitability, cultural adaptation, and practical implementation challenges of a brief tobacco prevention intervention for adolescents in Dhaka, Bangladesh (Study 3)

5.0 Chapter summary

This chapter explored the cultural adaptation of the Intervention for Adolescent Tobacco Initiation Prevention (IATIP) to ensure its acceptability, feasibility, and relevance among adolescents, teachers, and parents in Dhaka, Bangladesh. Using focus group discussions (FGDs), qualitative data were collected from 24 participants through six FGDs and analysed to identify participants' perspectives on the programme's contents, design, and implementation methods.

Participants appreciated the programme's focus on addressing tobacco use and mental well-being while recommending culturally resonant modifications, including the incorporation of religious values, relatable visuals, and interactive elements. Students and teachers stressed the need for practical and engaging delivery methods, such as expert-led and classroom-based sessions, to enhance programme uptake and impact. Key findings informed significant revisions to the IATIP programme manual, ensuring alignment with cultural norms, logistical feasibility, and participant preferences. The adaptations address critical barriers, such as clarity of information and perceived societal pressures, by embedding local cultural and religious narratives. The revised manual is detailed in Appendix 5.6 and includes session plans, training modules, and implementation strategies to optimise engagement and fidelity. This study highlights the importance of stakeholder involvement in co-creating culturally adapted interventions and sets the stage for the next step: evaluating the feasibility and effectiveness of the IATIP through a pilot cluster randomised controlled trial.

5.1 Introduction

The foundation for the development of the Intervention for Adolescent Tobacco Initiation Prevention (IATIP) is detailed in Chapter 4, where the integration of theoretical models, survey findings (qualitative), and expert consensus informed the intervention design. This multifaceted approach ensured that the intervention was not only theoretically robust and evidence-informed but also tailored to the lived experiences and behavioural patterns of adolescents in urban Bangladesh. Building on that groundwork, this chapter explores the critical process of cultural adaptation, an essential step for ensuring that the intervention is not only effective but also resonates with the specific socio-cultural context of adolescents in Dhaka, Bangladesh.

Cultural adaptation refers to the systematic process of modifying an intervention to align it with the cultural, social, and environmental contexts of its target population ²⁴⁴. It acknowledges that cultural norms, values, and practices significantly influence behaviours, including health-related behaviours such as tobacco use. Bernal et al. (2009) describe cultural adaptation as the tailoring of interventions to improve their cultural relevance, acceptability, and feasibility ²⁴⁴. For example, a school-based intervention in an urban Bangladeshi setting must consider the unique family structures, religious practices, and socio-economic realities that shape adolescents' experiences and decision-making.

Health and behaviour are profoundly influenced by the socio-cultural environment, cultural norms, beliefs, and practices ^{154 247}. Culture is a socially transmitted nexus of behaviours, capabilities, ideas, concepts, symbols, attitudes, practices, institutions, and artefacts that shape human experience ^{154 248}. It encompasses both observable items, such as patterned behaviours, symbols, and artefacts, and cognitive entities, including shared beliefs, schemas, and norms. Given the strong influence of culture on behaviour, many health problems and their interventions are highly culture sensitive. Implementing an intervention in a new setting without adaptation may limit its effectiveness and reduce its likelihood of achieving positive outcomes ²⁴⁹.

The need for cultural adaptation arises from recognising that interventions developed in one context may not translate seamlessly into another. This is particularly true in global public health, where many evidence-based interventions are initially designed in high-income countries with different cultural assumptions, health systems, and resources than those in low- and middle-income countries (LMICs) ²⁵⁰. Without cultural adaptation, interventions risk being perceived as irrelevant or inappropriate, reducing their effectiveness and uptake. The importance of cultural adaptation has been demonstrated in several meta-analyses. For instance, a meta-analysis of 76 trials involving 25,225 participants found a substantial effect size ($d = 0.45$) for culturally adapted psychological interventions compared to unadapted ones ²⁵¹. Another meta-analysis of 65 trials with 8,620 participants reported a modestly higher effect size ($d = 0.46$) for culturally adapted interventions, with greater degrees of adaptation associated with stronger outcomes ²⁵².

Cultural adaptation is not only a practical necessity but also an ethical obligation. It reduces the risk of interventions violating individuals' cultural values and norms, thereby fostering respect and inclusivity ²⁵³. Furthermore, culturally adapted interventions are often more acceptable and appropriate for the target population, enhancing participants' understanding, engagement, and adherence. These qualities contribute to sustained fidelity, ensuring that the intervention is delivered as intended and achieves its desired outcomes. In the case of tobacco use prevention among adolescents, cultural adaptation ensures that the intervention addresses not only universal factors, such as peer pressure and accessibility of tobacco products, but also context-specific factors, such as local beliefs about smoking, gender norms, and the influence of family and community structures ²⁵⁴. Failing to incorporate these cultural dimensions can lead to resistance from both adolescents and their families, undermining the intervention's impact.

Cultural adaptation involves several considerations to ensure that the intervention aligns with the target population's cultural and contextual realities. Domenech-Rodriguez and Wieling (2004) highlight the importance of addressing language, values, social norms, economic contexts, and stakeholder

engagement ²⁵⁵. Language and communication are crucial for ensuring that intervention materials are linguistically appropriate and accessible. Technical terms must be translated into everyday language, and local idioms can enhance relatability. The intervention must align with the population's core values and beliefs, incorporating messages that resonate with their cultural frameworks, such as religious teachings or family values. Social norms and practices, including family hierarchies and community leadership, must also be considered, as these norms often shape behaviour. Additionally, addressing structural factors, such as economic pressures and exposure to tobacco advertising, is essential in low-resource settings. Stakeholder engagement is integral, requiring active involvement from adolescents, parents, and teachers to ensure that the intervention is relevant and well-received.

Cultural adaptation is a multi-step process that integrates both theoretical frameworks and practical engagement with the target population. Models such as the Ecological Validity Model (EVM) ²⁵⁶ and the Cultural Adaptation Framework ²⁵⁷ provide valuable guidance for structuring this process. The first step is conducting a preliminary assessment to understand the cultural and contextual factors influencing the target behaviour. This often involves formative research, including focus group discussions, interviews, and community surveys, to gather insights into adolescents' perceptions of tobacco use, their motivations for behaviour change, and barriers to engagement with the intervention. This stage lays the groundwork for informed adaptation. The next phase involves surface adaptations, which focus on visible aspects of the intervention, such as language, imagery, and examples. For instance, materials may incorporate local attire, familiar settings, and relatable characters to ensure that they resonate with the target population. These adaptations make the intervention visually and contextually familiar to the audience. Deep adaptations, on the other hand, address underlying cultural values and norms that shape behaviour. This includes embedding themes such as respect for elders, community responsibility, and religious teachings into the intervention content. These adaptations aim to align the intervention with the deeply held beliefs and practices of the target population, enhancing its relevance and acceptability.

Stakeholder involvement, framed within the principles of Patient and Public Involvement and Engagement (PPIE), is integral to the cultural adaptation process ²⁵⁸. PPIE ensures that interventions are co-designed with the target population rather than imposed upon them ^{258 259}. In this study, adolescents, parents, and teachers actively contributed feedback on the IATIP's content, design, and delivery methods, enhancing its acceptability, feasibility, and cultural relevance. Following this engagement, the IATIP underwent iterative refinement to incorporate stakeholder insights, strengthening its alignment with real-world needs. The next step involves testing the intervention's feasibility through a pilot cluster randomised controlled trial, where continued PPIE input will further optimise its implementation.

5.2 Objectives

The objectives of this study were as follows:

- i. To explore the perceptions and experiences of adolescents, teachers, and parents regarding the content of the IATIP, and to understand their views on its suitability in preventing tobacco initiation and promoting health and well-being among adolescents in Dhaka, Bangladesh.
- ii. To examine how the IATIP can be culturally adapted to the socio-cultural, linguistic, and contextual realities of Bangladesh, by exploring the beliefs, practices, and values of the target population and identifying areas for modification or enhancement.
- iii. To assess likely practical implementation challenges, including potential barriers and suggestions for engaging students, teachers, and parents in the intervention.

5.3 Methods

5.3.1 Design

This study employed a qualitative design using focus group discussions (FGDs) to explore the acceptability, feasibility, and cultural adaptation of the IATIP. This design was chosen to allow an in-depth understanding of participants' perspectives and to facilitate rich, interactive discussions.

5.3.2 Participants

The participants of this study were school students, teachers, and parents from the previous collaborating schools in Dhaka, Bangladesh (see Chapter 3 for more details about the schools). The participants of this study were identified based on the following three inclusion criteria:

- i. Participants must be a Bangladeshi school students aged ≥ 14 years, parents and teachers
- ii. The teachers must have four years of teaching experience (the lower age limit is 30)
- iii. Participants' willingness to fulfil the objectives of the study.

5.3.3 Sample size

A total of 24 participants were included in this study, divided into six FGDs with four participants in each group. The groups comprised two FGDs each for students, teachers, and parents. The sample size was determined using the concept of information power as described by Malterud et al. (2016)²⁶⁰. Key considerations included the study's relatively broad aim, the specificity of the target sample, the use of established theoretical frameworks, the high quality of researcher-participant dialogue, and sample variation. A larger sample size was chosen to ensure data saturation and the robustness of findings.

5.3.4 Sampling procedure

Participants were recruited from collaborating schools in Dhaka, Bangladesh. The schools received an open invitation letter outlining the study and inviting teachers and students and their parents to participate. Interested individuals were instructed to contact the research team via email or phone within a specified timeframe. Potential participants were assessed against inclusion criteria to ensure eligibility. The final selection was purposeful, ensuring equal gender representation, diversity, and high-quality dialogue. In cases of excess interest, participants were selected on a first-come, first-served basis.

5.3.5 Data collection procedure

Data were collected in person through six FGDs, each lasting approximately 60 to 90 minutes. Separate FGDs were conducted for students, parents, and teachers, with two groups per participant category. The decision to conduct separate FGDs rather than mixed discussions was made to encourage open and honest dialogue. Given the hierarchical nature of teacher-student and parent-child relationships, mixed FGDs might have inhibited participants from expressing their views freely. For instance, students may have felt constrained discussing sensitive topics in the presence of teachers or parents, while parents might have moderated their opinions if teachers were involved. Although mixed FGDs could have facilitated broader discussions by incorporating diverse perspectives simultaneously, the risk of social desirability bias and power dynamics influencing responses was considered too high^{261 262}. By keeping the groups separate, this study ensured that each participant category could engage in a candid discussion, thereby capturing a more authentic representation of their views.

The focus groups were facilitated by me, with the assistance of a note-taker and audio recorder. All focus groups began with introductions, where participants had the opportunity to present themselves to the group. The purpose of the focus group was explained, as outlined in the respective topic guides for each participant category. Participants were provided with an information sheet, which was read aloud to ensure comprehension, and any questions were

addressed before the start of the discussions. Written consent was obtained from all participants prior to the start of each focus group. All focus groups were conducted on the premises of the participating schools.

As the facilitator I used three focus group topic guides to direct discussions and prompt participants when necessary: one for students (Appendix 5.1), one for teachers (Appendix 5.2), and one for parents (Appendix 5.3). The topic guides covered a range of topics related to the IATIP intervention, including:

- i. Initial impressions about the contents and design of the IATIP
- ii. Attitudes and perceptions towards the intervention content
- iii. Most appreciated features and aspects requiring improvement
- iv. Opinions on the cultural relevance of the intervention content
- v. Perceptions of feasibility and preferred delivery methods

A systematic approach was followed to ensure the quality of discussions. Specific techniques included establishing clear ground rules, using neutral and open-ended questions to facilitate discussion, reassuring participants about confidentiality, and actively encouraging quieter individuals to share their views. Additionally, a non-judgmental atmosphere was ensured to minimise social desirability bias and promote honest responses.

A three-step procedure was followed for managing the data. First, a note-taker and audio-recorder were present to ensure accurate documentation of the discussions. Second, the recordings were transcribed verbatim in Bangla, with the text cleaned to ensure clarity. Finally, the transcripts were translated into English to facilitate analysis. It is to note that to ensure accurate representation of participants' perspectives, all Bangla quotes were tidied for clarity before being translated into English. As a result, the English quotes presented may appear more formal than the original Bangla expressions.

5.3.6 Data analysis

The FGD transcripts were analysed using the framework method, a structured and systematic approach to thematic analysis widely employed in health research ²⁶³. This method was chosen for its flexibility in incorporating both deductive and inductive coding while ensuring transparency and rigour. The analysis followed seven stages: (i) transcription, where all FGDs were transcribed verbatim and reviewed for accuracy; (ii) familiarisation, involving repeated reading of transcripts alongside listening to the audio recording to identify initial themes; (iii) coding, where a blended deductive-inductive approach was used to categorise data; (iv) developing the analytical framework, informed by study objectives and emergent themes; (v) applying the framework, indexing data systematically to thematic categories; (vi) charting, summarising indexed data into thematic matrices for comparative analysis across participant groups; and (vii) mapping and interpretation, identifying patterns, relationships, and contrasts, contextualised within the cultural perspective in Bangladesh. This rigorous process provided a comprehensive understanding of participants' perceptions, barriers, and suggestions for the cultural adaptation of the IATIP intervention.

5.3.7 Ethics

Ethical approval for this study was obtained from the institutional review board, the 'Biosafety, Biosecurity & Ethical Committee' of Jahangirnagar University, Dhaka, Bangladesh (Ref No: BBEC,JU/M 2023/ 05 (29)), ensuring research and ethical permission within the host country. International ethics approval was also obtained from University College London, with the UCL Research Ethics Committee Approval ID Number 22645/003. See Appendix 5.4 for the approved ethics certificates.

5.4 Results

5.4.1. Participants' characteristics

This study included 24 participants, evenly divided among students, teachers, and parents. The mean ages were 17 years for students and approximately 44 years for both teachers and parents. Sex representation was balanced among students, while teachers were predominantly male, and parents predominantly female. Most teachers held graduate degrees, and students were evenly distributed between Year 9 and Year 10. Tobacco use varied, with current use reported by a minority of participants, including students who exclusively smoked tobacco, while teachers reported using both smoked and smokeless forms, and parents using only smokeless tobacco.

Table 5.1: Participants' characteristics (N=24)

Participant characteristics	Student, % (n)	Teacher, % (n)	Parent, % (n)
Age			
Mean (SD)	17.13 (0.64)	43.38 (5.71)	44.25 (6.48)
Sex			
Female	50 (4)	25 (2)	62.5 (5)
Male	50 (4)	75 (6)	37.5 (3)
Education			
Nine	50 (4)		12.5 (1)
Ten	50 (4)		25 (2)
Graduate		87.5 (7)	62.5 (5)
Doctoral		12.5 (1)	
Tobacco use status			
Current	12.5 (1)	25 (2)	12.5 (1)
Ex-user	12.5 (1)	0	12.5 (1)
Never	75 (6)	75 (6)	75 (6)
Types of tobacco use			
Smoked tobacco	100 (1)	50 (1)	0
Smokeless tobacco	0	50 (1)	100 (1)

5.4.2. Main findings

The thematic analysis revealed six key themes and thirteen corresponding sub-themes, as detailed in Appendix 5.5. This table includes representative quotes from students, teachers, and parents, illustrating their diverse perspectives on the intervention for adolescent tobacco initiation prevention (IATIP).

Theme 1: Initial impressions of the IATIP

Sub-theme 1.1: General thoughts on content

Students, teachers, and parents generally appreciated the IATIP's content. Students emphasised the importance of understanding tobacco addiction and the value of setting clear goals for prevention. One student shared:

“The topics are very important. Understanding tobacco addiction and setting goals for prevention is key.” [ID-S3]

Teachers described the programme's objectives as noble and praised the content's structure, stating:

“Your work is valuable, your objective is clear, and the content is also great. It seems everything is in good shape.” [ID-T1]

Parents highlighted the programme's relevance and potential benefits, with one commenting:

“I found all the topics relevant and very good. If you can implement it successfully, it'll be really beneficial.” [ID-P2]

Sub-theme 1.2: Perceptions of layout/design

Students noted the need for more interactive and visual elements, such as experiments or animations, to make the content more engaging. One student remarked:

“I think it would be more effective if it's shown through experiments. Reading alone wouldn't be that effective.” [ID-S7]

Teachers suggested incorporating visual aids like documentary-style videos to enhance awareness. However, they stressed that fear-based visuals, such as showing the consequences of tobacco use, could be particularly effective:

“In terms of visualisation, it does sound effective. A video could be shown, maybe a small documentary-style video. But unless we show

them how tobacco is slowly leading them towards death, I feel like that's not as impactful. Some other ways of awareness raising are fine, but if you show them the direct fear of death, that would work better. Because the fear itself is the key." [ID-T3]

In contrast, the parents had no recommendation regarding the layout/design. They believed that everything is important and needs to be addressed to get a positive outcome. A parent said:

"Your program ideas are all really good. Every aspect you've mentioned needs attention because addressing these issues could lead to effective outcomes." [ID-P1]

Sub-theme 1.3: Clarity of information provided

Regarding the clarity of the information of the IATIP intervention, the students expressed difficulty understanding technical terms, such as "ETS", and requested simpler language. One student said:

"No, I don't understand what you mean by ETS. (...) It would be easier for us if you could explain it clearly. Also, I think you shouldn't use any language that is too complex for us." [ID-S6]

Teachers emphasised the importance of presenting information in relatable terms and using a mix of lectures and group work to enhance engagement. Parents also highlighted the need for guidance, stating:

"Children might not understand everything just by reading. Someone should guide them." [ID-P7]

Theme 2: Likes and dislikes the contents of the IATIP

Sub-theme 2.1: Most appreciated features

Students valued the inclusion of mental health topics, viewing them as essential for addressing underlying causes of addiction. One participant noted:

"If mental health can be normalised in our society, then many of these addictions, like tobacco addiction, will highly decrease." [ID-S8]

Teachers appreciated the focus on healthier alternatives to tobacco use, while parents praised practical activities such as breathing exercises. A parent remarked:

“You’re saying that breathing exercises can be done in the session. It’s a great activity. I love it. It will help them (adolescents) keep their brains cool. I think they can practice this during assemblies or in physical education classes as well.” [ID-P6]

Sub-theme 2.2: Content-related concerns

Students recommended using modern technologies, such as 3D animations, to vividly illustrate the consequences of tobacco use. One participant suggested,

“Regarding the health risks mentioned here, since we can now use 3D animation (amm) for various things, like if we show them how cancer happens due to tobacco use, (...) and how the operation process works and what damages occur, if they see that through 3D animation, they might avoid it. They might be scared that if they don’t stay away, they could face the same fate.” [ID-S3]

Teachers called for addressing contemporary stressors faced by adolescents, such as emotional and social pressures, to provide a more holistic approach. A teacher mentioned:

“Our children today are dealing with stuff we never even thought about. Back in the day, we grew up in joint families, so no matter what trouble we got into, we could always run to our grandfather for protection, and our dad wouldn’t scold us. But now, children face all sorts of stress and often have nowhere to turn. Plus, our generation is all about wanting more and more – always chasing something better, and it never seems to end. It’s good that you’ve added mental wellbeing components, but you should also include how to get emotional and social support.” [ID-T4]

Parents emphasised the importance of teaching children the consequences of their actions, highlighting the need for a stronger focus on illustrating real-life outcomes. One parent noted:

“It’s essential to teach children the difference between right and wrong. (ahh) They need to understand that good actions lead to good outcomes, and bad actions have consequences. Once they realise this, they’ll think twice about making poor decisions. If a child knows their parents have explained both sides to them, they’re less likely to stray onto the wrong path. Even if they’re tempted, they’ll remember what their parents said

and reconsider. [...] So, I believe the most important thing is for parents to become aware first.” [ID-P4]

Theme 3: Suggestions for additions to IATIP

Sub-theme 3.1: Content changes

Students suggested incorporating activities like sports to make the programme more engaging. One participant remarked:

“There is an opportunity for some activities to be included in the programme like sports. [...] If there are any open activities available for everyone, I think it would be better.” [ID-S3]

Teachers highlighted the need to address misleading marketing strategies portraying tobacco as less harmful. One of the teachers mentioned:

“In an open economy, tobacco represents a significant percentage (...). Even after raising the tax rate year after year, you still can’t control it. No matter how expensive the cigarette gets, whether it’s 15 or 16 takas, a student will still buy them. And not only that, various new brands have emerged. They are being marketed as ‘less harmful’. This is the new trend – marketing tobacco as less harmful, but it’s not really less harmful. At the same time, business policies are being added. So, you must address these issues in your programme and motivate the students not to use tobacco.” [ID-T3]

On the other hand, parents proposed introducing health check-ups to monitor tobacco use in schools, with one stating:

“Another thing you can add (hmm) is that you could start annual health checkups for students, (hmm) let’s say for class eight to twelve. You can test for tobacco use and issue certificates. Anyone who will be found using tobacco would be expelled from the school.” [ID-P7]

Sub-theme 3.2: Delivery modifications

Students emphasised the importance of addressing societal pressures contributing to tobacco use, particularly for boys. Teachers recommended using real-life stories, such as interviews with individuals affected by smoking-related illnesses, to make the consequences more tangible. Parents suggested

embedding tobacco prevention content into school curricula across various subjects, stating:

“The contents of your programme, tobacco prevention programme, should be included in school textbooks, and lots of seminars can be conducted on this. They [children] don’t know. They don’t know about the health risks of tobacco use at all. I think the health risks can be added to the science books, the social and environmental risks to the social studies books, and the religious perspective to the religion books. If we include a bit in each subject, then they’ll be aware.” [ID-P7]

Theme 4: Cultural relevance of the IATIP contents

Sub-theme 4.1: Alignment with socio-cultural norms

Students recognised the importance of aligning the intervention with cultural norms to enhance its effectiveness. One student highlighted the normalisation of public smoking in everyday settings, noting,

“And also, in our country, it’s really common to see people smoking while walking on the footpath. No one ever says anything or tries to stop them, even though others who don’t like cigarette smoke have to deal with it too. It’s just seen as normal. But I think we should change this cultural practice. Maybe you could highlight this issue in the programme.” [ID-S2]

Teachers highlighted the cultural acceptance of smokeless tobacco and urged the programme to address these double standards. One of them stated:

“We are only focusing on smoking, but there’s also a sector for ‘Jarda’, Yes. My mother, my grandmother, madam, yes, are big fans of ‘Jorda’. And within our cultural context, this ‘Jorda’ is viewed in two different ways. If mothers and grandmothers consume it, it’s seen as positive. But if it’s smoked, it’s seen as negative. I don’t know why this double standard exists – why does fire make it problematic, but not otherwise? I don’t understand why this happens. (...) And in our wedding ceremonies, you’ll see that ‘Betel leaf’ is displayed in various ways, and if it’s not there, people fight. Yes, sweet, ‘Betel leaf’ and ‘Jarda’ – if those aren’t there, there will be trouble. This means that, culturally, this is so deeply rooted and accepted that uprooting it is almost impossible. Therefore, you must address this in your programme.” [ID-T2]

Parents emphasised promoting positive role models within families as an effective strategy to deter tobacco use. One of the parents stated:

“As a mother, I always try to teach my child to follow the successful people in my family, usually follow those who are gentle and don’t get involved in any wrongdoing. So, you can also focus on this in your programme. Teaching them about following the good people around us and the importance of staying healthy to take care of their family and I think it can discourage them from using tobacco.” [ID-P3]

Sub-theme 4.2: Integration of religious values

Religious values were seen as a powerful motivator for behavioural change. Students and parents highlighted the potential impact of framing tobacco use as “haram” or forbidden in Islam. Teachers supported this approach, adding that such messaging could resonate across different religious groups:

“If I think from a religious perspective, whether it’s Hindu, Muslim, Christian, or Buddhist, no religion says that you should engage in addiction. No religion says that you should do forbidden things. It’s not stated anywhere. (...) For this reason, to prevent tobacco use, or many other prohibited activities, you can motivate students through religion as well.” [ID-T3]

Most students advocated for using religious teachings to strengthen the intervention’s impact, noting:

“It can be presented religiously. If we can use religion to convey a message, it will likely be more effective because people are emotionally attached to religion. (Ahhh) I believe that if you present this in a religious context, it will have more impact.” [ID-S4]

Theme 5: Implementation challenges of the IATIP

Sub-theme 5.1: Practicality of implementation

Students preferred classroom-based sessions for focused engagement, with one stating:

“In a seminar, many may not attend, or they may talk among themselves, and the maintenance won’t be good. If it’s done in a classroom, we can make sure that everyone listens.” [ID-S4]

Teachers suggested conducting regular seminars supplemented by videos and discussions. One of them reported:

“We could also hold seminars every month or every three months or every six months. (...) Regular seminars where we show videos or engage in discussions would be very beneficial.” [ID-T8]

Parents stressed the importance of linking the intervention with existing tobacco control laws to reinforce its credibility.

“There’s a law [tobacco control] in Bangladesh, but it’s not being implemented. You should mention that the proper implementation of these laws needs to be ensured. You can connect this to your lecture, for example, there’s a fine for smoking in public, but it’s not enforced, but we should follow this.” [ID-P8]

Sub-theme 5.2: Perceived barriers

Students highlighted the need for scientific explanations to make the intervention more credible. Teachers expressed concerns about time constraints, particularly during exam periods, noting:

“This time is difficult for us because it’s our students’ year finals. Right now, every class is very important, this kind of activity will disrupt that.” [ID-T3]

Parents, however, reported no major barriers to their participation and strongly supported the initiative.

“We don’t think there’ll be any barriers from parents. We’re really happy about it because we don’t want our children to be destroyed by using tobacco or something like this.” [ID-P2]

Theme 6: Preferred delivery methods of the IATIP

Sub-theme 6.1: Peer-led, teacher-led, or expert-led approaches

Students preferred expert-led sessions for credibility, stating:

“We won’t take friends as seriously as we would take experts, (umm) this is because they (experts) will have more knowledge. That’s why we

would take them (experts) more seriously. I think it would be better if they (experts) conducted it.” [ID-S7].

Teachers recommended combining expert-led sessions with teacher oversight to ensure smooth management. On the contrary, parents had no thoughts on this.

Sub-theme 6.2: Mode of engagement (in-person or online)

Students and teachers favoured in-person sessions for better engagement and comprehension. One student remarked:

“(Ah..) It would be better if the program is held in the classroom. People (students) don’t pay much attention or take things seriously online. We’ve seen this even in online classes.” [ID-S1]

Teachers agreed, adding that smaller, classroom-based groups would facilitate active participation. A teacher reported:

“In my opinion, the classroom approach is better. Fewer students will be present, they will be able to grasp the concepts better, and they will also be able to participate and give their opinions.” [ID-T1]

However, no specific preference was expressed by parents in this regard during the discussions.

5.5 Discussion

The findings of this study provide valuable insights into the acceptability and cultural relevance of the contents and the implementation feasibility of IATIP in Bangladesh. The use of FGDs revealed nuanced perspectives from students, teachers, and parents, highlighting both strengths and areas for improvement in the intervention contents, design, and delivery.

Participants’ initial impressions of the IATIP underscored the perceived importance of addressing tobacco addiction through structured programmes. Similar to Bernal et al. (2009), who emphasise the need for systematic modifications to align with cultural patterns ²⁴⁴, participants highlighted the relevance of tailoring the programme to the socio-cultural context of Bangladesh. Students and teachers praised the programme’s focus on school

adolescents, aligning with Thomas et al. (2015), who identified school-based interventions as critical tools for shaping adolescent behaviours ⁹⁹. Parents echoed these sentiments, recognising the programme's potential societal benefits, as also highlighted by previous researchers on parental involvement in adolescent health programmes ²⁶⁴⁻²⁶⁶.

The emphasis on incorporating visual and interactive elements, such as 3D animations or videos, reflects a growing trend in public health to incorporate engaging multimedia tools to enhance message retention ^{267 268}. This approach aligns with calls in the literature to use engaging formats for improving message retention, especially in resource-constrained settings like LMICs. However, balancing these pedagogical innovations with the logistical realities of implementation remains a challenge ²⁵⁰.

Content related to mental well-being was regarded as a pivotal component, with participants valuing its integration into the programme. This resonates with previous findings in systematic reviews, where authors demonstrated the effectiveness of addressing emotional well-being to mitigate tobacco and/or substance use ^{159 269}. The participants' emphasis on normalising mental health discussions also aligns with Barrera et al. (2013), who advocate for culturally relevant health interventions to ensure community acceptance ¹⁵⁴. Students' appreciation of this focus highlights the importance of adopting a holistic approach to behavioural change interventions. Similarly, parents and teachers viewed stress management activities, such as breathing exercises, as practical and culturally appropriate additions to the programme.

The cultural adaptation highlighted in this study, including suggestions for integrating religious teaching, aligns closely with the EVM ²⁵⁶. Participants' recommendations to incorporate Islamic values and local role models demonstrate the significance of embedding interventions within existing cultural frameworks ^{270 271}. The integration of religious philosophy into the IATIP, as suggested by participants, offers a pathway to making the programme more relatable and acceptable. Teachers' insights into the cultural normalisation of smokeless tobacco use among older generations highlight the complexities of

addressing intergenerational attitudes towards tobacco. This is further supported by findings from other studies, where authors discussed the challenges of addressing entrenched cultural norms, such as the normalisation of smokeless tobacco use in South Asia ²⁷²⁻²⁷⁴. This finding emphasises the need for targeted messaging to challenge entrenched norms.

The study revealed a strong preference for in-person, classroom-based delivery methods among participants. This is consistent with evidence suggesting that face-to-face interventions foster greater engagement and comprehension, particularly in low-resource settings ²⁷⁵. Participants' support for expert-led sessions underscores the importance of credibility in delivering behavioural health interventions. However, challenges such as academic scheduling conflicts must be addressed to ensure the programme's successful implementation.

The findings of this study have several implications for policy and practice. First, efforts to culturally adapt interventions must go beyond surface-level modifications, embedding local norms, values, and traditions into programme content and delivery. Second, the integration of mental health components within tobacco prevention programmes should be prioritised, as they address underlying risk factors for tobacco use. Third, the inclusion of key stakeholders (e.g., students, parents and teachers for any school-based intervention) in the intervention design and implementation can enhance acceptability and sustainability.

This study has several strengths. First, it utilised a qualitative design that allowed for an in-depth exploration of the perspectives of students, teachers, and parents. By employing focus group discussions, the study captured rich, interactive dialogue, enhancing the understanding of the acceptability, feasibility, and cultural relevance of the IATIP. Second, the study addressed a significant gap in public health research by focusing on culturally adapting a school-based tobacco prevention intervention for adolescents in Bangladesh, a low-resource setting. Third, the inclusion of diverse participant groups ensured a holistic view of the intervention's potential impact, aligning with best practices in stakeholder

engagement. However, this study also has limitations. The sample size, while adequate for qualitative research, may limit the generalisability of findings to broader populations. Additionally, the reliance on self-reported data introduces the potential for social desirability bias, particularly when discussing sensitive topics like tobacco use. Another limitation pertains to the subjective nature of qualitative data analysis. Due to time constraints, only one person conducted the analysis, which may have introduced potential biases in interpreting the data. Although systematic procedures were followed, such as thematic coding and the use of a framework method, the absence of multiple coders reduces the opportunity for inter-coder reliability checks. Future research should consider involving multiple analysts to mitigate subjective biases and ensure a more robust interpretation of qualitative findings.

5.6 Conclusion

This study highlights the critical importance of cultural adaptation, stakeholder engagement, and holistic approaches in designing and implementing school-based tobacco prevention programmes. By addressing the socio-cultural, emotional, and practical needs of adolescents, the IATIP has the potential to serve as a model for similar interventions in LMICs. The findings underscore the value of involving students, teachers, and parents in the co-creation of public health initiatives, ensuring their relevance and effectiveness in promoting health and well-being.

5.7 Implications for the finalisation of the IATIP

The findings from this study provide critical insights into refining and finalising the IATIP. The revised programme manual addresses all participant insights gathered during the cultural adaptation process, including recommendations for integrating visual and interactive elements, embedding cultural and religious values, and modifying delivery methods for feasibility and effectiveness. These revisions ensure the intervention is culturally relevant, engaging, and practical for implementation in school settings. To ensure these changes are effectively operationalised, the finalised IATIP contents and programme manual have been detailed in Appendix 5.6.

5.7.1 Modification of IATIP

The cultural adaptation of the IATIP intervention involved substantial modifications to its content, delivery, and methodology to enhance its relevance, accessibility, and impact. Content modifications included replacing standardised tobacco education with context-specific examples, improving the clarity of terminology, and updating graphical materials with locally relevant and adolescent-friendly images. Additionally, static text-heavy materials were supplemented with real-life testimonials from tobacco users, alongside discussions on alternative coping mechanisms such as stress management and sports. In terms of delivery, the intervention shifted from a traditional lecture-based approach to an interactive, problem-based learning format, incorporating role-playing, storytelling, and multimedia presentations to improve engagement. Methodological refinements included a shift from generic anti-smoking messaging to targeted discussions on culturally normalised tobacco products and their societal implications. Supplementary resources, such as a take-home programme manual and parent information sheets, were also introduced to extend learning beyond the classroom. Table 5.2 summarises these key modifications to the IATIP intervention, ensuring alignment with socio-cultural contexts and optimising its feasibility and effectiveness in adolescent health promotion.

Table 5.2: Overview of the modifications to culturally adapt version of IATIP

Original version		Culturally adapted version
Changes in content		
1	General tobacco education with standardised messaging	Context-specific examples tailored to cultural norms; greater emphasis on locally relevant tobacco use patterns and consequences
2	Language ambiguity related to terminology	Enhanced the clarity of information and precision in communication throughout all materials
3	Graphical material (photos, poster, and flyers)	All graphical materials updated with locally contextualised images to ensure relevance and adolescent-friendly illustrations

4	Static images and text-heavy materials illustrating the health effects of tobacco	Integration of real-life testimonials from local tobacco users and culturally familiar imagery to enhance comprehension and impact
5	No discussion on alternative coping mechanisms	Encouraged alternative positive behaviours (e.g., stress management techniques, sports/physical activity, and peer-support strategies)

Changes in delivery

6	Traditional lecture-based presentations	Incorporated problem-based learning with interactive, discussion-based sessions incorporating role-playing, storytelling, and group activities to increase engagement
7	No plan for multi-media presentation	Included multi-media presentation to increase engagement

Methodology

8	Generic anti-smoking messaging	Targeted discussions on culturally normalised tobacco products (e.g., smokeless tobacco, betel leaf) and strategies for challenging social norms
9	Limited resources for students outside sessions	Inclusion of supplementary materials such as take-home programme manual and parent information sheets to extend learning beyond the classroom

The next step involves testing the feasibility of the culturally adapted IATIP through a pilot cluster randomised controlled trial, presented in Chapter 6. This will allow for the evaluation of its implementation processes, participant engagement, and initial outcomes, providing essential feedback for further refinement and scalability.

Chapter 6 – Intervention for Adolescent Tobacco Initiation Prevention (IATIP) to promote health and well-being: A pilot feasibility cluster randomised controlled trial in Dhaka, Bangladesh (Study 4)

6.0 Chapter summary

Adolescent tobacco use represents a critical global public health challenge, particularly in low- and middle-income countries (LMICs) such as Bangladesh. Early initiation of tobacco use significantly increases the risk of addiction and long-term health consequences. Schools provide an ideal setting for preventive interventions; however, culturally relevant approaches remain limited in Bangladesh. The Intervention for Adolescent Tobacco Initiation Prevention (IATIP) trial was designed to assess the feasibility, acceptability, and preliminary efficacy of a brief school-based program aimed at preventing tobacco initiation and promoting health and well-being among adolescents in Dhaka.

The IATIP trial employed a pilot feasibility cluster randomised controlled design involving eight schools, with 1,396 adolescents aged 11-17 years participating. Schools were randomised into intervention and inactive control groups. The intervention consisted of three 40-minute sessions delivered over three consecutive days, focusing on knowledge, attitudes, and skills to resist tobacco use, complemented by mental well-being components. Key outcomes included feasibility measures (recruitment, retention, practicality, fidelity, and acceptability), intention to use tobacco, mental well-being, and skills for a tobacco-free lifestyle. Quantitative data were collected at the end of follow-up, supplemented by a process evaluation.

The trial achieved high recruitment (88.4%) and low attrition (3.5%) rates, demonstrating the feasibility of implementing the IATIP in the school setting. Fidelity to the intervention protocol was high, with over 95% of sessions

delivered as intended. Most schools supported the extended durations; however, one school restricted sessions to 45 minutes to align with their standard class schedules. The intervention was well-received, with 94.6% of participants rating the content as highly acceptable.

Statistically significant reductions in the intention to use tobacco at one-month follow-up were observed in the intervention group compared to the control group (Odds Ratio [OR]: 0.030; 95% confidence interval [CI]: 0.02–0.05; $p < 0.001$). Secondary outcomes revealed notable improvements in mental well-being (mean difference: 6.16 units; 95% CI: 5.47–6.84), refusal skills (OR: 22.12; 95% CI: 10.86–45.05), and decision-making abilities (mean difference: 3.23 units; 95% CI: 2.76–3.70). Process evaluation highlighted minor challenges in session attendance due to weather disruptions and academic pressures, as well as reasons for participant withdrawal, which included lack of perceived relevance and familial disinterest.

The IATIP trial demonstrated the feasibility, acceptability, and potential efficacy of a culturally tailored school-based intervention in preventing tobacco initiation and enhancing mental well-being among adolescents in Dhaka, Bangladesh. By integrating behaviour change techniques (e.g., information about health consequences, problem solving, reduce negative emotions, social support) and addressing both tobacco prevention and mental health, the IATIP offers a scalable model for public health interventions in LMICs. Future research should focus on long-term outcomes, cost-effectiveness, and adaptation for diverse settings to inform national health policies and strategies.

6.1 Introduction

As described in Chapter 1, tobacco use remains a significant global public health challenge, contributing substantially to both mortality and morbidity ¹³. In 2019, tobacco-related causes accounted for 8.7 million deaths (15.4% of all deaths) and 229.8 million disability-adjusted life years lost worldwide, particularly pronounced in low- and middle-income countries (LMICs) ²⁷⁶. Beyond its evident physical health implications, tobacco use intricately links with mental health, having a bidirectional relationship where tobacco use contributes to mental health disorders, such as anxiety, depression, and substance use disorders ^{73 82 176 178 179}. Conversely, individuals with pre-existing mental health disorders are more likely to engage in tobacco use as a means of self-medication or coping mechanism, further exacerbating their mental health symptoms and perpetuating a cycle of dependency ^{82 176 178}. Recognising the interplay between tobacco use and physical and mental health disorders underscores the importance of holistic preventive interventions ¹⁷⁶.

To address the associated harms, it is imperative to focus on preventing tobacco initiation, particularly among adolescents. Studies consistently highlight that the majority of tobacco users initiate this habit before reaching the age of 15 ^{203 277}. Tobacco use is of paramount concern given its highly addictive nature ^{16 18 277 278}. The World Health Organization reports that approximately 38 million adolescents globally, with 25 million boys and 13 million girls aged 13 to 15, currently use tobacco ⁸⁹. Efforts to reduce tobacco initiation among adolescents can significantly impact their overall health and well-being. Health and well-being encompass various dimensions, including physical health, psychological stability, and social engagement ²⁷⁹. Physical wellness involves self-care and a balanced lifestyle, while psychological well-being comprises subjective experience and positive emotions ²⁸⁰. A stable mood enhances resilience, and social engagement fosters belonging and support within communities through interpersonal relations ²⁸¹. Addressing these facets is crucial in adolescent health interventions like tobacco prevention.

Given that adolescents spend a significant portion of their time in schools, these institutions represent a key setting for supporting adolescent health and well-being^{282 283}. Schools have the potential to reach the vast majority of adolescents, and school health programs can positively impact those who rarely visit health facilities²⁸⁴. Previous global interventions in schools have demonstrated success in preventing tobacco initiation, emphasizing various approaches such as classroom lessons, anti-tobacco messages, and peer communication^{99 285 286}.

Bangladesh, a densely populated LMIC, ranks among the top ten nations worldwide for tobacco use, encompassing both combustible and non-combustible forms^{183 205}. With nearly 36 million adolescents constituting 22.0% of the population in the country, the situation demands attention.¹⁸⁴ The Global School-based Student Health Survey (2014) shows that 9.8% of school adolescents, 13.8% of boys and 2.0% of girls, regularly use tobacco products⁴⁷. Furthermore, 31.1% of adolescents in Bangladesh are exposed to tobacco smoke at home, and 59.0% are exposed to tobacco smoke in enclosed public places⁴⁸. Research identifies various factors contributing to adolescent tobacco initiation, including familial and peer influences, low socioeconomic status, impulsivity, and mental health disorders³⁵. Of note, the prevalence of common mental disorders among Bangladeshi adolescents ranges from 25% to 37%, highlighting a pressing need for targeted interventions^{184 190}. Bangladesh, however, struggles with challenges such as the ubiquitous availability of tobacco products, weak enforcement of existing regulations, and the absence of targeted prevention interventions^{44 183 205}. It is noteworthy that there is currently no intervention program in Bangladesh specifically designed to prevent adolescent tobacco initiation while promoting health and well-being.

The Intervention for Adolescent Tobacco Initiation Prevention (IATIP) aimed to address this gap by providing valuable insights and solutions tailored to Bangladeshi adolescents (see Chapter 4 and 5). This chapter gives details of a pilot feasibility trial to assess the feasibility and potential efficacy of the IATIP trial implemented among adolescents (aged 11–17) enrolled in school years 8 and 9 in Dhaka, Bangladesh. Adolescents in this age group were selected due

to their heightened susceptibility to tobacco initiation and the critical importance of early intervention in preventing tobacco use ^{116 203 277}. While the primary focus of this intervention was to reduce tobacco initiation among adolescents, it included components addressing overall health and well-being. Efforts to prevent tobacco initiation can indirectly benefit physical, psychological, and social well-being, and vice versa, even if the impact on health and well-being is not the primary aim of the intervention ²⁷⁹⁻²⁸¹. This chapter outlines the objectives, hypotheses, design, methodology, results of the IATIP trial, and discussion, shedding light on a crucial initiative aimed at addressing the pressing issues of adolescent tobacco use and health and well-being in the context of Bangladesh.

6.1.1 Research objectives

Primary objective

To assess the feasibility of implementing the IATIP in secondary schools in Dhaka, Bangladesh by evaluating the intervention's acceptability, practicality, and fidelity, as well as to assess the feasibility of conducting a future cluster randomised controlled trial (C-RCT) in this context, including recruitment, randomisation, retention, and data collection procedures.

Secondary objectives (SO)

SO1. To evaluate the potential efficacy of IATIP in preventing tobacco initiation as indexed by intention to use tobacco among school adolescents.

SO2. To examine the effect of IATIP on promoting health and well-being in the adolescents.

SO3. To explore changes in tobacco-related knowledge, attitudes, beliefs, and skills to resist tobacco.

SO4. To estimate the direct cost of delivering the intervention in a school setting in Dhaka, Bangladesh.

6.2 Methods

6.2.1 Design

This feasibility study employed a pilot cluster randomised controlled design. The unit of randomisation was schools, with the ultimate goal of informing a full-scale cluster randomised controlled trial (C-RCT). Additionally, a mixed-methods approach was followed for the process evaluation of the trial.

6.2.2 Intervention

This pilot trial introduced the IATIP, an evidence-based and culturally sensitive tobacco prevention program designed to promote health and well-being specifically for Bangladeshi adolescents. The IATIP involves three 40-minute sessions, delivered over three consecutive days. A comprehensive overview of the IATIP sessions, including their titles, sub-sessions taught, interactive components, learning outcomes, and learning types, was presented in Chapter 4.

The development process of the IATIP consisted of four stages: (i) review of existing literature, (ii) needs assessment, (iii) selection of intervention components and framework integration, and (iv) expert consensus and adaptation. In the first stage, a comprehensive review of existing literature on adolescent tobacco use prevention strategies was performed ²⁸⁵. This literature review aimed to explore the effectiveness of school-based tobacco prevention interventions in LMICs and identify key risk factors, protective factors, and evidence-based interventions relevant to the Bangladeshi context. Following the literature review, a needs assessment was conducted to better understand the specific challenges faced by adolescents in Bangladesh regarding tobacco use and health and well-being. This assessment included a large-scale school survey and a qualitative study – focus groups and interviews with students, teachers, and parents – to gather insights into the social, cultural, and environmental factors influencing adolescent behaviour. In the third stage, the intervention components were selected based on the findings of stages 1 and 2. Rooted in evidence-based practices, the components were integrated with

Behaviour Change Techniques (BCTs) ²³⁰, the Behaviour Change Wheel ²¹⁸, and the Theoretical Domains Framework ²²⁴. To ensure the delivery of the intervention is both effective and engaging, the Arena Blended Connected (ABC) model was applied ²³⁵. This model combines a variety of delivery methods, including face-to-face sessions, online resources, and interactive technologies, to create a dynamic and accessible learning experience for adolescents. Diverse learning needs of adolescents were acknowledged and integrated six key learning types to optimize knowledge acquisition, concept investigation, collaboration, meaningful discussions, practical application, and active skill and insight production. In the fourth stage, an expert consensus workshop similar to a Delphi exercise was performed with nine international experts in the fields of tobacco control, psychology, behaviour change, public health, and education. The draft version of the intervention contents underwent thorough review by the experts to ensure its scientific rigour and alignment with evidence-based practices. Based on the feedback of the experts, further refinements and improvements in the intervention design and components were made to finalise the intervention contents.

The final curriculum of the IATIP was structured around three core components, each tailored to address the nuanced challenges faced by adolescents in Bangladesh. First, the information curriculum aimed to cultivate factual awareness by providing students with scientifically grounded insights into the consequences of tobacco use. Second, the social influence curriculum addressed to raise awareness of diverse social influences (e.g., peer pressure) that may encourage tobacco use and learn to manage both direct and indirect high-risk situations with confidence ⁹⁸. Complementing this, the third component, the social competence curriculum, focused on enhancing adolescents' social learning processes and life skills, such as problem-solving, decision-making, and cognitive skills for resisting various interpersonal or media influences ²⁸⁷. It aimed to strengthen their self-control, self-esteem, coping strategies for stress, and general social and assertive skills, thereby empowering them to refuse offers to tobacco use through improved social competence. While the social competence curriculum focused on enhancing overall social skills, the social influence curriculum specifically targets the

identification and mitigation of tobacco-related social pressures ⁹⁸. This trial was registered at ClinicalTrials.gov (NCT06399588).

6.2.3 Participants

The trial aimed to recruit school students enrolled in years 8 and 9 in Dhaka city, Bangladesh. Potential participants were identified based on the following three inclusion criteria: participants must be (i) Bangladeshi school adolescent; (ii) students at one of the participating schools (iii) students in Year 8 or 9. The exclusion criteria included students who were (i) unwilling to participate, (ii) unable to provide informed consent (including parental consent), and (iii) having severe cognitive or physical impairments hindering meaningful engagement with the intervention or completion of assessment measures (as assessed in consultation with the respective school teachers).

Current tobacco users were not excluded from participation. This decision reflected both conceptual and pragmatic considerations aligned with the trial's aims and design. First, the intervention was delivered in real-world classroom settings. A typical school classroom represents the naturalistic environment in which the intervention would be implemented in practice. In these settings, it is not feasible, ethical, or desirable to screen out current users from receiving health education alongside their peers. Second, the intervention had dual relevance. While the intervention was designed primarily to prevent initiation, it also included components relevant to reducing use and supporting cessation (e.g., goal setting, refusal skills, coping strategies), which could benefit current users. Third, adolescent tobacco use is often experimental and intermittent rather than habitual. Many "current users" may be early experimenters rather than established smokers. Including them allowed for evaluation of the intervention's effect across a broader behavioural spectrum, which is especially important in feasibility studies. Fourth, as this was a pilot feasibility trial, the focus was on assessing the intervention's delivery, acceptability, and preliminary patterns of effect – not on testing efficacy through strict participant selection. Fifth, while smoking initiation was a key behavioural outcome, this study also assessed secondary outcomes (e.g., intention to tobacco use, knowledge, and

attitudes), where inclusion of current users provided valuable data on potential efficacy. The inclusion of all students in the relevant year groups thus aligns with the universal, school-based nature of the intervention and the broader public health goal of promoting tobacco-free behaviours among all adolescents.

6.2.4 Sample size calculation

Based on the one-sided 80% confidence interval method for analysis ²⁸⁸, a sample size of 78 was required in each group.

Sample size calculation formula:
$$N = \frac{[(4\sigma^2)(Z_{1-\alpha} + Z_{1-\beta})^2]}{(E)^2}$$

This was assuming a standard deviation (σ) of each treatment response of 4 ²⁸⁵; significance criterion ' α ' value 0.2, power of 80% and minimum detectable difference between treatment means of 1.53 derived from a 22% reduction in the main efficacy outcome (proportion of participants who reported ever using tobacco) in a recent systematic review ²⁸⁵. With a design effect $[1 + (m - 1) \rho]$ to account for clustering calculated as 13.7, a total sample size of 1,068 was required for this pilot study. The clusters were schools with two classes in year 8 and 9 participating (each class had about 40 students) so the average cluster size (m) was $4 \times 40 = 160$, with the intraclass coefficient (ρ) conservatively estimated to be around 0.08 (based on my systematic review, with a mean intraclass coefficient of 0.034, ranging from 0.005 to 0.14; see Chapter 2). Furthermore, factoring in a 15% non-response/lost-to-follow-up rate, the final sample size resulted in approximately 1,260 participants (630 in each group), or four schools per group and eight schools in total. Thus, the final target sample size was 1,280 (640 in each group).

6.2.5 Procedure

Recruitment

A pool ($n=24$) of secondary and higher secondary schools in Dhaka, representing the most common type of school following the National Curriculum

and Textbook Board (NCTB) curriculum in 'Bangla', was invited to participate in this trial. This selection strategy was aimed at allowing findings to be generalised across a broad sector of the Bangladeshi school system. Half of the invited schools agreed to participate in this trial, with 8 schools to be randomly recruited. All eligible grade 8 and 9 students were the study sample. Schools received an invitation letter, students and/or parents/guardians received information sheets and consent forms. The final list of participating schools, classes, and students was confirmed based on inclusion and exclusion criteria.

Randomisation

Due to contamination risks, randomisation within schools was impractical. Therefore, cluster randomisation was used to allocate schools to either the intervention or control group. Allocation considered matching and stratification factors such as geographic location (based on local government boundaries), monthly school fees, and school passing rates to ensure balanced allocation. A random sequence generation method involving three stratified blocks (based on sex composition of the schools: girls only, boys only and mixed sex) was used to allocate schools (four in each group) using computer-generated random numbers. Importantly, randomisation was conducted prior to baseline data collection. This allowed sufficient time for coordination with schools regarding their allocation and for logistical preparation. However, conducting randomisation before baseline introduces a potential risk of bias, such as differential student engagement or responses if participants or staff became aware of their allocation. To mitigate this, baseline data were collected using standardised self-administered tools by trained, independent data collectors who were not involved in the intervention delivery. The randomisation sequence was concealed until assignment to minimise selection bias. Although blinding of participants and researchers was not possible, independent data collectors were collected outcome data to minimise assessment bias. They promptly entered the data into the UCL Data Safe Haven using REDCap software^{185 186} as soon as it was collected. The randomisation process was monitored closely to ensure adherence to the protocol, with deviations documented transparently in this chapter. Figure 6.1 outlines recruitment, randomisation, and assessment flow of the IATIP trial.

Comparator

In the control condition of this pilot trial, participating schools maintained their regular ongoing activities without the introduction of the IATIP. However, to maximise the impact of this research and ensure that all participants benefit from the knowledge, a short lecture was conducted and the written materials available for the intervention were shared with the control participants after the follow-up assessment.

Assessments

The field implementation of this trial was completed over a period of 3 months, with staggered assessments at baseline (t_0) and 1-month follow-up (t_2). Feasibility assessment (t_1) was followed immediately after the intervention, with a process evaluation after the follow-up assessment (Table 6.1). Data collection sessions, lasting 40-45 minutes, were conducted in classroom time using structured questionnaires (see Appendix 6.1). These questionnaires, aligned study objectives, were administered to both intervention and control groups, utilising established scales and measures.

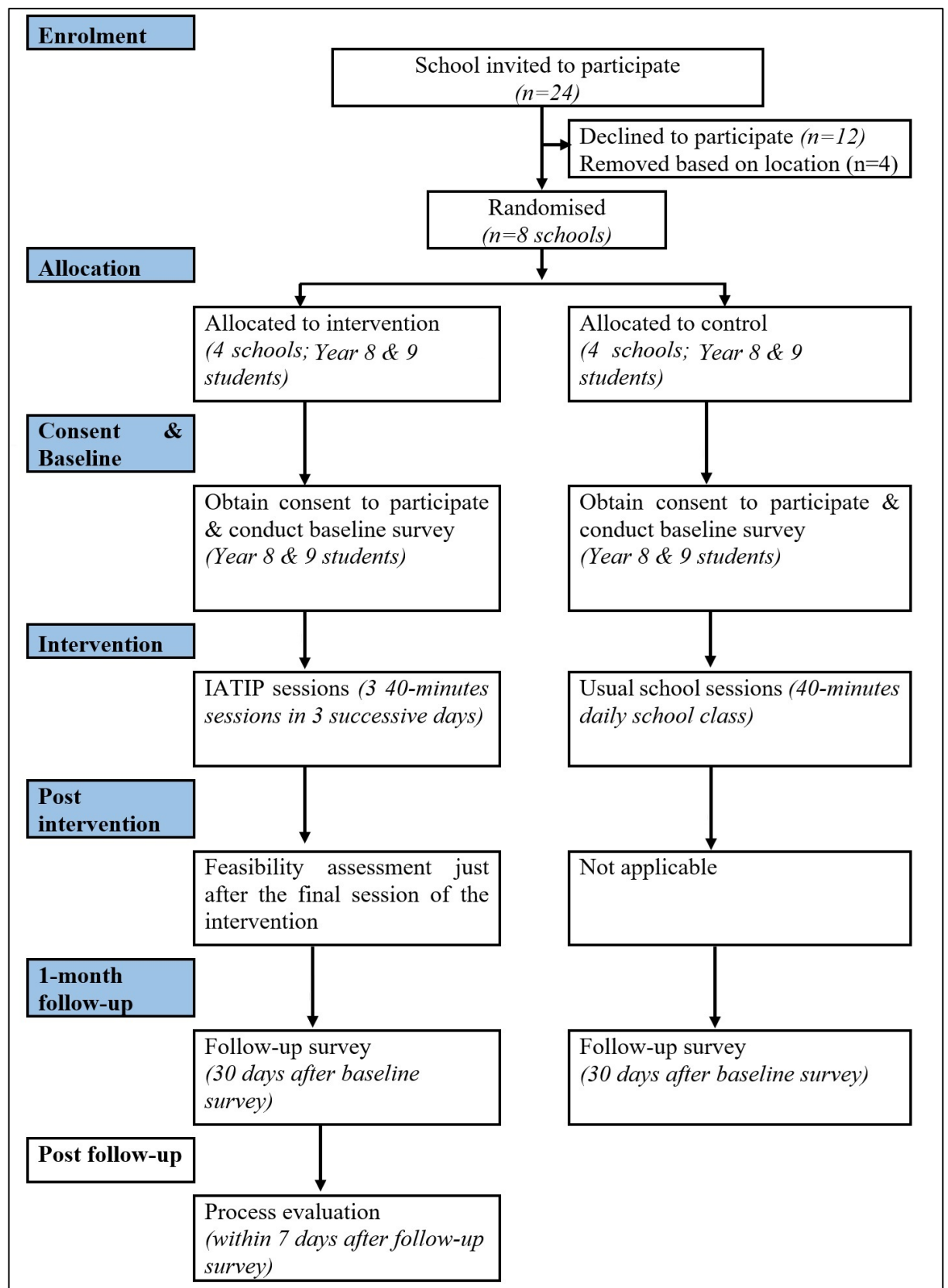


Figure 6.1: Recruitment, randomisation, and assessment flow diagram

6.2.6 Measures

6.2.6.1 Primary outcome measures: Feasibility

The primary outcome for this pilot trial was the feasibility of conducting the IATIP intervention and trial procedures in a school setting. Feasibility was assessed using a combination of outcomes, some of which were measured across both intervention and control arms (e.g., recruitment and attrition), and others specific to the intervention arm only (e.g., fidelity, practicality, and acceptability), as these relate directly to the delivery and reception of the intervention. This mixed approach aligns with established guidance for feasibility studies of complex interventions.

Recruitment rate: The recruitment success rate was calculated as the percentage of invited participants who agreed to participate in the study.

Attrition rate: The attrition rate was determined by the percentage of participants who completed the baseline survey but did not complete the follow-up survey.

Practicality: The time allocated by schools to complete the assessments and IATIP sessions and the actual time needed for field implementation was recorded to indicate whether schools had the capacity to support the intervention. A separate participants' attendance sheet for every single activity of the trial was also maintained by the intervention operator.

Fidelity: Fidelity of the intervention was assessed using a pre-defined index, consisting of 21 IATIP content items, evaluated on a 3-point Likert (0 = not implemented, 1 = partially implemented and 2 = fully implemented). Fidelity data were collected through multiple methods, including video recording observations of intervention delivery as a gold standard ²⁸⁹, self-reports from students ²⁹⁰, and intervention operator delivery logs ²⁹¹.

Table 6.1: SPIRIT flow diagram: schedule of enrolment, interventions, and assessments

Timepoint	Study period				Close-out t ₂ follow-up
	Enrolment	Allocation	Post-allocation		
			t ₀ baseline	t ₁ post intervention	
Enrolment					
Eligibility assessment	X				
School enrolment	X				
Allocation		X			
Informed consent			X		
IATIP implementation					
Assessment					
<i>Primary outcome</i>					
Feasibility: recruitment and attrition rates	X				X
Feasibility: fidelity of delivery				X	
Feasibility: acceptability				X	
<i>Secondary outcomes</i>					
Intention to use tobacco			X		X
Knowledge, attitudes & beliefs about tobacco & health			X		X
Tobacco use status			X		X
Motivation to quit			X		X
Skills ^a for a healthy lifestyle			X		X
Self-rated health status			X		X
Mental wellbeing (SWEMWBS)			X		X
Stress (PSS)			X		X
Anxiety (GAD-7)			X		X
Depression (PHQ-9)			X		X
Process evaluation					X

Note: ^a assertiveness, decision-making skill, problem-solving skill, refusal skill, and self-esteem.

IATIP Intervention for Adolescent Tobacco Initiation Prevention; SWEMWBS Short Warwick–Edinburgh Mental Well-being Scale; PSS Perceived Stress Scale;

GAD-7 Generalized Anxiety Disorder-7 (GAD-7); PHQ-9 Patient Health Questionnaire-9

Quality of implementation: The quality of the intervention's delivery was evaluated by presenting the average score of facilitator performance, as rated by participants, using a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely). Participants were asked, "How would you rate the quality of the sessions' delivery by facilitator?".

Acceptability: To evaluate the acceptability of the intervention, participants' perceptions of the intervention's relevance, and appropriateness was explored. The participants were asked a 5-point Likert scale question: "To what extent do you feel the study sessions met your expectations?", with response options ranging from 1 (not at all) to 5 (completely). They were also asked, "To what extent do you think the components were relevant to preventing tobacco initiation and promoting health and well-being?" and "To what extent do you think the images and videos presented in the sessions were appropriate and relevant to the contents?" with the same measures. The clarity and comprehensibility of the intervention materials, such as handbooks and presentations, were rated on a 5-point Likert scale from 1 (not at all) to 5 (extremely). Finally, participants' engagement during the intervention sessions was assessed using a 5-point Likert scale question: "How engaged did you feel during the taught and interactive sessions?" Response options ranging from 1 (not at all) to 5 (extremely), with higher scores indicating greater engagement during the sessions.

The assessment of feasibility was supplemented by a qualitative process evaluation. Qualitative data were analysed to identify key themes and participant perspectives regarding the IATIP trial.

6.2.6.2 Secondary outcome measures

Change in intention to initiate tobacco use: To assess the change in intention to initiate tobacco use, a two-item scale was used: (i) "if someone (cousin/friend/close relative) offers you a tobacco product, would you use it?" and (ii) "at any time during the next 12 months, do you think you will use any form of tobacco?". Each item employed a 4-point Likert response format (0 =

“Definitely not” to 3 = “Definitely yes”), yielding a total combined score range of 0–6. Lower scores indicating a lower likelihood of intending to initiate tobacco. The potential effect of the intervention was determined by changes in scores between baseline and follow-up.

Health and well-being: Health and wellbeing were assessed using following validated scales. To assess physical health state, students were rated their overall physical health on a 5-point scale, with higher scores indicating better health. Mental well-being was measured using the Short Warwick–Edinburgh Mental Well-being Scale, with scores ranging from 7 to 35 ^{292 293}. Perceived stress was evaluated using the 10-item Perceived Stress Scale ²⁹⁴. This widely recognised scale assesses the extent to which individuals perceive situations in their lives as stressful. Students’ anxiety was assessed using the Generalized Anxiety Disorder-7 scale, a 7-item 4-point Likert scale, with scores ranging from 0 to 21 ¹⁹⁰. The Patient Health Questionnaire-9 scale, a 9-item 4-point Likert scale, with scores ranging from 0 to 27 was used to assess depression ²⁹⁵. These scales, chosen for their validity and reliability, offered a comprehensive evaluation of adolescents’ mental health and well-being, encompassing positive aspects, perceived stress, anxiety, and depressive symptoms. The structured responses provided by students were contributed valuable data for understanding the effect of the IATIP on mental health outcomes. It is important to note that a response of “3” to question 9 of the PHQ-9 questionnaire was treated as highly sensitive data, as it indicates self-harm/suicidal risk. For any such case, I followed the suicide & self-harm risk protocol, detailed in Appendix 3.9, to manage these cases.

Knowledge about tobacco and health: Students’ knowledge about tobacco harm and health effects was assessed using 20 items adapted from a previous study ²⁹⁶. A student earned 1 point for each correct response, with a maximum score of 20. A higher score indicates greater knowledge related to tobacco harm and disease.

Attitudes toward tobacco and health: Students’ attitudes toward tobacco and health were measured using a 16-item standardised scale adapted from a

previous study conducted in China ²⁹⁶. Responses were rated on a 5-point scale, with scores ranging from 16 to 80, and higher scores reflecting stronger attitudes against tobacco use. For positive attitude items, responses of “extremely agree” to “extremely disagree” were scored as 5 to 1, whereas for negative attitude items, the scoring were reversed as 1 to 5 points.

Beliefs about tobacco and health: Students’ beliefs about tobacco use were assessed using an 8-item 4-point scale adapted from the EU-Dap questionnaire ^{297 298}. This scale focused on both positive (4 items) and negative (4 items) beliefs concerning various aspects of tobacco use. Positive beliefs included feeling relaxed, having fun, being popular, and being confident and outgoing. Negative beliefs encompassed issues with parents and friends, financial problems, and the risk of addiction. The overall score of this scale ranged from 8 to 32. A higher score indicates a greater level of risk for tobacco use.

Skills for a tobacco-free healthy lifestyle: To comprehensively assess various skills contributing to a tobacco-free healthy lifestyle, multiple dimensions were evaluated through distinct Likert-type scales. The scales used for assessing 'decision-making skills,' 'refusal skills,' 'self-esteem,' 'poor problem-solving skills,' and 'assertiveness' were adapted from the EU-Dap questionnaire ²⁹⁷. The EU-Dap questionnaire is a validated instrument in the field, provided a comprehensive framework for evaluating various skills relevant to tobacco prevention among adolescents.

‘Decision-Making Skills’ were assessed through five statements reflecting different decision-making approaches, rated on a 4-point Likert scale (1 = strongly agree to 4 = strongly disagree). Of the items, three were positive items, with response for these items being reversed, and added to the two negative items. The total decision-making skills score, ranging from 5 to 25, was calculated by summing the scores across all items. Higher scores indicate better decision-making skills.

‘Refusal Skills’ were assessed using three hypothetical scenarios. Participants were asked to rate their likelihood of refusing tobacco in each scenario on a 4-

point Likert scale (1 = very likely to 4 = very unlikely). The total refusal skills score, ranging from 3 to 12, was calculated by summing the scores across all scenarios. Higher scores indicate greater refusal skills and, consequently, a lower perceived risk of tobacco use.

'Self-esteem' was assessed using a 4-point Likert scale (1 = strongly agree to 4 = strongly disagree) on ten self-descriptive statements. Of these, five items were positive, with responses being reversed and added to the negative self-esteem items. The total self-esteem score, ranging from 10 to 40, was calculated by summing the scores across all items. Higher scores indicate higher levels of self-esteem.

'Problem-solving' skills were assessed using five statements related to interpersonal dealings, each rated on a 4-point Likert scale (1 = strongly agree to 4 = strongly disagree). The total problem-solving skills score, ranging from 5 to 20, was calculated by summing the scores across all items. Higher scores indicate better problem-solving skills.

'Assertiveness' was assessed by considering the ease or difficulty students perceived in accomplishing six hypothetical scenarios. Participants rated their perceived difficulty on a 4-point Likert scale (1 = very easy to 4 = very difficult). The responses for each scenario were reverse-scored, and the total assertiveness score, ranging from 6 to 24, was calculated by summing the scores across all scenarios. Higher scores indicate greater assertiveness.

Cost measures: All direct costs associated with the intervention delivery were recorded to provide a comprehensive understanding of resource use. These included costs for materials purchased, researcher and field staff time, and logistical expenses during the implementation.

6.2.6.3 Covariates

Socio-demographic information: Socio-demographic information was collected from all participating students through both open-ended and close-

ended questions, including their age, sex, religion, weekly pocket money expenditure, place of living (e.g., hostel, rented house with parents, owned property with parents, and others), and family background (including paternal and maternal education levels). See the full questionnaire in the Appendix 6.1.

Tobacco use behaviours: Tobacco use behaviours were assessed based on the Global Youth Tobacco Survey (GYTS) methodology ¹⁸⁷. The estimates of tobacco use were derived from six questions, resulting in three measures: current user, ever user and never-user. Current users were defined as individuals who had used any tobacco product (including combustible: cigarettes, pipes, cigars, waterpipes, hookah, shisha, bidis and non-combustible: tobacco leaf, gul, zorda with pan, khaini and pan-masala) at least once in the past 30 days. This category included both daily and occasional users. Ever tobacco users were defined as individuals who had used any tobacco product at least once in their lifetime. Never-users were defined as individuals who had never used any tobacco product.

6.2.7 Analysis

All analyses were conducted in STATA version 18.5. Alpha was set to 0.05% and 95% CI is reported.

6.2.7.1 Analysis for primary outcomes: Feasibility of the IATIP trial

Recruitment and attrition rates: Frequency and percentage were used to present recruitment and attritions data. Attrition rates were examined by clusters, and comparisons were made between participants who completed follow-up assessments and those who were lost to follow-up.

Practicality: Descriptive statistics was used to assess the practicality of the IATIP trial. The duration of each IATIP session was reported as mean and standard deviation for each cluster. Analysis of variance (ANOVA) was conducted to determine if there were significant variations in session duration across clusters. The attendance of the participants was reported in percentage

and chi-squared test was performed to check the statistical difference within clusters. Students' participation in a separate feasibility assessment was reported in percentage.

Fidelity: Fidelity data was summarised descriptively first, and then comparative statistical analysis was performed to see whether any significant variation was there across clusters. Fidelity scores were calculated for each component, with the total fidelity score being the sum of all item scores for each session. These scores were reported as means and standard deviations overall and by cluster to provide an overview of how closely the intervention was implemented as intended.

During analysis, data from the intervention operator logs were merged with the observer logs, as both used the same assessment structure. Where discrepancies occurred between these two sources, the observer's rating was treated as the gold standard. This decision was made because the observers were independent and trained individuals who were not involved in the delivery of the intervention and thus were less prone to bias compared to delivery staff. Their assessments were therefore considered to offer the most objective fidelity ratings. These merged scores were used as the final implementation fidelity measure. Fidelity data from student self-reports were analysed separately to assess perceived fidelity from the participant perspective.

Quality of the implementation: Mean facilitator performance scores were calculated for each cluster, along with their standard deviations. One-way ANOVA was conducted to determine if there were significant differences in mean facilitator performance scores across clusters. A linear mixed-effects model, accounting for clustering effects, was employed to examine the association between fidelity to the intervention and the quality of session delivery as rated by participants. This analysis aimed to determine if higher fidelity to the intervention was associated with higher ratings of session quality. Before conducting the regression analysis, assumptions of normality and homoscedasticity of the total quality score were checked. If these assumptions were violated, a log-transformation of the total quality score was applied.

Acceptability: The frequencies and percentages of student agreement with statements regarding general acceptability, content acceptability, usefulness, and other relevant aspects were described. Chi-square tests were performed to examine for statistically significant differences in agreement levels across clusters.

Qualitative part: Additionally, the assessment of feasibility was supplemented by analysing relevant qualitative data from the process evaluation. The Framework Method was used for this qualitative analysis. All data were initially translated from Bangla to English by bilingual team members to ensure accurate and culturally relevant interpretation. A back-and-forth validation process was employed to ensure translation accuracy. An initial coding structure was developed inductively from the data itself, allowing themes to emerge naturally. These codes were then grouped into categories to form a working analytical framework. Subsequent transcripts were indexed using this framework. Finally, the data were interpreted to understand the implementation, facilitation, and participant experiences of the IATIP trial.

6.2.7.2 Analysis for secondary outcomes

Baseline characteristics were summarised for the entire sample and stratified by group (experimental versus control). Categorical variables were presented as frequency and percentages, while continuous were summarised using means and standard deviations, or medians and interquartile ranges (IQR) for skewed data. For ordinal variables, medians and IQR were reported. Multilevel models were employed to assess differences in baseline characteristics between groups, accounting for the clustering of participants in schools. Given that this was a C-RCT, it was crucial to examine baseline differences between groups, as randomisation occurred at the cluster level rather than the individual level. For numeric outcomes, multilevel linear regression was used, for binary outcomes multilevel logistic regression was used and for ordinal outcomes multilevel ordinal logistic regression was used.

Differences between groups at follow-up were evaluated using Multilevel models. Multilevel logistic regression was applied for binary outcomes, incorporating group assignment as a fixed effect and accounting for participant-level clustering with random intercepts. Multilevel Ordinal logistic regression models were used for ordinal outcomes and Multilevel Linear regression was used for numeric outcomes. Both had a similar hierarchical structure as the Multilevel logistic regression. For each outcome, both complete-case analyses and ITT analysis with last observation carried forward were reported. All models also adjusted for the baseline measure of the dependent variable using a fixed effect. For multilevel linear regression, residuals and fitted values were examined to assess the assumption of normality and homoscedasticity. If violated, log-transformations were applied and the assumptions re-tested. For the multilevel ordinal logistic regression, the assumption of proportional odds was checked using the Brant test. If the assumption was violated, adjacent categories were collapsed to address the issue. If the violation persisted, the outcome was converted to a binary variable for further analysis. Alpha set to 0.05.

6.2.8 Ethical approval

Ethical approval for this trial was obtained from the institutional review board, the 'Biosafety, Biosecurity & Ethical Committee' of Jahangirnagar University, Dhaka, Bangladesh (Ref No: BBEC,JU/M 2024/ 02 (82)), ensuring research and ethical permission within the host country. International ethics approval was also obtained from University College London, with the UCL Research Ethics Committee Approval ID Number 22645/004. See Appendix 6.2 for the approved ethics certificates.

This pilot trial adhered to the highest ethical standards and governance practices to safeguard the rights, safety, and well-being of all participants. Participants and their parents/guardians received clear information regarding the nature, purpose, and procedures of the trial. Both parental and participant information sheets (Appendix 6.3 and Appendix 6.4) and consent forms

(Appendix 6.5 and Appendix 6.6) were distributed in hard copy, emphasising the voluntary nature of participation and the right to withdraw at any time. While parental consent was obtained, written consent was also obtained from each participating student prior to the baseline assessment. Confidentiality and privacy were strictly maintained through the anonymisation and secure storage of participant data.

6.2.9 Availability of data and material

The anonymised dataset and STATA code used for data analysis will be made available upon reasonable request from the corresponding author following the publication of this trial in a peer-reviewed journal.

6.3 Results

6.3.1 Participants characteristics

1396 participants from eight schools in Dhaka, Bangladesh were recruited for this trial between 1st April and 2nd May 2024. Baseline data was collected between 5th May and 30th May 2024, and follow-up data was collected between 9th June and 1st July 2024.

A total of 1,374 participants were included in the baseline analysis, with 50.2% (n=689) in the experimental group and 49.9% (n=685) in the control group. Participants were predominantly from Year 8 (51.5%, n=708) and aged 12–14 years (60.9%, n=837), with a nearly equal distribution of males (54.7%, n=751) and females (45.3%, n=623). The majority were Muslim (91.3%, n= 1255), had 1–2 siblings (67.5%, n= 927), and their parents mostly had university-level education (55.2% of mothers, 69.9% of fathers). Most participants lived in hostel/rented homes (68.8, n=945) and had low monthly pocket money expenditures (56.2%, n=772). Connections with smokers and smokeless tobacco users were noted in 61.5% (n= 845) and 43.0% (n= 591) of participants, respectively. The baseline characteristics were well-balanced across most variables, indicating no significant differences between the intervention and control groups (Table 6.2).

Table 6.2: Baseline characteristics of participants

Variable	Total (N=1374)		Group			
	%	N	Experimental (N=689)		Control (N=685)	
			%	N	%	N
School grade/year						
Year 8	51.5	708	49.5	341	53.6	367
Year 9	48.5	666	50.5	348	46.4	318
Age groups						
12-14 yrs	60.9	837	59.4	409	62.5	428
15-18 yrs	39.1	537	40.6	280	37.5	257
Sex						
Female	45.3	623	39.5	272	51.2	351
Male	54.7	751	60.5	417	48.8	334
Religion						
Muslim	91.3	1255	91.4	630	91.2	625
Other	8.7	119	8.6	59	8.8	60
Number of siblings						
None	0.8	11	0.7	5	0.9	6
1-2	67.5	927	67.5	465	67.4	462
≥ 3	31.7	436	31.8	219	31.7	217
Highest level of education of the mother						
No formal education/	44.8	615	46.3	319	43.2	296
School level (up to year 12)						
University level (undergrad and above)	55.2	759	53.7	370	56.8	389
Highest level of education of the father						
No formal education/	30.1	413	31.6	218	28.5	195
School level (up to year 12)						
University level (undergrad and above)	69.9	961	68.4	471	71.5	490
Living accommodation						
Hostel/Rented house with parents/Others	68.8	945	67.9	468	69.6	477
Owned house with parents	31.2	429	32.1	221	30.4	208
Monthly pocket money expenditure ^c						
Low (≤ 860 taka)	56.2	772	56.7	391	55.6	381
High (> 860 taka)	43.8	602	43.3	298	44.4	304
Connected with smokers						
<i>None/Don't know</i>						
No	61.5	845	64.9	447	58.1	398
Yes	38.5	529	35.1	242	41.9	287
<i>Family in household</i>						
No	82.4	1132	81.7	563	83.1	569

Yes	17.6	242	18.3	126	16.9	116
<i>Family not in household</i>						
No	64.8	890	64.2	442	65.4	448
Yes	35.2	484	35.8	247	34.6	237
<i>Friends</i>						
No	80.1	1101	83.0	572	77.2	529
Yes	19.9	273	17.0	117	22.8	156
<i>School teachers</i>						
No	90.3	1241	89.3	615	91.4	626
Yes	9.7	133	10.7	74	8.6	59
Connected with smokeless tobacco users						
<i>None/Don't know</i>						
No	43.0	591	46.6	321	39.4	270
Yes	57.0	783	53.4	368	60.6	415
<i>Family in household</i>						
No	90.6	1245	90.4	623	90.8	622
Yes	9.4	129	9.6	66	9.2	63
<i>Family not in household</i>						
No	75.9	1043	76.6	528	75.2	515
Yes	24.1	331	23.4	161	24.8	170
<i>Friends</i>						
No	94.2	1295	94.0	648	94.4	647
Yes	5.8	79	6.0	41	5.6	38
<i>School teachers</i>						
No	96.6	1328	96.2	663	97.1	665
Yes	3.4	46	3.8	26	2.9	20

^a Adjusted for clustering.

^b Ordinal Generalized Linear Mixed Model (GLMM) was used for ordinal categorical variables, while logistic GLMM was applied for other types of variables.

^c The categorisation is based on median value.

6.3.2 Outcomes

6.3.2.1 Primary outcome: Feasibility assessment

6.3.2.1.1 Recruitment and attrition rates

Out of 1,580 eligible students, 1,396 provided consent to participate, resulting in a recruitment rate of 88.4%. At baseline, 1,378 students completed the survey, with 4 students subsequently withdrawing, leaving 1,374 participants (689 in experimental group and 685 in control group). At follow-up, 1,326 students (669 in experimental group and 657 in control group) completed the survey, yielding an attrition rate of 3.5% (Figure 6.2).

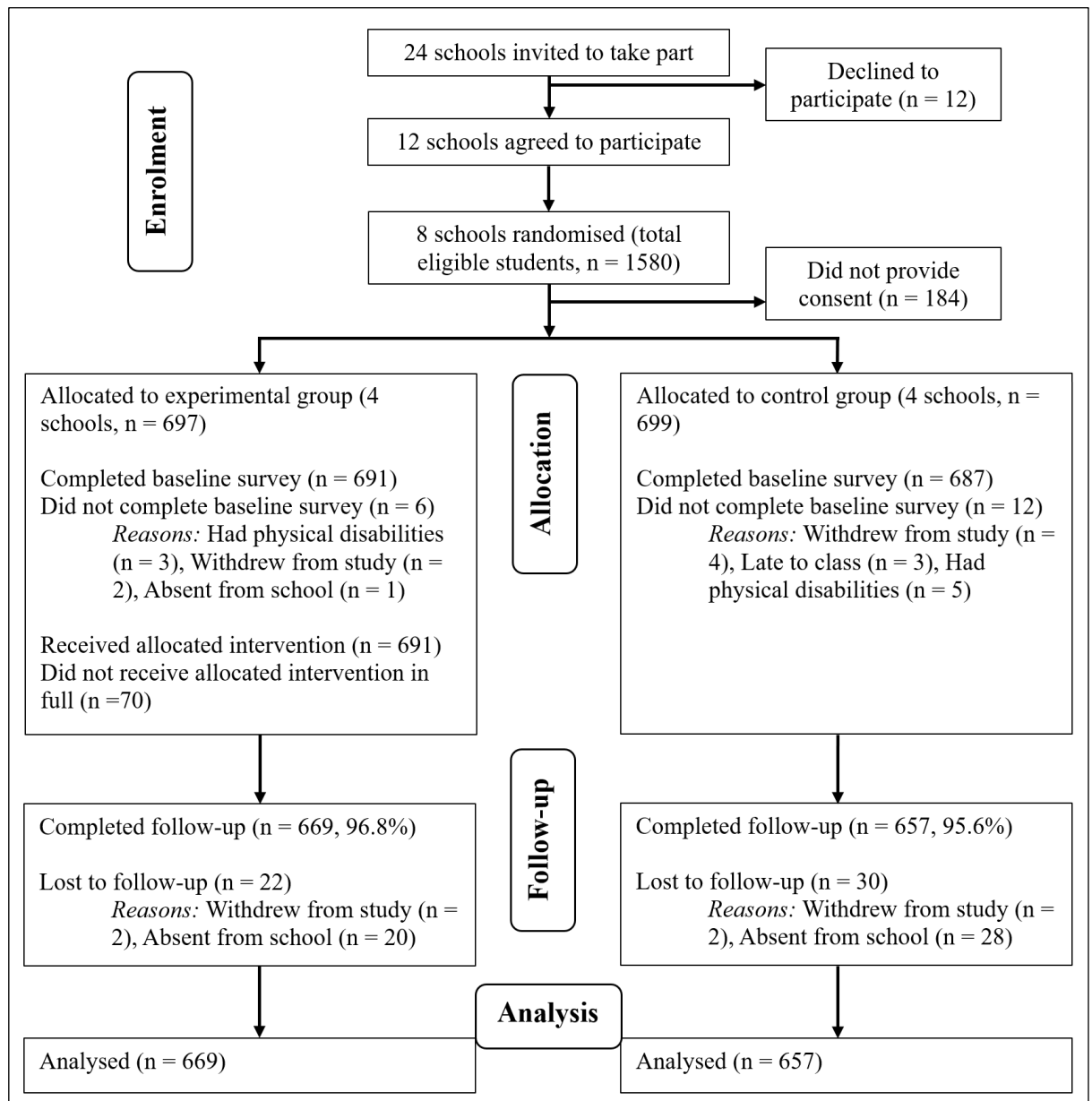


Figure 6.2: Consort diagram showing participant flow throughout the IATIP trial

6.3.2.1.2 Practicality

A total of 42 sessions in 4 experimental schools were conducted in this pilot study. The average duration of IATIP sessions varied across clusters (Table 6.3). For Session 1, the mean duration was 50.64 minutes (SD = 5.43), with significant differences observed between clusters ($F = 7.05$, $p = 0.008$). Session 2 had a mean duration of 48.14 minutes (SD = 6.02), and no significant

differences were observed between clusters. Session 3 had a mean duration of 52.36 minutes (SD = 8.17), with significant differences between clusters.

In terms of the attendance of students in the intervention sessions, 96.08% (n = 662) completed both Session 1 and Session 2, and 96.52% (n = 665) completed Session 3. Overall, 89.84% (n = 619) completed all three sessions, while 9.0% (n = 62) completed only two sessions, and 1.16% (n = 8) completed only one session. There was no statistically significant difference in session attendance within clusters.

Table 6.3: Average duration of IATIP sessions, quality of the sessions' delivery, and fidelity scores, by intervention clusters

Variables	Cluster # 1 ^a	Cluster # 2 ^b	Cluster # 3 ^a	Cluster # 4 ^a	Total	Significant differences
Duration of sessions in minutes						
Session 1 ($\bar{x} \pm \sigma$)	50.50 (2.89)	57.50 (3.54)	44.75 (3.59)	53.25 (3.95)	50.64 (5.43)	F = 7.05, p = 0.008
Session 2 ($\bar{x} \pm \sigma$)	52.0 (8.29)	46.50 (2.12)	43.50 (4.43)	49.75 (3.69)	48.14 (6.02)	F = 1.73, p = 0.2229
Session 3 ($\bar{x} \pm \sigma$)	49.25 (5.56)	60.0 (0.0)	45.25 (3.40)	58.75 (8.54)	52.36 (8.17)	F = 5.02, p = 0.022
Fidelity scores by observer						
Session 1 ($\bar{x} \pm \sigma$)	12.0 (0.0)	12.0 (0.0)	11.0 (0.0)	12.0 (0.0)	11.71 (0.47)	Non-estimated
Session 2 ($\bar{x} \pm \sigma$)	12.0 (0.0)	11.0 (0.0)	10.75 (1.26)	12.0 (0.0)	11.5 (0.85)	F = 3.33, p = 0.065
Session 3 ($\bar{x} \pm \sigma$)	18.0 (0.0)	18.0 (0.0)	16.0 (0.0)	17.5 (0.58)	17.29 (0.91)	F = 32.86, p = <0.001
Total fidelity score	42.0 (0.0)	41.0 (0.0)	37.75 (1.26)	41.50 (0.58)	40.50 (1.95)	F = 25.36, p = <0.001
Fidelity scores by students						
Session 1 ($\bar{x} \pm \sigma$)	11.48 (0.96)	11.65 (0.69)	11.46 (1.28)	11.27 (1.12)	11.41 (1.08)	F = 2.08, p = 0.102
Session 2 ($\bar{x} \pm \sigma$)	11.31 (1.04)	11.35 (1.38)	11.28 (1.39)	11.22 (1.31)	11.27 (1.27)	F = 0.18, p = 0.907
Session 3 ($\bar{x} \pm \sigma$)	17.15 (1.56)	17.67 (1.12)	17.04 (1.73)	16.88 (1.76)	17.08 (1.65)	F = 3.05, p = 0.029

Total fidelity score	39.95 (3.23)	40.67 (2.81)	39.78 (3.86)	39.37 (3.65)	39.76 (3.52)	F = 1.92, p = 0.126
Quality of the sessions' delivery [#]	4.85 (0.39)	4.82 (0.44)	4.83 (0.41)	4.74 (0.47)	4.80 (0.43)	F = 1.66, p = 0.175

$\bar{x}$ = Mean; σ = Standard deviation

^a cluster had 4 groups – 2 from year 8 & 2 from year 9.

^b cluster had 2 groups – 1 from year 8 & 1 from year 9.

[#] The quality of the sessions' delivery was assessed using a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely good). A total of 430 students responded to this question.

Among the experimental group students, 62.41% (n = 430) participated in a separate feasibility assessment after the final session of the IATIP trial. Based on their responses, the fidelity, quality of implementation, and acceptability of the IATIP were assessed. Of these students, 11.16% (n = 48) reported that they had challenges in attending the sessions. These challenges were further explored during the process evaluation and can be found in Table 6.6.

6.3.2.1.3 Fidelity

Fidelity scores, as reported by observers, were high across all sessions (Table 6.3). For Session 1, the mean score was 11.71 (SD = 0.47). Session 2 had a mean score of 11.5 (SD = 0.85), with no significant differences between clusters (F = 3.33, p = 0.065). Session 3 had a mean score of 17.29 (SD = 0.91), with significant differences between clusters (F = 32.86, p < 0.001). The total fidelity score was 40.50 (SD = 1.95), with significant differences between clusters (F = 25.36, p < 0.001). Fidelity scores reported by students were also high. For Session 1, the mean score was 11.41 (SD = 1.08), with no significant differences between clusters (F = 2.08, p = 0.102). Session 2 had a mean score of 11.27 (SD = 1.27), with no significant differences between clusters (F = 0.18, p = 0.907). Session 3 had a mean score of 17.08 (SD = 1.65), with significant differences between clusters (F = 3.05, p = 0.029). The total fidelity score was 39.76 (SD = 3.52), with no significant differences between clusters (F = 1.92, p = 0.126).

Furthermore, the fidelity to IATIP components was generally high, as reported by both observers and students. Observers noted 100% full implementation for most of the key components across all sessions (Appendix 6.7). In Session 1, components such as “tobacco toxicity and addiction information”, “discuss nicotine and nicotine dependence”, and “discuss health effects of tobacco use” were fully implemented in 100% of sessions. However, “religious views on tobacco use” had a lower full implementation rate of 71.43%. In Session 2, components such as “3C’s of decision making” and “problem-solving skills” were fully implemented in 100% of sessions, while “explain why people use tobacco” had a full implementation rate of 85.71%. In Session 3, components like “expression of negative feelings”, “dealing with stress, depression, and anxiety”, “deep breathing exercise”, “goal setting”, and “personal pledge” were fully implemented in 100% of sessions, but “identify everyday life stressors” had a lower full implementation rate of 71.43%. Students’ reports were consistent, with high full implementation rates for most components, such as 94.65% for “discuss nicotine and nicotine dependence” and 92.56% for “religious views on tobacco use.” Notably, “interactive activity on tobacco toxicity and addiction” and “discuss health effects of tobacco use” had lower full implementation rates of 81.63% and 80.47%, respectively. Overall, fidelity to IATIP components was very high (80% to 96% fully implemented) according to the students. These findings indicate strong adherence to the intervention protocol, with some variation in specific activities.

6.3.2.1.4 Quality of implementation

The quality of session delivery, assessed on a 5-point Likert scale, showed high ratings across clusters, with a mean score of 4.80 (SD = 0.43) (Table 6.3). No significant differences were found between clusters ($F = 1.66$, $p = 0.175$). The cluster adjusted mixed-effects regression model predicting session delivery quality ratings indicated that higher IATIP content fidelity scores were significantly associated with higher quality ratings ($\beta = 0.36$, 95% CI: 0.28 – 0.45, $p < 0.001$) (Table 6.4).

Table 6.4: Results of the mixed-effects regression model predicting session delivery quality ratings[®]

Predictor ^a	β (SE)	95% CI	z-value	p-value
IATIP contents fidelity scores	0.36 (0.04)	0.28 – 0.45	8.41	<0.001
Intercept	0.23 (0.16)	-0.08 – 0.54	1.43	0.154

β = Beta coefficient; SE = Standard error; CI = Confidence interval

[®] The assumptions of normality and homoscedasticity were violated; therefore, a log-transformation of the outcome variable (session delivery quality ratings) was applied.

^a Analysis is based on the Linear Mixed-Effects Model (LMEM), adjusted for clustering.

6.3.2.1.5 Acceptability

The acceptability of the IATIP was high. General acceptability was rated highly (“quite a bit to completely”) by 94.65% of students, with no significant differences between clusters ($\chi^2 = 5.14$, $p = 0.170$) (Table 6.5). Taught content acceptability was rated as “quite a bit to completely” by 97.67% of students, with no significant differences between clusters ($\chi^2 = 1.52$, $p = 0.855$). Interactive content acceptability was rated as “quite a bit to completely” by 95.58% of students, with no significant differences between clusters ($\chi^2 = 2.27$, $p = 0.522$). Clarity and comprehensibility of study materials were rated as “very to extremely” by 94.88% of students, with no significant differences between clusters ($\chi^2 = 7.60$, $p = 0.082$). Usefulness was rated as “very to extremely” by 94.19% of students, with no significant differences between clusters ($\chi^2 = 6.71$, $p = 0.082$). Participant engagement was rated as “very to extremely” by 90.93% of students, with significant differences between clusters ($\chi^2 = 8.50$, $p = 0.044$). Overall satisfaction was rated as “satisfied to very satisfied” by 96.98% of students, with no significant differences between clusters ($\chi^2 = 3.40$, $p = 0.312$).

Table 6.5: Acceptability of the IATIP by students (N=430)

Variables	Cluster # 1 ^a	Cluster # 2 ^b	Cluster # 3 ^a	Cluster # 4 ^a	Total	Significant differences
General acceptability [‡]						
Not at all to moderately, % (n)	2.73 (3)	6.12 (3)	3.06 (3)	8.09 (14)	5.35 (23)	χ^2 -value = 5.14, p-value = 0.170
Quite a bit to completely, % (n)	97.27 (107)	93.88 (46)	96.94 (95)	91.91 (159)	94.65 (407)	
Taught content acceptability [‡]						
Not at all to moderately, % (n)	2.73 (3)	0	2.04 (2)	2.89 (5)	2.33 (10)	χ^2 -value = 1.52, p-value = 0.855
Quite a bit to completely, % (n)	97.27 (107)	100.00 (49)	97.96 (96)	97.11 (168)	97.67 (420)	
Interactive content acceptability [‡]						
Not at all to moderately, % (n)	2.73 (3)	6.12 (3)	3.06 (3)	5.78 (10)	4.42 (19)	χ^2 -value = 2.27, p-value = 0.522
Quite a bit to completely, % (n)	97.27 (107)	93.88 (46)	96.94 (95)	94.22 (163)	95.58 (411)	
Clarity and comprehensibility of study materials [†]						
Not at all to moderately, % (n)	2.73 (3)	2.04 (1)	3.06 (3)	8.67 (15)	5.12 (22)	χ^2 -value = 7.60, p-value = 0.082
Very to extremely, % (n)	97.27 (107)	97.96 (48)	96.94 (95)	91.33 (158)	94.88 (408)	
Usefulness [†]						
Not at all to moderately, % (n)	0.91 (1)	8.16 (4)	8.16 (8)	6.94 (12)	5.81 (25)	χ^2 -value = 6.71, p-

Very to extremely, % (n)	99.09 (109)	91.84 (45)	91.84 (90)	93.06 (161)	94.19 (405)	value = 0.082
Participant engagement †						
Not at all to moderately, % (n)	5.45 (6)	8.16 (4)	5.10 (5)	13.87 (24)	9.07 (39)	χ^2 -value = 8.50, p-value = 0.044
Very to extremely, % (n)	94.55 (104)	91.84 (45)	94.90 (93)	86.13 (149)	90.93 (391)	
Overall satisfaction‡						
Very dissatisfied to neutral, % (n)	0.91 (1)	2.04 (1)	5.10 (5)	3.47 (6)	3.02 (13)	χ^2 -value = 3.40, p-value = 0.312
Satisfied to very satisfied, % (n)	99.09 (109)	97.96 (48)	94.90 (93)	96.53 (167)	96.98 (417)	

^a cluster had 4 groups – 2 from year 8 & 2 from year 9.

^b cluster had 2 groups – 1 from year 8 & 1 from year 9.

‡ General acceptability/ Taught content acceptability/ Interactive content acceptability was assessed using a 5-point Likert scale ranging from 1 (not at all) to 5 (completely).

† The clarity and comprehensibility of study materials/ Usefulness/ Participant engagement was assessed using a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely).

‡ The overall satisfaction was assessed using a 5-point Likert scale ranging from 1 (very dissatisfied) to 5 (very satisfied).

6.3.2.1.6 Qualitative process evaluation

The qualitative process evaluation provided additional insights into the feasibility of the IATIP trial. Key themes identified included attendance challenges and factors influencing engagement.

Attendance challenges

Some students reported difficulties in attending sessions due to weather-related issues, illness, and family constraints (Table 6.6). For example, one participant noted, “One of the sessions I could not attend due to bad weather. Completely natural reason. It rained heavily on that day” (Male participant, School year 9). Another mentioned, “I missed the session because I was sick” (Female

participant, School year 8), and a third stated, “I couldn’t come to school that day due to family issues” (Female participant, School year 9).

Table 6.6: Key themes and participant perspectives of the IATIP trial

Theme	Sub-theme	Representative quotes
Attendance challenges	Weather-related issues	“One of the sessions I could not attend due to bad weather. Completely natural reason. It rained heavily on that day.” – Male participant, School year 9
	Illness and health concerns	“I missed the session because I was sick”. – Female participant, School year 8
	Family constraints	“I couldn’t come to school that day due to family issues.” – Female participant, School year 9 “...the techniques to manage stress, depression, and anxiety were very helpful for us.” – Male participant, School year 8
Positive engagement factors	Relevance of content	“Many members of my family were smokers, and after participating actively in these sessions, I was able to share the information I learned with them. This has encouraged some of them to think about quitting smoking.” – Female participant, School year 8
	Skill development	“...The ability to confidently decline offers of tobacco is important. These sessions helped us build that confidence...” – Female participant, School year 9
	Interactive design	“The opportunity for reflection and application made the sessions impactful, as it allowed us to explore new ideas and think critically about tobacco health risks.” – Male participant, School year 8
Negative engagement factors	Initial reluctance	“... and I was reluctant to fully engage at first but became more interested as the session progressed.” – Female participant, School year 9
	External distractions	“External factors like noise disrupted the session at times.” – Male participant, School year 9

Positive engagement factors

Students highlighted the relevance of the content, skill development, and the interactive design of the sessions as key factors that enhanced their engagement. One participant remarked, “[...] the techniques to manage stress, depression, and anxiety were very helpful for us” (Male participant, School year 8). Another shared, “Many members of my family were smokers, and after participating actively in these sessions, I was able to share the information I learned with them. This has encouraged some of them to think about quitting smoking” (Female participant, School year 8).

Negative engagement factors

Initial reluctance and external distractions were noted as factors that negatively impacted engagement (Table 6.6). A participant mentioned, “[...] and I was reluctant to fully engage at first but became more interested as the session progressed” (Female participant, School year 9). Another noted, “External factors like noise disrupted the session at times” (Male participant, School year 9).

6.3.2.2 Secondary outcomes

6.3.2.2.1 Baseline outcome characteristics

Baseline tobacco use and second-hand smoke (SHS) exposure were similar between the experimental (N=689) and control (N=685) groups, with no significant differences observed (See Table 6.7). Most participants had never used tobacco (74.8%, n=1028), including smoked (82.5%, n=1133) and smokeless forms (82.8%, n=1138). Current use of any tobacco was low (9.1%, n=125), with slightly fewer reporting current smoked (6.4%, n=88) and smokeless (4.4%, n=60) tobacco use. SHS exposure was prevalent, mainly in indoor public places (78.8%, n=1083) or outdoor public places (77.2%, n=1061), while only 15.1% (n=207) reported SHS exposure at home.

The baseline outcome characteristics were also similar between the experimental and control groups, with no statistically significant differences observed (see Table 6.8). Median scores for skewed variables, such as intention to use tobacco (0, IQR=2), attitudes (70, IQR=13), beliefs (14, IQR=8),

refusal skills (12, IQR=0), physical health (4, IQR=1), anxiety (6, IQR=7), and depression (7, IQR=10), were identical across groups. Mean scores for continuous variables like knowledge of tobacco health effects (5.7, SD=2.8), self-esteem (27.3, SD=4.4), and mental well-being (24.3, SD=5) were also comparable. Skills such as decision-making (13.8–14.1), problem-solving (12.9–13.1), and assertiveness (16.7–16.8) showed minimal variation.

Table 6.7: Baseline tobacco use and exposure to second-hand smoke characteristics of participants

Variable	Total (N=1374)		Group Experimental (N=689)		Control (N=685)		Differences p-value ^{a, b}
	%	N	%	N	%	N	
Ever all tobacco use							
No	74.8	1028	75.8	522	73.9	506	0.977
Yes	25.2	346	24.2	167	26.1	179	
Ever smoked tobacco use							
No	82.5	1133	83.3	574	81.6	559	0.911
Yes	17.5	241	16.7	115	18.4	126	
Ever smokeless tobacco use							
No	82.8	1138	83.3	574	82.3	564	0.924
Yes	17.2	236	16.7	115	17.7	121	
Current all tobacco use							
No	90.9	1249	92.6	638	89.2	611	0.687
Yes	9.1	125	7.4	51	10.8	74	
Current smoked tobacco use							
No	93.6	1286	94.9	654	92.3	632	0.897
Yes	6.4	88	5.1	35	7.7	53	
Current smokeless tobacco use							
No	95.6	1314	96.5	665	94.7	649	0.464
Yes	4.4	60	3.5	24	5.3	36	
Exposure to SHS at home							
No	84.9	1167	83.7	577	86.1	590	0.530
Yes	15.1	207	16.3	112	13.9	95	
Exposure to SHS in indoor public places							
No	21.2	291	20.3	140	22.0	151	0.530
Yes	78.8	1083	79.7	549	78.0	534	
Exposure to SHS in outdoor public places							

No	22.8	313	22.6	156	22.9	157	0.953
Yes	77.2	1061	77.4	533	77.1	528	

^a Adjusted for clustering.

^b Ordinal Generalized Linear Mixed Model (GLMM) was used for ordinal categorical variables, while logistic GLMM was applied for other types of variables.

Table 6.8: Baseline outcome characteristics of participants distributed as mean/median score with standard deviation/ interquartile range

Variable	Total (N=1374)		Group Experimental (N=689)		Control (N=685)		Differences p-value [#]
	Mean/ Median	SD/ IQR	Mean/ Median	SD/ IQR	Mean/ Median	SD/ IQR	
Intention to use tobacco ^{a, P}	0	2	0	2	0	1	0.655
Intention to use tobacco (Binary)							
No (% , N)	69.4%	954	70.8%	488	68.0%	466	0.518
Yes (% , N)	30.6%	420	29.2%	201	32.0%	219	
Knowledge of health effects of tobacco use	5.7	2.8	5.7	2.9	5.7	2.7	0.907
Attitudes toward tobacco and health ^{a, b}	70	13	70	11	70	14	0.914
Beliefs about tobacco and health ^{a, b}	14	8	14	7	15	8	0.566
Decision making skills	14	2.3	13.8	2.2	14.1	2.3	0.243
Refusal skills ^a	12	0	12	0	12	0	0.784
Self-esteem	27.3	4.4	27.3	4.6	27.3	4.2	0.787
Problem solving skills	13	2.5	12.9	2.4	13.1	2.7	0.397
Assertiveness	16.7	2.7	16.7	2.7	16.8	2.8	0.716
Physical health ^a	4	1	4	1	4	2	0.807
Mental well-being	24.3	5	24.02	5	24.6	5	0.439
Stress	20.8	5.02	21	5	20.7	5.04	0.193
Anxiety ^{a, b}	6	7	6	6	6	7	0.909
Depression ^{a, b}	7	10	7	9	7	10	0.324

SD = Standard deviation; IQR = Interquartile range

^a The variable is significantly skewed; therefore, the descriptive statistics are presented as the median and IQR.

[#] Violates the proportional odds assumption (Brant test p-value is 0.026).

^b Log transformation was applied to improve the normality of residuals. Consequently, a mixed-effects model was run using the log-transformed data.

[#] An ordinal Generalized Linear Mixed Model (GLMM) was used for ordinal categorical variables, a logistic GLMM was applied for binary variables, and a linear mixed-effects model was employed for continuous variables.

6.3.2.2.2 Descriptive statistics for secondary outcomes at follow-up

Table 6.9 shows the descriptive statistics for the secondary outcomes at follow-up. As the baseline intention to use tobacco variable violated the proportional odds assumption (Brant test p-value = 0.026), it was transformed into a binary variable. The intention to use tobacco was considerably lower in the experimental group (7.2%, n=48) compared to the control group (39.4%, n=259). Median scores for skewed variables differed markedly between groups: attitudes (experimental: 73, IQR = 8; control: 65, IQR = 14), beliefs (experimental: 10, IQR=4; control: 17, IQR=9), refusal skills (experimental: 12, IQR=0; control: 12, IQR=4), anxiety (experimental: 3, IQR = 5; control: 9, IQR=8), and depression (experimental: 3, IQR=5; control: 10, IQR=10). Mean scores for continuous variables also showed notable differences: knowledge of tobacco health effects (experimental: 15.02 ± 2.02 ; control: 5.6 ± 3.02), self-esteem (experimental: 32.4 ± 4.6 ; control: 26.0 ± 4.2), and mental well-being (experimental: 27.9 ± 4.0 ; control: 22.2 ± 5.1). Skills such as decision-making (experimental: 15.9 ± 2.0 ; control: 12.9 ± 2.4), problem-solving (experimental: 16.9 ± 1.9 ; control: 12.02 ± 2.8), and assertiveness (experimental: 19.6 ± 2.4 ; control: 15.8 ± 2.8) varied across groups.

Table 6.9: Descriptive statistics of dependent variables at follow-up

Variable	Total (N=1326)		Group Experimental (N=669)		Control (N=657)	
	Mean/ Median	SD/ IQR	Mean/ Median	SD/ IQR	Mean/ Median	SD/ IQR
Intention to use tobacco [¶]						
No (% , N)	76.8%	1019	92.8%	621	60.6%	398
Yes (% , N)	23.2%	307	7.2%	48	39.4%	259
Knowledge of health effects of tobacco use	10.3	5.4	15.02	2.02	5.6	3.02
Attitudes toward tobacco and health ^a	70	13	73	8	65	14
Beliefs about tobacco and health ^a	13	9	10	4	17	9
Decision making skills	14.4	2.7	15.9	2.0	12.9	2.4
Refusal skills ^a	12	0	12	0	12	4
Self-esteem	29.2	5.5	32.4	4.6	26.0	4.2
Problem solving skills	14.5	3.4	16.9	1.9	12.02	2.8
Assertiveness	17.7	3.2	19.6	2.4	15.8	2.8
Physical Health ^a	4	1	4	1	4	1
Mental well-being	25.1	5.4	27.9	4.0	22.2	5.1
Stress	20.2	4.4	18.8	3.9	21.6	4.5
Anxiety ^a	5	7	3	5	9	8
Depression ^a	6	10	3	5	10	10

[¶] As the baseline outcome variable violated the proportional odds assumption (Brant test p -value = 0.026), it was transformed into a binary variable.

^a The variable is significantly skewed; therefore, the descriptive statistics are presented as the median and interquartile range (IQR).

6.3.2.2.3 Efficacy of the IATIP trial in reducing the intention to use tobacco

The efficacy of the IATIP trial in reducing the intention to use tobacco among school adolescents in Dhaka, Bangladesh, is presented in Table 6.10. In Model 1, which is based on complete case analysis using the logistic Generalised Linear Mixed Model (GLMM), the odds ratio (OR) for the experimental group was 0.030 (95% CI: 0.02 – 0.05, $p < 0.001$). In Model 2, based on intention-to-treat (ITT) analysis using the Generalised Linear Mixed Model (GLMM) for a binary outcome, the OR for the experimental group was 0.032 (95% CI: 0.02 – 0.06, $p < 0.001$). Both models show a significant reduction in the intention to use tobacco in the experimental group compared to the control group.

Table 6.10: Efficacy of the IATIP trial in reducing the intention to use tobacco among school adolescents in Dhaka, Bangladesh [¶]

Group	Model 1 ^a			Model 2 ^a		
	OR	95% CI	p-value	OR	95% CI	p-value
Control	1.00			1.00		
Experimental	0.030	0.02 – 0.05	<0.001	0.032	0.02 – 0.06	<0.001

[¶] As the baseline outcome variable violated the proportional odds assumption (Brant test p -value = 0.026), the dependent variable was transformed into a binary variable.

Model 1 is based on complete case analysis using the logistic Generalised Linear Mixed Model (GLMM).

Model 2 is based on intention-to-treat (ITT) analysis using the Generalised Linear Mixed Model (GLMM) for a binary outcome.

OR = Odds ratio; CI = Confidence interval; ICC = Intraclass correlation coefficient

^a Adjusted for clustering, and baseline intention to use tobacco score.

6.3.2.2.4 Efficacy of the IATIP trial in promoting health and well-being

The efficacy of the IATIP trial in promoting health and well-being was significant across multiple measures (Table 6.11). Participants in the experimental group showed a notable improvement in mental well-being, with increases of 6.16 units (95% CI: 5.47–6.84) and 6.00 units (95% CI: 5.30–6.70) in Models 1 and 2, respectively. Stress levels decreased significantly by 3.03 units (95% CI: -3.66 – -2.40) in Model 1 and 2.91 units (95% CI: -3.49 – -2.32) in Model 2. Anxiety scores were reduced by 0.90 units (95% CI: -1.00 – -0.80) and 0.81 units (95% CI: -0.86 – -0.75) in Models 1 and 2, respectively. Depression scores also saw a significant decrease, with reductions of 0.98 units (95% CI: -1.04 – -0.91) in Model 1 and 0.90 units (95% CI: -0.97 – -0.84) in Model 2. Additionally, physical health improved significantly, with odds ratios of 3.48 (95% CI: 2.54 – 4.75, $p < 0.001$) in Model 1 and 3.38 (95% CI: 2.51 – 4.56, $p < 0.001$) in Model 2, indicating better overall physical health in the experimental group.

Table 6.11: Efficacy of the IATIP trial in promoting health and well-being

Variables	Group	Model 1 [#]			Model 2 [#]		
		β (SE)/OR	95% CI	p- value	β (SE)/OR	95% CI	p- value
Mental well-being ^a	Control	Ref.			0.00		
	Experimental	6.16 (0.35)	5.47 – 6.84	<0.001	6.00 (0.36)	5.30 – 6.70	<0.001
Stress ^b	Control	Ref.			0.00		
	Experimental	-3.03 (0.32)	-3.66 – 2.40	<0.001	-2.91 (0.30)	-3.49 – 2.32	<0.001
Anxiety ^{c, P}	Control	Ref.			0.00		
	Experimental	-0.90 (0.05)	-1.00 – 0.80	<0.001	-0.81 (0.03)	-0.86 – 0.75	<0.001
Depression ^{d, P}	Control	Ref.			0.00		
	Experimental	-0.98 (0.03)	-1.04 – 0.91	<0.001	-0.90 (0.03)	-0.97 – 0.84	<0.001
Physical health ^{e, *}	Control	Ref.			1.00		
	Experimental	3.48	2.54 – 4.75	<0.001	3.38	2.51 – 4.56	<0.001

β = Beta coefficient; SE = Standard error; CI = Confidence interval

Model 1 is based on complete case analysis using the Linear Mixed-Effects Model (LMEM).

Model 2 is based on intention-to-treat (ITT) analysis using the Linear Mixed-Effects Model (LMEM).

[#] Adjusted for clustering, and baseline data of the respective outcome variable.

^a Mental well-being was measured using the Short Warwick–Edinburgh Mental Well-being Scale (scores range from 7 to 35). A higher score indicates greater positive mental well-being.

^b Stress was measured using the Perceived Stress Scale-10 (PSS-10, scores range from 0 to 40). A higher score indicates greater perceived stress.

^c Anxiety was measured using the Generalised Anxiety Disorder-7 (GAD-7) scale (scores range from 0 to 21). A higher score indicates more severe anxiety.

^P The assumptions of normality and homoscedasticity was violated; therefore, a log-transformation of the outcome variable was applied.

^d Depression was measured using the Patient Health Questionnaire-9 (PHQ-9) scale (scores range from 0 to 27). A higher score indicates more severe depression.

^e Physical health was measured using a 5-point Likert scale. A higher score indicates very good overall physical health condition.

^{*} The analysis was based on the ordinal Generalised Linear Mixed Model (GLMM).

6.3.2.2.5 Efficacy of the IATIP trial in improving knowledge, attitudes and beliefs about tobacco use, and its harms and health effects

The IATIP trial demonstrated significant efficacy in improving knowledge, attitudes, and beliefs about tobacco use and the associated harms and health

effects (Table 6.12). Participants in the experimental group showed a substantial increase in knowledge, with scores compared with the control group rising by 9.44 units (95% CI: 8.83 – 10.05) in Model 1 and 9.12 units (95% CI: 8.59 – 9.65) in Model 2. Attitudes towards tobacco and health also improved significantly, with an increase of 0.12 points (95% CI: 0.08 – 0.16) in both models. Additionally, beliefs about tobacco use showed a significant reduction, with scores decreasing by 0.41 units (CI: -0.48 – -0.33) in Model 1 and 0.39 units (95% CI: -0.47 – -0.32) in Model 2. These findings indicate that the IATIP trial effectively enhanced participants' knowledge and attitudes against tobacco use, while also reducing harmful beliefs about tobacco.

Table 6.12: Efficacy of the IATIP trial in improving knowledge, attitudes and beliefs about tobacco use, and its harms and health effects

Variables	Group	Model 1 [#]			Model 2 [#]		
		β (SE)	95% CI	p- value	β (SE)	95% CI	p- value
Knowledge ^a	Control	Ref.			0.00		
	Experimental	9.44 (0.31)	8.83 – 10.05	<0.001	9.12 (0.27)	8.59 – 9.65	<0.001
Attitudes ^{b, P}	Control	Ref.			0.00		
	Experimental	0.12 (0.02)	0.08 – 0.16	<0.001	0.12 (0.02)	0.08 – 0.16	<0.001
Beliefs ^{c, P}	Control	Ref.			0.00		
	Experimental	-0.41 (0.04)	-0.48 – -0.33	<0.001	-0.39 (0.04)	-0.47 – -0.32	<0.001

β = Beta coefficient; SE = Standard error; CI = Confidence interval

Model 1 is based on complete case analysis using the Linear Mixed-Effects Model (LMEM).

Model 2 is based on intention-to-treat (ITT) analysis using the Linear Mixed-Effects Model (LMEM).

[#] Adjusted for clustering, and baseline data of the respective outcome variable.

^a Knowledge about tobacco harm and health effects was assessed using 20 items (scores range from 0 to 20). A higher score indicates greater knowledge related to tobacco harm and disease.

^b Attitudes towards tobacco and health was assessed using a 16-item 5-point scale (scores range from 16 to 80). A higher score indicates stronger attitudes against tobacco.

^P The assumptions of normality and homoscedasticity were violated; therefore, a log-transformation of the outcome variable was applied.

^c Beliefs about tobacco use was assessed using an 8-item 4-point scale (scores range from 8 to 32). A higher score indicates a greater level of risk for tobacco use.

6.3.2.2.6 Efficacy of the IATIP trial in improving skills to resist tobacco

The IATIP trial significantly improved participants' skills to resist tobacco use (Table 6.13). Decision-making skills in the experimental as compared with the control group increased by 3.23 units (95% CI: 2.76 – 3.70) in Model 1 and 3.13 units (95% CI: 2.67 – 3.59) in Model 2. Problem-solving skills also saw significant improvements, with increases of 5.02 units (95% CI: 4.48 – 5.57) in Model 1 and 4.83 units (95% CI: 4.33 – 5.33) in Model 2. Self-esteem scores rose by 6.41 units (95% CI: 5.67 – 7.15) in Model 1 and 6.21 units (95% CI: 5.46 – 6.97) in Model 2. Assertiveness skills improved by 3.84 units (95% CI: 3.47 – 4.21) in Model 1 and 3.72 units (95% CI: 3.36 – 4.08) in Model 2. Additionally, refusal skills showed a substantial increase, with odds ratios of 22.12 (95% CI: 10.86 – 45.05) in Model 1 and 19.00 (95% CI: 9.52 – 37.95) in Model 2. These results indicate that the IATIP trial effectively enhanced various skills necessary to resist tobacco use among participants.

Table 6.13: Efficacy of the IATIP trial in improving skills to resist tobacco

Variables	Group	Model 1 [#]			Model 2 [#]		
		β (SE)/O R	95% CI	p- value	β (SE)/O R	95% CI	p- value
Decision- making skills ^a	Control	Ref.			0.00		
	Experimental	3.23 (0.24)	2.76 – 3.70	<0.00 1	3.13 (0.24)	2.67 – 3.59	<0.00 1
Problem- solving skills ^b	Control	Ref.			0.00		
	Experimental	5.02 (0.28)	4.48 – 5.57	<0.00 1	4.83 (0.25)	4.33 – 5.33	<0.00 1
Self-esteem ^c	Control	Ref.			0.00		
	Experimental	6.41 (0.38)	5.67 – 7.15	<0.00 1	6.21 (0.38)	5.46 – 6.97	<0.00 1
Assertiveness ^d	Control	Ref.			0.00		
	Experimental	3.84 (0.19)	3.47 – 4.21	<0.00 1	3.72 (0.19)	3.36 – 4.08	<0.00 1
Refusal skills ^{e, *}	Control	Ref.			1.00		
	Experimental	22.12	10.8 6 – 45.0 5	<0.00 1	19.00	9.52 – 37.9 5	<0.00 1

β = Beta coefficient; SE = Standard error; CI = Confidence interval

Model 1 is based on complete case analysis using the Linear Mixed-Effects Model (LMEM).

Model 2 is based on intention-to-treat (ITT) analysis using the Linear Mixed-Effects Model (LMEM).

[#] Adjusted for clustering, and baseline data of the respective outcome variable.

^a Decision-making skills were assessed using five items, each reflecting different approaches to decision-making (scores range from 5 to 20). A higher score indicates a very good level of decision-making skills.

^b Problem solving skills were assessed using five items 4-point scale (scores range from 5 to 20). A higher score indicates a higher level of problem-solving skills.

^c Self-esteem was assessed using ten items 4-point scale (scores range from 10 to 40). A higher score indicates a higher level of self-esteem.

^d Assertiveness skills were assessed using six items 4-point scale (scores range from 6 to 24). A higher score indicates a higher level of assertiveness.

^e Refusal skills were assessed using three hypothetical scenarios, with total scores ranging from 3 to 12. A higher score indicates very good refusal skills.

^{*} The analysis was based on the ordinal Generalised Linear Mixed Model (GLMM).

6.3.2.2.7 Intraclass correlation coefficient (ICC) of outcome variables

The ICCs for the outcome variables were calculated based on both complete case analysis and intention-to-treat analysis. The ICCs for intention to use tobacco were 0.010 and 0.016, respectively, indicating minimal clustering effects for this outcome variable (Table 6.14). Other outcomes, such as mental well-being, stress, anxiety, depression, physical health, knowledge about tobacco and health, attitudes toward tobacco and health, beliefs about tobacco and health, decision-making skills, refusal skills, self-esteem, problem-solving skills, and assertiveness skills, also showed generally low ICCs. Notably, beliefs about tobacco and health had higher ICCs of 0.056 and 0.055 for complete case and intention-to-treat analyses, respectively.

Table 6.14: Intraclass correlation coefficient of outcome variables

Variables	ICC based on complete case analysis	ICC based on intention-to-treat analysis
Intention to use tobacco	0.010	0.016
Mental well-being	0.015	0.016
Stress	0.012	0.009
Anxiety	0.017	<0.001
Depression	<0.001	<0.001
Physical health	0.008	0.007
Knowledge about tobacco and health	0.040	0.021
Attitudes toward tobacco and health	0.036	0.037
Beliefs about tobacco and health	0.056	0.055
Decision making skills	0.034	0.032
Refusal skills	0.042	0.041
Self-esteem	0.018	0.019
Problem-solving skills	0.040	0.029
Assertiveness skills	0.013	0.012

6.3.2.2.8 Cost of the pilot feasibility trial of IATIP

The total direct cost of delivering the IATIP trial was £25,472.29. This amount covers all resource use, including materials (e.g., electronic devices, printing materials), staff time (e.g., researchers, field staff, and a primary researcher's

air ticket), and logistical expenses (e.g., travel, internet, communication, and operational costs). The average cost of the intervention was £18.54 per student and £3,184 per school. The total cost per participant was £27 for the intervention group and £10.02 for the control group, leading to an incremental cost of £16.98 per participant. More details of the cost can be found in Appendix 6.8.

6.4 Discussion

The Intervention for Adolescent Tobacco Initiation Prevention (IATIP) trial represents a pioneering effort in addressing the dual challenges of tobacco initiation and mental well-being among adolescents in Dhaka, Bangladesh. This pilot feasibility trial provides a critical foundation for understanding the practical implementation and potential efficacy of a short school-based intervention in a low-resource setting. The results underscore the significant need and opportunity for preventive interventions targeting adolescents in Bangladesh, where tobacco use remains a major public health challenge exacerbated by high exposure to second-hand smoke and co-occurring mental health issues.

Findings from this trial demonstrate the feasibility of implementing the IATIP in schools, with high recruitment rates (88.4%), low attrition (3.5%), and strong fidelity to the intervention protocol. These results reflect the acceptability of the program among adolescents and schools, as evidenced by the high ratings for engagement and session quality. However, closer examination of participant withdrawal provides important insights. Four female students from Year 9 reported reasons such as discomfort with questions about tobacco use, lack of personal relevance, academic pressures, familial disinterest and lack of perceived benefit. These insights highlight the importance of addressing potential barriers to participation through enhanced engagement strategies and tailored communication in future trials. Additionally, challenges encountered during session attendance and engagement, such as weather disruptions, illness, and competing priorities, emphasise the need for flexible scheduling and proactive follow-up measures to mitigate dropouts.

The IATIP's outcomes indicate promising efficacy, including significant reductions in the intention to use tobacco, improvements in mental well-being, increased knowledge regarding health effects of tobacco, and enhanced skills to resist tobacco use. Such results align with global evidence on the effectiveness of school-based interventions but offer unique insights specific to the Bangladeshi context. The observed improvements in mental well-being also highlight the added value of integrating tobacco prevention with mental health promotion, addressing the intertwined challenges faced by adolescents in LMICs.

Very few school-based interventions to prevent tobacco use and promote health and well-being among adolescents have been successfully implemented in LMICs. The findings of this trial align with and extend the existing body of limited evidence on school-based interventions for adolescent tobacco prevention. For instance, the culturally adapted version of the Unplugged program implemented in Chile demonstrated similar feasibility and fidelity, emphasising the importance of tailoring interventions to the local context ²⁹⁹. Likewise, a behaviour change intervention for smokeless tobacco cessation in Pakistan highlighted the effectiveness of culturally specific strategies, particularly in enhancing participant engagement and addressing sociocultural barriers ³⁰⁰.

In addition to primary outcomes, the improvements observed in secondary measures such as mental well-being and decision-making skills resonate with findings from the DISCOVER program for mental health in adolescents in the UK ³⁰¹. This program emphasised the role of interactive and engaging content, which parallels the IATIP's approach in fostering meaningful participant involvement. Similarly, the Healthy Lifestyles Programme (HeLP) trial reported high fidelity and substantial impacts on health-related behaviours, underlining the significance of maintaining consistent and high-quality intervention delivery ³⁰².

When comparing the IATIP's outcomes on tobacco use prevention, previous studies observed reductions in smoking prevalence through structured school-based curricula^{99 285}. However, it is important to acknowledge that the IATIP trial, as a pilot study, did not report tobacco use outcomes but rather focused on the intention to initiate tobacco use. This limitation stems from the short 1-month follow-up period, which does not allow sufficient variability in behaviour to assess actual uptake or prevention of uptake. These outcomes will be more appropriately addressed in a future full-scale trial with extended follow-up periods and behavioural assessments. Nonetheless, the IATIP's integration of skills development and mental well-being components represents a unique contribution, as many similar interventions focus solely on tobacco-related outcomes. The findings of this trial suggest that incorporating well-being components can enhance the overall effectiveness of tobacco prevention programs. Improvements in refusal skills and self-esteem, key predictors of adolescent resilience against peer pressure, were consistent with findings from the EU-Dap Project^{303 304}, which emphasised skill-building as a cornerstone of successful prevention efforts.

While these comparisons highlight the IATIP's alignment with global best practices, the trial also contributes novel insights specific to LMICs. The contextual adaptation of BCTs and the high fidelity achieved despite resource constraints underscore the feasibility of implementing short interventions in low-resource settings. By integrating culturally tailored elements, the IATIP addresses the unique challenges faced by Bangladeshi adolescents, including high exposure to second-hand smoke and limited access to mental health support. These findings collectively demonstrate that the IATIP trial not only aligns with global evidence but also advances the field by highlighting the importance of integrating mental health promotion and skills development within tobacco prevention frameworks. Future studies should further investigate these intersections to optimise intervention strategies in diverse settings.

6.4.1 Practical implications

6.4.1.1 Practical feasibility

The high acceptability and feasibility of the IATIP intervention underscore its potential as a scalable solution for adolescent health promotion in Bangladesh. Schools represent an optimal setting for implementing such interventions, given their capacity to reach large populations of adolescents who may otherwise have limited access to health education and preventive services. The integration of culturally tailored content and interactive components enhances the relevance and effectiveness of the intervention, fostering better engagement and skill acquisition among participants.

An important practical consideration emerged during the field implementation of IATIP trial regarding the duration of intervention sessions. Although the protocol specified 40-minute sessions, the actual delivery required more time due to the comprehensiveness of the content. Analysis revealed mean session durations of 50.64 minutes for Session 1, 48.14 minutes for Session 2, and 52.36 minutes for Session 3. These deviations highlight the need for future definitive trials to adopt more realistic session durations to maintain fidelity and accommodate the intervention's comprehensive nature. Positively, most schools supported the extended durations, recognising the importance of delivering the content fully. However, a cluster (school) faced restrictions, with sessions limited to 45 minutes to align with their standard class schedules. This constraint underscores the necessity of engaging schools during the planning phase to align intervention requirements with institutional limitations.

6.4.1.2 Policy and scalability

Policy implications could be considerable if the IATIP intervention is shown to be effective in not only reducing the intention to use tobacco but also in reducing actual tobacco use. If these outcomes are demonstrated, the IATIP framework could be integrated into the national curriculum to amplify its reach. For instance, scaling up the intervention as part of a comprehensive adolescent health strategy could complement existing public health initiatives. Moreover, the IATIP trial's design and implementation strategies offer valuable lessons for

other LMICs facing similar challenges. The use of BCTs ²³⁰, the integration of theoretical frameworks like the Behaviour Change Wheel ²¹⁸, and the focus on fidelity and quality assurance provide a robust model for adapting the intervention to diverse cultural and resource settings. By addressing both individual and contextual factors influencing tobacco use, the IATIP trial has the potential to serve as a benchmark for comprehensive adolescent health programs globally, especially in LMICs.

6.4.2 Future research

The promising findings from this pilot trial pave the way for future research to refine and expand the IATIP trial. A definitive large-scale cluster randomised controlled trial with longer follow-up periods is essential to evaluate the sustained impact of the intervention on tobacco use behaviours and health outcomes. Such studies should also explore cost-effectiveness and scalability to inform policy decisions and resource allocation.

Future research should further investigate the differential impact of the IATIP intervention across subgroups, considering factors such as gender, socioeconomic status, and baseline mental health conditions. Understanding these nuances will enable the tailoring of the intervention to maximise its impact and equity.

6.4.3 Strengths and limitations

This study possesses several notable strengths. First, the use of a rigorous cluster randomised controlled design ensured robust and reliable findings. Second, the integration of mixed methods for process evaluation enhances the depth and breadth of insights into the feasibility and acceptability of the intervention. Third, the culturally tailored and evidence-based design of the IATIP addressed the unique needs of Bangladeshi adolescents, ensuring high relevance and potential impact.

Despite the strengths of this pilot trial, several limitations should be acknowledged. The reliance on self-reported data introduces the potential for reporting bias, including social desirability and recall bias. Although validated instruments and confidential data collection procedures were used to mitigate these risks, some level of bias may remain. A key limitation was the reduced follow-up duration. The original study design aimed to assess behavioural outcomes (i.e., tobacco use) at six months post-intervention. However, due to time constraints, follow-up was limited to one month, and tobacco use intention was used as a proxy outcome. While intention is a theoretically grounded and scientifically acceptable early indicator of behaviour change, it does not capture actual behaviour. Future definitive trials should include longer-term follow-up to robustly evaluate behavioural outcomes and the sustained effects of the intervention. The generalisability of the findings is also limited to urban schools in Dhaka, highlighting the need for future studies to include diverse educational and geographic settings, particularly rural areas where cultural norms and tobacco use patterns may differ. Logistical challenges related to implementing the intervention consistently across schools – due to variations in academic calendars, infrastructure, and resource availability – also posed constraints. These operational differences must be addressed in future studies to ensure standardised and scalable delivery. Finally, maintaining student engagement in the face of competing academic and extracurricular demands proved challenging. Enhancing the interactivity and contextual relevance of intervention activities will be essential for sustaining participant interest and maximising impact in future iterations.

6.4.4 Conclusions

The IATIP pilot feasibility trial provides preliminary evidence supporting the intervention's feasibility, acceptability, and potential to influence key behavioural determinants of tobacco use among adolescents in Bangladesh. While these findings are encouraging, they are limited by the short follow-up period and the trial's exploratory nature. Therefore, conclusions about effectiveness or scalability should be drawn with caution. Nonetheless, this study lays important

groundwork for the development of a definitive trial and informs future adaptations of brief school-based interventions that integrate tobacco prevention and mental health promotion within the Bangladeshi context. In doing so, it aligns with the broader aims of Sustainable Development Goal 3 (Good Health and Well-being), by informing strategies that may promote adolescent health in low-resource settings ⁸⁹.

Chapter 7 – Process evaluation of the IATIP trial: A qualitative analysis of perceived efficacy, future improvements, and resource implications (Study 5)

7.0 Chapter summary

Process evaluations play an important role in understanding how complex interventions are implemented, received, and experienced by participants, offering insights into both efficacy and areas for improvement. This chapter presents the process evaluation of the Intervention for Adolescent Tobacco Initiation Prevention (IATIP) trial, a school-based programme designed to prevent tobacco use, develop life skills, and promote adolescent health and well-being.

A qualitative design was employed, incorporating four focus group discussions with students (n=31) and four in-depth interviews with schoolteachers (n=4). Data were analysed thematically using the Framework Method to explore participants' experiences, perceived outcomes, and recommendations for future iterations.

The IATIP trial was perceived as highly effective in increasing students' knowledge about the harmful effects of tobacco, enhancing decision-making, problem-solving, and refusal skills, and improving their understanding of health and well-being. Students also reported sharing their knowledge with peers and family members. Teachers praised the programme's structure and delivery and noted improvements in students' behaviours. Recommendations for improvement included expanding the content to include electronic cigarettes and screen addiction, optimising session length, and scheduling follow-up sessions to sustain engagement.

The IATIP trial demonstrated substantial potential as a school-based tobacco prevention programme. The findings highlight the importance of addressing

contextual health challenges, improving delivery strategies, and enhancing cost-efficiency to ensure sustainability and scalability in future large-scale trials. Strengthening partnerships, improving resource allocation, and incorporating targeted incentives could further enhance the programme's impact and address health disparities among adolescents in low- and middle-income countries, particularly in Bangladesh.

7.1 Introduction

Tobacco use during adolescence is not only a gateway to lifelong dependency but also a major contributor to the global burden of preventable morbidity and mortality ^{276 305}. In the context of low- and middle-income countries (LMICs) like Bangladesh, where tobacco use prevalence among adolescent and youth is a concern ⁴⁴, interventions designed to prevent initiation are of critical importance. The Intervention for Adolescent Tobacco Initiation Prevention (IATIP) trial was developed to address the pressing issue of adolescent tobacco use in Dhaka, Bangladesh, through a culturally adapted, evidence-based programme. While the pilot feasibility cluster randomised controlled trial of IATIP (Chapter 6) demonstrated the practicality, fidelity, and acceptability of the intervention, a comprehensive understanding of its perceived efficacy and opportunities for improvement remains vital. Process evaluations serve this purpose by exploring how interventions are delivered, received, and experienced by key stakeholders, thereby providing valuable insights that extend beyond quantitative outcomes ^{306 307}.

The primary aim of process evaluations in trials of complex and public health interventions is to understand the effects of these interventions ^{216 307 308}. These effects can guide assessments of validity by identifying key components of the intervention (construct validity), showing links between the intervention and outcomes (internal validity), and relating the intervention to other contexts (external validity) ^{309 310}. Additionally, process evaluations can investigate implementation and change processes ^{213 311}, and examine factors linked to variations in effectiveness ³¹². They can also assess the usefulness of theories

that underpin the intervention design and generate new questions or hypotheses for future research ³¹³. Thus, process evaluations serve multiple purposes, including understanding intervention effects, potential generalisability, and optimisation in routine practice ³¹⁴. For public health interventions like IATIP, particularly in resource-constrained LMIC settings, process evaluations are indispensable for bridging the gap between research findings and practical implementation ³¹⁵.

Published studies on process evaluations of public health interventions often prioritise qualitative research methods to explore the complexities of implementation and participant experiences ^{216 307 311 316}. However, many aspects of process evaluations, such as assessing fidelity, reach, and outcomes, can benefit from mixed methods approaches that integrate both qualitative and quantitative data ³¹⁰. The importance of qualitative inquiry in public health interventions cannot be overstated, particularly as it builds on the foundational understanding provided by process evaluations to capture in-depth, context-specific insights from key stakeholders ^{153 245}. By exploring the lived experiences and subjective perceptions of stakeholders, qualitative methods enable a detailed exploration of intervention dynamics that might remain concealed within purely quantitative approaches ^{245 315}. For this chapter, the decision to emphasise qualitative methods reflects the need to prioritise stakeholder voices – particularly students and teachers – to understand the perceived efficacy, barriers, and facilitators of the intervention. This focus ensures that the intervention's development and implementation remain grounded in the lived realities and perspectives of its primary beneficiaries, thereby enhancing its cultural and contextual relevance. Engaging stakeholders such as students and teachers provide a richer understanding of the intervention's perceived efficacy and its cultural and contextual relevance ^{317 318}. This chapter examines these perspectives to identify key facilitators and barriers to the programme's success and opportunities for improvement. Furthermore, by incorporating findings on resource implications, the analysis provides practical insights into the feasibility of scaling the intervention within resource-limited settings ³¹⁹, a crucial consideration for LMICs.

7.2 Objectives

The primary objective of this process evaluation was to explore the in-depth view of the participants about the efficacy and the future direction of the IATIP intervention. The specific objectives were as follows:

- i. Exploring the participants' perceptions of the intervention's efficacy in achieving its goals.
- ii. Identifying suggestions for improving the contents, design and delivery of the IATIP intervention.

7.3 Methods

7.3.1 Design

This study employed a mixed methods design as part of the parallel process evaluation of the IATIP trial. However, this chapter focuses solely on the qualitative component of the process evaluation (see Chapter 6 for quantitative findings). The design aligns with the principles of qualitative research, which prioritises understanding participants' experiences and perspectives within their specific social and cultural contexts ²³⁸.

7.3.2 Participants

Participants were purposefully selected to ensure the inclusion of diverse perspectives (e.g., sex and engagement levels) relevant to the IATIP intervention. The sample comprised students who participated in the intervention sessions from four experimental schools and their class teachers who observed the implementation. Inclusion criteria for students required active participation in at least 75% of the intervention sessions, while teachers needed to have attended at least one session as observers. A total of 31 students and 4 teachers were recruited for this study.

7.3.3 Data collection procedure

Data were collected through four focus group discussions (FGDs) with students and four in-depth interviews (IDIs) with teachers at the end of 1-month follow-up of the trial. Logistical constraints influenced the choice of IDIs, as teachers were based in different schools, making it impractical to gather them in a single location for a group discussion. This methodological approach ensured data richness while accommodating the practical realities of participant availability and engagement. FGDs and interviews were conducted in a quiet, familiar setting within the school premises to ensure participant comfort and minimise disruptions. Two guides were used: a FGD guide for students and an interview guide for teachers, both of which were developed based on the intervention objectives and relevant literature, covering topics such as perceived efficacy, suggestions for improvement, and perceived challenges. All sessions were audio-recorded with participant consent, and detailed field notes were taken to capture non-verbal cues and contextual information. The recordings were transcribed verbatim in Bangla by two public health graduates from Bangladesh. The same individuals then translated the transcripts into English to facilitate analysis. To ensure translation accuracy, a back-and-forth validation process was conducted, with final verification carried out by me.

7.3.4 Measures

The semi-structured focus group discussion guide for students (Appendix 7.1) and the interview guide for teachers (Appendix 7.2) were specifically designed to explore key domains relevant to the IATIP intervention. These guides included a combination of structured questions and open-ended prompts to encourage detailed responses and uncover thoughtful insights.

The FGD guide for students aimed to gather insights into their experiences with the intervention. It explored how the programme influenced their knowledge, attitudes, and behaviours related to tobacco use, health, and well-being. Additionally, students were asked about perceived improvements in life skills such as decision-making and problem-solving. Their beliefs about the intervention's effectiveness in preventing tobacco initiation and promoting health

were also examined. Finally, the guide sought feedback on the relevance and interactivity of the content, the delivery approach, session structure, and suggestions for future improvements of the intervention, along with any additional comments about their overall experience.

The interview guide for teachers explored their perceptions of the IATIP intervention across several domains. First, it assessed the perceived importance of promoting health and well-being among students, as well as the prevention of tobacco use. Second, teachers were also asked about potential barriers or disruptions related to implementing such intervention in future and the strategies to mitigate these challenges. Third, the guide captured their willingness to support similar interventions in the future, including the types of logistical, financial, or administrative support required. Lastly, it sought their views on the feasibility of integrating such programmes within existing workloads and their suggestions for improving the intervention's content, delivery approach, and session structure for future implementation. These measures were informed by existing literature and adapted to the local context to ensure cultural relevance and appropriateness. The guides underwent pre-testing, with iterative refinements made based on initial feedback to ensure clarity and comprehensiveness.

7.3.5 Data analysis

The Framework Method was used for the qualitative data analysis ²⁶³, as outlined in Chapter 5. An initial coding structure was developed inductively from the data, allowing themes to emerge naturally. These codes were then grouped into categories to form a working analytical framework, which was used to index subsequent transcripts. To ensure a comprehensive analysis, conflicting or divergent perspectives – such as differences in perceptions between students and teachers – were systematically examined. Contradictory views were compared across participant groups to identify variations in experiences, expectations, and recommendations. Where discrepancies arose, they were analysed in relation to contextual factors, such as differing roles in programme implementation, variations in school environments, or distinct personal

experiences with tobacco-related education. This approach ensured that the analysis captured both shared themes and nuanced divergences, providing a balanced and contextually relevant interpretation of the findings.

7.3.6 Ethics

Ethical approval for this study was obtained as detailed in Chapter 6. In summary, approvals were granted by the institutional review board, the 'Biosafety, Biosecurity & Ethical Committee' of Jahangirnagar University, Dhaka, Bangladesh (Ref No: BBEC,JU/M 2024/ 02 (82)) and the UCL Research Ethics Committee (Approval ID: 22645/004). See Chapter 6 for further details on the ethical procedures followed.

7.4 Results

7.4.1 Perceived efficacy of the IATIP trial

The IATIP trial was widely perceived as effective by both students and teachers in addressing tobacco initiation prevention, developing life skills, and promoting health and well-being. The findings from students' FGDs are organised into four key domains: efficacy related to tobacco use, life skills, health and well-being, and empowerment. In contrast, the findings from teachers' IDIs are presented in one domain: perceived efficacy from the teachers' point of view (see Table 7.1). The categorisation of findings differs between students' FGDs and teachers' IDIs due to the distinct nature of the data collected. While students' discussions naturally covered a broad range of topics, allowing for categorisation into multiple domains, teachers' interviews focused more specifically on their perceived efficacy, necessitating a single-domain presentation.

7.4.1.1 Efficacy related to tobacco use (students' perceptions)

The intervention was effective in increasing students' knowledge about the harmful effects of tobacco use. Participants frequently highlighted that the sessions provided new information, describing the material as both informative and impactful. For example, a female student (school year 9) noted:

“Before these sessions, I was not fully aware of the extent of the damage caused by tobacco use. The presentation of the sessions was very impactful.” – (Female participant, School year 9)

Changes in attitudes towards tobacco were also observed, with students demonstrating stronger motivation to abstain from use:

“The programme helped me understand that the perceived pleasure derived from tobacco use is merely temporary and ultimately unsustainable.” – (Male participant, School year 9)

Furthermore, some students reported behavioural changes, including cessation of tobacco use and active efforts to discourage its use among family members:

“I used to consume tobacco, but I have since quit. (...) I have also started encouraging my family members to avoid it.” – (Female participant, School year 8)

Table 7.1: Perceived efficacy of the IATIP trial

Theme	Sub-theme	Representative quotes
Students' point of view		
Efficacy related to tobacco use	Increased knowledge about tobacco's harmful effects	"Before these sessions, I was not fully aware of the extent of the damage caused by tobacco use. The presentation of the sessions was very impactful." – Female participant, School year 9
		"I got to know more details about the health effects of tobacco use from this session." – Male participant, School year 8
		"I have gained a considerable amount of knowledge about tobacco and health, which is why I was eager to participate in these sessions. (...) This knowledge has been invaluable." – Female participant, School year 9
	Changed attitudes towards tobacco	"The program helped me understand that the perceived pleasure derived from tobacco use is merely temporary and ultimately unsustainable. Tobacco use offers no lasting solutions and only leads to negative consequences." – Male participant, School year 9 "I now understand that the perceived benefits of tobacco use, such as stress relief, are actually misconceptions. And, this programme has empowered me to abstain from this harmful habit by debunking misconceptions." – Male participant, School year 9
	Changed behaviours of tobacco use	"I previously used to consume tobacco, but I have since quit. Through these training sessions, (...) I learned about the various harmful effects of tobacco on the body and the importance of avoiding all forms of tobacco products. I have decided not to use tobacco and have also started encouraging my family members to avoid it." – Female participant, School year 8

Theme	Sub-theme	Representative quotes
Efficacy related to life skills	Prevent tobacco initiation	"I initially felt a strong curiosity about tobacco use, questioning why so many people engaged in this habit. Through the sessions of this programme, I came to understand that the perceived benefits of tobacco use, such as stress relief, are often illusory. (...) Now I am confident that I would be able to stay away from tobacco use." – Male participant, School year 8 "I believe these sessions have equipped me with the necessary knowledge and confidence to stay away from tobacco and resist peer pressure, and also make healthy choices" – Female participant, School year 9
	Promote decision-making skills	"(...) the 'Three C's' framework (...) was particularly helpful that provided me with a valuable approach to making informed decisions regarding my health and well-being." – Female participant, School year 9 "I believe these sessions have equipped me with the necessary knowledge and confidence to stay away from tobacco and resist peer pressure, and also make healthy choices." – Female participant, School year 9
	Promote problem-solving skills	"I've started applying problem-solving strategies discussed in the sessions to real-life challenges." – Male participant, School year 8 "I believe that the life skills I have developed (...) have equipped me with the ability to effectively navigate challenges and overcome obstacles. – Male participant, School year 8

Theme	Sub-theme	Representative quotes
	Promote refusal skills	“I wasn't always confident in my ability to refuse and (ah.) often wondered about the potential consequences of declining. However, these sessions have empowered me to confidently decline offers of tobacco. Even, now I am confident to refuse the offers of tobacco even from close friends.” – Female participant, School year 8 “While tobacco use might seem appealing to some, I know its detrimental effects and confidently refuse such offers.” – Male participant, School year 8 “(…) these sessions have equipped me with valuable refusal skills. I now feel confident in declining offers of tobacco and can confidently explain to others why I choose not to use tobacco” – Female participant, School year 9
	Promote self-esteem and assertiveness	“While I do not use tobacco myself, I now feel confident in advising my friends and others about the risks associated with tobacco use.” – Female participant, School year 9 “(…) Now I am confident that I would be able to stay away from tobacco use.” – Male participant, School year 8
Efficacy related to health and well-being	Increased knowledge about health and well-being	“The contents I found most helpful in these sessions were mental health contents, especially, the techniques to manage stress, depression and anxiety. (...) That's why it was very helpful for us to know what to do to maintain good mental health. I am very glad to know about these. This session was helpful for me.” – Male participant, School year 8 “This knowledge has significantly impacted my perspective on tobacco use and has empowered me to make healthier choices for myself. I believe these training sessions have

Theme	Sub-theme	Representative quotes
		played a crucial role in my personal growth and well-being.” – Female participant, School year 8
	Changed attitudes towards negative emotions	“I realised that negative emotions like stress can be managed without using tobacco.” – Male participant, School year 9 “I, like many others, have occasionally used tobacco products as a coping mechanism for stress and loneliness. But the training sessions significantly increased my awareness of the detrimental health effects of tobacco use. (...) This realisation has led me to seek healthier coping mechanisms to manage stress and promote my overall well-being.” – Female participant, School year 8
	Changed behaviours in managing negative emotions	“The programme effectively addressed various aspects of mental well-being, including stress management techniques. These valuable insights have equipped me with the tools to navigate challenges more effectively, make more informed decisions, and cultivate a positive mindset.” – Male participant, School year 8 “I’ve started practicing deep-breathing exercise, and I’ve found it very helpful for managing my negative emotions.” – Female participant, School year 9
	Promote health and well-being	“I learned that while tobacco use may initially provide a temporary sense of pleasure, it ultimately leads to negative consequences, including frustration, sadness, and even depression. This understanding has significantly impacted my perspective on tobacco use and has empowered me to make informed choices about my own well-being.” – Female participant, School year 9 “I completely believe that this programme highly contributed to the promotion of my health and well-being.” – Female participant, School year 8

Theme	Sub-theme	Representative quotes
Improved ability to educate others about health risks	Educate friends	“I now feel empowered to have open and honest conversations with my friends about the dangers of tobacco use and encourage them to make healthier choices.” – Female participant, School year 8
	Educate family members	“My father is a smoker. Initially, when I tried to discourage him from smoking, he dismissed my concerns. However, after participating in this programme, I was able to effectively communicate the dangers of tobacco use to him. I explained the harmful effects of nicotine, emphasising detrimental health effects of smoking, including its potential to cause death. My father, who previously smoked 7-8 cigarettes a day, has since reduced his consumption to 3-4 cigarettes per day. This positive change in his behaviour gives me hope that I can continue to support him in his journey to quit smoking entirely.” – Female participant, School year 8
	Empowerment to make informed decisions	“I learned how to effectively communicate the harmful health consequences of tobacco use to my friends and family, empowering them to make informed decisions about their health. This experience has prepared me to confidently advise my tobacco user friends on the dangers of tobacco use and encourage them to quit.” – Male participant, School year 8 “Prior to these sessions, I might have hesitated to confront a friend about their tobacco use due to concerns about their reaction or the potential impact on our friendship. However, these sessions have equipped me with the confidence and knowledge to address this issue effectively. [08:00] I now feel empowered to have open and honest conversations with my friends about the dangers of tobacco use and encourage them to make healthier choices.” – Female participant, School year 8

Theme	Sub-theme	Representative quotes
Teachers' point of view		
Perceived efficacy of IATIP trial	Quality of implementation	"The design of the sessions was very good, and the presentations were informative and engaging. Superb." – Male teacher, Role: Headmaster "I would like to commend you on your sincerity. You dedicated yourself wholeheartedly to your implementation work and approached all tasks systematically." – Female teacher, Role: Principal
	Preventing student tobacco use	"I'm truly happy to see the positive development of our students after your sessions in preventing tobacco use and promoting health and well-being. They are now aware of the health risks associated with tobacco use, and I believe the programme will have a positive impact on their behaviour." – Male teacher, Role: Senior teaching staff
	Promoting student health and well-being	"The anti-tobacco training programmes you have conducted have effectively addressed some important aspects of adolescents physical and mental health. So, I believe that these experiences will play a pivotal role in shaping their future and promoting their overall well-being." – Male teacher, Role: Vice principal

7.4.1.2 Efficacy related to life skills (students' perceptions)

The intervention was recognised for its role in developing essential life skills, particularly decision-making, problem-solving, and refusal skills. A student stated:

“The ‘Three C’s’ framework provided a valuable approach to making informed decisions regarding my health and well-being.” – (Female participant, School year 9)

Students also reported an increased ability to resist peer pressure:

“These sessions have empowered me to confidently decline offers of tobacco.” – (Female participant, school year 8).

7.4.1.3 Efficacy related to health and well-being (students' perceptions)

The programme improved students' understanding of health and well-being, particularly its relevance to their emotional and physical health. The mental health component, which included techniques for managing stress, depression, and anxiety, was particularly well-received. A student reported:

“The techniques to manage stress, depression, and anxiety (...) were very helpful for us.” – (Male participant, School year 8)

Participants also noted changes in their approach to emotional regulation, reporting an increased ability to cope with negative emotions. A student reflected:

“I, like many others, have occasionally used tobacco products as a coping mechanism for stress and loneliness. But the training sessions significantly increased my awareness of the detrimental health effects of tobacco use. (...) This realisation has led me to seek healthier coping mechanisms to manage stress and promote my overall well-being.” – (Female participant, School year 8)

7.4.1.4 Improved ability to educate others about health risks (students' perceptions)

A notable outcome of the intervention was the extent to which students actively shared their learnings with family and peers. A student shared the experience as follows:

“My father is a smoker. (...) I was able to effectively communicate the dangers of tobacco use to my father, who has since reduced his consumption.” – (Female participant, School year 8)

7.4.1.5 Perceived efficacy from the teachers' point of view

Teachers viewed the intervention as highly effective in improving students' awareness of tobacco-related risks and promoting health and well-being. They unanimously reported positive perceptions of the IATIP trial, praising the structure and delivery of the sessions:

“The design of the sessions was very good, and the presentations were informative and engaging.” – (A male teacher, role: Headmaster)

Teachers also reported observing positive behavioural changes in students related to tobacco use and general health. A teacher stated:

“I'm truly happy to see the positive development of our students after your sessions in preventing tobacco use and promoting health and well-being.” – (A male teacher, role: Senior teaching staff)

7.4.2 Suggestions for intervention improvement

While the intervention was positively received, several areas for improvement were identified by both the students and teachers (see Table 7.2):

7.4.2.1 Content improvement

Students and teachers highlighted areas for content expansion, particularly regarding electronic cigarettes. A student noted:

“You missed addressing e-cigarettes in this programme. I think this should be added in future studies.” – (Male participant, School year 8)

Teachers also recommended addressing broader adolescent health concerns such as screen addiction:

“The widespread use of various electronic devices has led to increased screen time among our students, resulting in a range of negative consequences. (...) You should focus on this topic in your next intervention.” – (Female teacher, Role: Principal)

7.4.2.2 Delivery approach

There was consensus on the need for smaller group sizes to encourage active participation.

“I suggest that smaller group sizes would be beneficial in facilitating more effective contributions from all members.” – (Female participant, School year 8)

Teachers also proposed adopting a peer-educator model to expand the programme’s reach:

“I believe that focusing on a smaller group of thirty dedicated students would allow for more effective instruction compared to a larger class of Fifty. By providing comprehensive training to these thirty students, you can empower them to become peer educators, raising awareness among their peers.” – (Male teacher, Role: Vice principal)

7.4.2.3 Session length and follow-ups

Participants emphasised the need for longer sessions and follow-up activities to reinforce key messages. A recommended:

“Two to three follow-up sessions per year would help ensure we remember the information.” – (Male participant, School year 9)

Teachers echoed this recommendation:

“To ensure sustained learning and behavioural change, regular follow-up sessions, ideally three to four times per year, are crucial (...).” – (Male teacher, Role: Senior teaching staff)

7.4.2.4 Scheduling adjustment

Views on scheduling varied. Some students preferred sessions outside regular school hours to avoid academic disruptions, while others favoured integration into class schedules. A student stated:

“I think sessions during school hours are more effective than scheduling them on holidays or tiffin time or after school.” – (Female participant, School year 8)

A male teacher noted:

“If these training programmes are conducted early in the academic year, (...) particularly when academic pressures are less, it would be easier for us to manage our time and participate effectively.” – (Male teacher, Role: Headmaster)

Table 7.2: Suggestions for future improvement

Theme	Sub-theme	Representative quotes from students	Representative quotes from teachers
Content improvement	Lack of clarity	“I feel like some of the contents like three C’s of decision making like these need greater clarity. Your presentation was somewhat brief in discussing these issues, (ah) and I believe a more in-depth explanation would have been helpful for us.” – Female participant, School year 9	“In my opinion, all aspects of the programme and the contents were both contemporary and realistic. I think no further changes or modifications are necessary.” – Male teacher, Role: Senior teaching staff
	Electronic cigarettes	“Many adolescents mistakenly perceive electronic cigarettes as harmless alternatives to traditional cigarettes, unaware of the numerous harmful chemicals and toxins present in e-cigarette vapour. But you missed addressing e-cigarettes in this programme. I think this should be added in future studies.” – Male participant, School year 8	“The widespread use of various electronic devices has led to increased screen time among our students, resulting in a range of negative consequences. These include a decline in academic performance, behavioural issues, (...), and even the emergence of mental health concerns. So, you should focus on this topic in your next intervention. I believe it is important to explore the impact of excessive screen time and the specific types of digital content that contribute to these negative outcomes. – Female teacher, Role: Principal
Delivery approach enhancement	Smaller group sizes	“(…) I think everyone should actively participate in group works. Therefore, I suggest that smaller group sizes would be beneficial in facilitating more effective	“I believe that focusing on a smaller group of thirty dedicated students would allow for more effective instruction compared to a larger class of Fifty. By providing comprehensive training to these thirty students, you can empower them

		contributions from all members.” – Female participant, School year 8	to become peer educators, raising awareness among their peers.” – Male teacher, Role: Vice principal
	Additional support/ Incentive	“I observed that some challenges arose during the group work activities. For example, there was some initial confusion and minor disagreements within the group regarding who should be responsible for providing the worksheets. I believe the group work could have been more effective if the worksheets had been provided by you. This should be addressed in future sessions.” – Female participant, School year 9	“(…) to encourage and motivate student participation, I recommend providing refreshments, I mean some tiffin, and awarding certificates and perhaps small tokens of appreciation such as a crest. These non-monetary incentives can significantly enhance student engagement and motivation.” – Female teacher, Role: Principal
Session length optimisation	Extended duration	"The sessions felt a bit rushed; extending them by 15-20 minutes would allow deeper discussions." – Male participant, School year 8 "A little more time could have been allocated to certain topics. Yes, time was a big factor. And the most important thing is like I expected that Refusal skill, I actually expected to have a more in-depth discussion on this. While the program covered this topic, I mean a lot of things, I felt it could have been explored more extensively." – Female participant, School year 9	"Sessions of 50-60 minutes during school hours or 90-120 minutes on holidays would be ideal." – Female teacher, Role: Principal There was consensus on optimising session durations based on the academic schedule and workload of students.

	Follow-up sessions	“This programme should have two to three follow-up sessions in a year.” – Male participant, School year 9 “Regular follow-up sessions would help ensure that we internalise the information and are better equipped to resist the temptation to use tobacco.” – Male participant, School year 8	“The training sessions in a single point of time may not have a lasting impact on student behaviour. To ensure sustained learning and behavioural change, regular follow-up sessions, ideally three to four times per year, are crucial to reinforce the key messages and maintain student engagement.” – Male teacher, Role: Senior teaching staff “Two to three follow-up sessions per year would be good.” – Female teacher, Role: Principal
Scheduling improvements	Intervention delivery preferences	“We had pre-scheduled class assessments that were postponed due to your programme. This minor disruption to academic schedule did not significantly impact us. However, to minimise such disruptions in the future, I would suggest scheduling the programme outside of regular school hours, such as during lunch breaks or after school.” – Male participant, School year 9 “I think sessions during school hours are more effective than scheduling them on holidays or tiffin time or after school.” – Female participant, School year 8	“If these training programmes are conducted early in the academic year, for example, from January to February, particularly when academic pressures are less, it would be easier for us to manage our time and participate effectively.” – Male teacher, Role: Headmaster
Capacity building for	Sustainability and collaboration	[No comments from students]	“I believe that the impact of this work could be sustainable by involving our teachers more actively. This could involve let’s say training

sustainable
impact

teachers to deliver the programme themselves, then providing them with access to the valuable resources you have developed, (umm) such as your training materials, PowerPoint presentations, and videos. So that our teacher can encourage our students any time (ah) not to take tobacco by presenting these materials. I believe this approach will raise awareness among our students and also promote a sustainable impact of your programme.” – Male teacher, Role: Headmaster

Scalability
and inclusive
outreach

Expanding
reach

[No comments from students]

“This programme can be expanded. You can implement this programme with students from class seven to class ten.” – Male teacher, Role: Senior teaching staff

“I encourage you to consider extending the reach of your programme beyond urban centres. By conducting outreach activities in rural areas and smaller villages, you can gain valuable insights into the unique challenges and needs of these communities and effectively address the specific issues they face.” – Female teacher, Role: Principal

7.4.3 Institutional support and commitment to future implementation

7.4.3.1 Support for future interventions

Schools expressed strong willingness to participate in future interventions. A headmaster affirmed:

“This school will be extremely willing to participate and provide all support for similar interventions in the future.” – (Male teacher, Role: Headmaster)

7.4.3.2 Logistical and administrative support

Teachers committed to facilitating programme implementation, stating:

“I will certainly provide logistical and administrative support for the programme.” – (Female teacher, Role: Principal)

However, financial support remained a challenge:

“We do not have the authority to provide direct financial support, but we are committed to supporting the programme in other ways.” – (Male teacher, Role: Headmaster).

7.4.3.3 Teachers’ involvement in programme delivery

Several teachers expressed interest in taking a more active role in delivering the programme, provided they receive appropriate training and resources:

“We would be happy to deliver the programme if we get necessary training and other support from your side.” – (Male teacher, Role: Senior teaching staff)

7.4.3.4 Commitment to prevention

Teachers reaffirmed their commitment to adolescent health promotion and tobacco prevention:

“We are committed to implementing all necessary measures to prevent tobacco and drug use among our students.” – (Male teacher, Role: Headmaster)

Table 7.3: Institutional support and commitment to future prevention: Teachers' view

Theme	Sub-theme	Representative quotes
Support for future interventions	Interest in participation	"This school will be extremely willing to participate and provide all supports for similar interventions in the future. As the head of the school, I am interested, I always encourage good work and try to participate myself." – Male teacher, Role: Headmaster
	Logistical and administrative support	"I will certainly provide logistical and administrative support for the programme." – Female teacher, Role: Principal
	Financial support	"We do not have the authority to provide direct financial support, but we are committed to supporting the program in other ways." – Male teacher, Role: Headmaster
	Teachers' involvement in delivery	"Our teachers frequently engage in a variety of activities beyond their regular teaching duties. They are accustomed to and capable of handling additional responsibilities. So, we would be happy to deliver the programme if we get necessary trainings and other supports from your side." – Male teacher, Role: Senior teaching staff "We will carefully select teachers who are enthusiastic about implementing this initiative and who view it as an enriching professional development opportunity but not a pressure." – Female teacher, Role: Principal
Commitment to prevention	Teacher endorsements	"We are committed to implementing all necessary measures to prevent tobacco and drug use among our students." – Male teacher, Role: Headmaster

7.5 Discussion

This chapter explored the perceived efficacy, areas for improvement, and overall reception of the IATIP trial as a school-based intervention for tobacco initiation prevention and the promotion of adolescent health and well-being. The findings provide important insights into the programme's efficacy and future direction.

Teachers emphasised the importance of logistical support, suggested training peer educators to enhance sustainability, and recommended non-monetary incentives to sustain student engagement.

The IATIP trial was perceived as highly effective by both students and teachers, with participants reporting notable improvements in knowledge, attitudes, and behaviours related to tobacco use. The programme also enhanced students' life skills, particularly decision-making, problem-solving, and refusal skills.

Importantly, students highlighted an increased capacity to educate their peers and family members about health risks, reflecting the broader influence of the intervention beyond individual participants. Several areas for improvement were identified, including expanding the content to cover emerging topics such as electronic cigarettes, optimising session duration, incorporating follow-up sessions, and implementing the programme early in the academic year to strengthen its practicality and effectiveness. Teachers emphasised the need for improved logistical support, involving teachers in the delivery, training peer educators to enhance the programme's sustainability, and suggested ways to maintain student engagement through participatory learning methods.

7.5.1 Recommendations for programme improvements

A key recommendation emerging from the findings is the need to adapt the intervention content to reflect evolving adolescent health challenges. Both students and teachers suggested that the programme should address emerging topics such as electronic cigarettes, which many young people perceive as a

safer alternative to traditional smoking ^{320 321}. Future iterations of the intervention should integrate evidence-based content on vaping, including the risks of nicotine dependence, respiratory health concerns, and the regulatory landscape. Similarly, teachers identified screen addiction as an emerging concern, suggesting that future interventions should explore its impact on academic performance, mental health, and physical activity. By incorporating these contemporary health concerns, the intervention could further align with the lived realities of adolescents and strengthen its relevance.

Optimising the delivery approach was another key theme. Students expressed a preference for smaller group sizes, which they believed would enhance group discussions and ensure active participation. Teachers echoed this sentiment, recommending a structured peer-led model where trained students could take leadership roles in programme delivery. This approach has been effective in other school-based health interventions ⁹⁹, as peer educators often foster a sense of relatability and trust among their classmates. Future trials could pilot this model by selecting a core group of students to receive in-depth training, enabling them to facilitate discussions while being supported by trained facilitators or teachers. Additionally, students and teachers suggested involving external health professionals, such as doctors, psychologists, or former tobacco users, to deliver specific sessions. The inclusion of expert voices could lend credibility to the programme, reinforce the scientific basis of the intervention, and provide students with an opportunity to engage with professionals in a meaningful way.

Enhancing teacher involvement emerged as a critical factor in ensuring programme sustainability. Teachers expressed a willingness to play a more active role in delivering the intervention, but they emphasised the need for structured training and access to quality resources. Future adaptations should incorporate a formal teacher training component, equipping educators with a comprehensive understanding of adolescent tobacco prevention, behaviour change strategies, and interactive facilitation techniques. Developing a teacher toolkit, consisting of lesson plans, interactive activities, and multimedia resources, could provide a structured yet adaptable framework for

implementation. Furthermore, teachers suggested ongoing professional development opportunities, such as refresher training sessions or access to an online resource hub where they can exchange best practices and access updated materials. Integrating teachers more fully into programme delivery would not only enhance sustainability but also foster a school-wide culture of health promotion ^{322 323}.

Session duration and follow-ups were also identified as areas for refinement. Students and teachers recommended extending session lengths, with a suggested duration of 50–60 minutes during school hours and 90–120 minutes for holiday-based sessions. Additionally, both groups stressed the importance of follow-up sessions to reinforce learning and monitor behavioural change over time. A structured follow-up plan, involving biannual or triannual sessions, could be implemented to sustain engagement and address any emerging challenges students face in resisting tobacco use.

As part of the feasibility assessment, the resource requirements were reviewed to inform the potential for scaling up the intervention. For a definitive large-scale trial, additional elements – such as non-monetary incentives – must be factored into the cost framework. Teachers recommended providing refreshments, certificates, or small recognition tokens (e.g., crests) to enhance student engagement and participation. While these incentives may increase the total cost, they can be a valuable investment for sustaining student motivation and promoting consistent attendance ^{324 325}. Future large-scale trials must balance these incentives with cost-efficiency strategies, such as partnering with schools to share resources, training peer educators to lead sessions, and using digital follow-up components to reduce ongoing material and travel costs. The feasibility trial's cost analysis (see Chapter 6) thus serves as a crucial baseline for projecting and optimising financial planning in subsequent trials, ensuring that the intervention remains scalable and impactful across diverse settings.

7.5.2 Comparison with existing literature

The findings align with previous research on school-based tobacco prevention interventions, which consistently report positive impacts on knowledge, attitudes, and behaviours when health promotion is integrated with life skills training ⁹⁸. Similar studies have demonstrated that focusing on decision-making, problem-solving, and resistance skills yield positive behavioural outcomes, reinforcing the value of a holistic approach ^{303 326}. Evidence also suggests that peer-led and community-engaged strategies enhance the sustainability and reach of school-based interventions, a recommendation echoed by the teachers in this study ^{327 328}. A distinguishing feature of the IATIP trial was the inclusion of mental health components, particularly stress, depression, and anxiety management. Many tobacco prevention programmes focus narrowly on tobacco-related education, yet this study supports the growing recognition that addressing emotional well-being is essential for sustainable behaviour change ³²⁹. Adolescents often cite stress as a primary reason for experimenting with tobacco, making it crucial to equip them with alternative coping mechanisms.

7.5.3 Strengths and limitations

This trial had several strengths that enhance its contribution to the field of adolescent health interventions. Its comprehensive approach, integrating tobacco prevention with life skills development and mental well-being promotion, provided students with a multifaceted learning experience. The inclusion of both student and teacher perspectives strengthened the evaluation, offering a holistic understanding of the programme's effects. Additionally, the use of qualitative methods allowed for an in-depth exploration of participants' experiences, capturing contextual nuances that quantitative studies might overlook. This level of detail is particularly valuable in understanding how interventions operate in real-world school settings. Another key contribution of this study is the emphasis on the role of teachers in school-based interventions. While many adolescent health programmes rely on external facilitators, this study demonstrated that teachers are eager to support and sustain such initiatives, provided they receive adequate training and resources. Future research should further explore the mechanisms by which teachers can be

empowered to take ownership of school-based health promotion efforts, ensuring long-term sustainability.

Despite its strengths, this study has several limitations. The findings are based on qualitative data from a relatively small sample of students and teachers, which may limit generalisability to broader school populations. Additionally, as the data were collected one-month post-intervention, the long-term impact on behaviour change remains unknown. Future studies should consider conducting follow-up assessments over a longer period to measure sustained behavioural changes and determine whether the intervention leads to a lasting reduction in tobacco use. Practical challenges also emerged during programme implementation, particularly in balancing intervention delivery with academic schedules. Some students reported that sessions coincided with pre-scheduled assessments, while teachers highlighted the difficulty of allocating time within a demanding curriculum. These logistical constraints suggest the need for greater flexibility in future implementation, including coordination with school administrations to ensure integration into the academic timetable.

7.5.4 Implications for future research and practice

The findings underscore the importance of adapting school-based interventions to address evolving adolescent health concerns, such as vaping and screen addiction. Future iterations of the IATIP programme should explore the feasibility of incorporating peer-led education and teacher-driven implementation models to improve scalability and cost-efficiency. Additionally, the integration of expert-led sessions could further strengthen the programme's credibility and engagement. Future large-scale trials should focus on evaluating the intervention's long-term effectiveness, incorporating financial modelling to refine resource allocation strategies. Partnerships with schools, local health authorities, and community organisations could enhance sustainability, ensuring that tobacco prevention remains embedded within broader adolescent health initiatives.

7.6 Conclusion

The IATIP trial demonstrated substantial potential as a school-based intervention for preventing adolescent tobacco use and promoting health and well-being. The findings provide valuable insights into both the strengths and areas for improvement, offering a strong foundation for future definitive trials. By addressing the recommendations for enhanced content, delivery, and teacher involvement, the intervention can be further refined to maximise its scalability and long-term impact.

Chapter 8 – General Discussion

In this final chapter, the key findings across all studies are summarised, highlighting their theoretical, methodological, and practical contributions. The main strengths of the thesis, including its evidence-based development, cultural adaptation, and integration of mental well-being components, are considered alongside its limitations, such as short follow-up, reliance on self-reported data, and implementation constraints. Future research directions are proposed, focusing on long-term effectiveness, cost-efficiency, digital interventions, and parental engagement. Finally, the broader implications of this thesis for adolescent tobacco prevention in low- and middle-income countries are discussed.

8.1 Aims of this thesis

The overarching aim of this thesis was to develop and evaluate a brief, school-based intervention designed to prevent tobacco initiation and promote the health and well-being of adolescents in Dhaka, Bangladesh. This objective was underpinned by the recognition that adolescence represents a critical period for tobacco initiation, with substantial evidence highlighting the role of early exposure in establishing long-term tobacco use behaviours (see Chapter 1). As highlighted in Chapter 1, the lack of culturally tailored, school-based interventions for tobacco prevention in Bangladesh represents a critical gap. Given the escalating burden of tobacco-related morbidity and mortality in low- and middle-income countries (LMICs), particularly in Bangladesh, this thesis sought to address a significant public health challenge through a theoretically driven and contextually relevant intervention.

Building upon existing literature on adolescent health promotion and behavioural change, this thesis integrated evidence-based strategies into a culturally tailored intervention aligned with the socio-environmental realities of Bangladeshi adolescents. The design and implementation of the intervention were informed by established frameworks for behaviour change, beginning with

a behavioural analysis using the COM-B model ^{218 226} and the Theoretical Domains Framework (TDF) ^{228 229} to identify key determinants of tobacco initiation. Based on these determinants, specific Behaviour Change Techniques (BCTs) ²³⁰ were selected, and the intervention was structured using a blended approach of digital and in-person delivery, ensuring relevance to the school setting, as guided by the ABC model ²³⁵ (discussed in Chapter 4). Furthermore, drawing from the Medical Research Council's guidance on complex interventions ^{213 215}, the intervention was systematically developed and piloted to assess its feasibility, acceptability, and potential efficacy within the school setting.

To achieve this, the research first conducted a systematic review of existing school-based interventions targeting adolescent tobacco use prevention in LMICs, identifying effective components and key gaps in the literature. This was followed by a large-scale school-based survey in Dhaka to determine the prevalence of tobacco use, associated risk factors, and the relationship between tobacco use and common mental disorders such as anxiety and depression. These findings provided a comprehensive understanding of adolescent tobacco use within the local context, assessed existing preventive efforts, and captured students' perspectives on tobacco prevention interventions. This empirical groundwork informed the subsequent development of a theoretically grounded intervention, applying behaviour change principles and expert consensus to ensure both contextual and methodological rigour.

Additionally, a qualitative study involving students, teachers, and parents was conducted to ensure cultural relevance and adherence to the principles of Patient and Public Involvement and Engagement. The insights from this qualitative study guided the cultural adaptation of the intervention to enhance its acceptability and feasibility. The intervention was then pilot-tested through a feasibility cluster randomised controlled trial (C-RCT), allowing for an assessment of implementation fidelity, acceptability, and its preliminary effects on adolescent tobacco-related behaviours and intentions, as well as broader indicators of health, well-being, and life skills. Finally, a parallel process evaluation was undertaken to explore participants' and teachers' perspectives

on the implementation and perceived efficacy of the intervention, engagement levels, and potential areas for refinement in preparation for a definitive trial.

8.2 Summary of findings

The first study systematically reviewed and meta-analysed school-based tobacco prevention interventions for adolescents in LMICs, evaluating their effectiveness and identifying the BCTs used. A total of 27 studies were narratively synthesised, with 20 studies meta-analysed, covering a diverse range of interventions implemented across various countries, including Brazil, India, China, and Pakistan. The findings demonstrated that school-based interventions were effective in reducing adolescent tobacco initiation, with shorter interventions achieving greater effect than those with higher contact time. Furthermore, interventions with a lower risk of bias exhibited stronger preventive effects, reinforcing the need for rigorous study designs in future evaluations. A key contribution of this study was the identification of the BCTs used across the interventions, which provided critical insights into the mechanisms driving behaviour change in terms of tobacco use. The most commonly used BCTs were problem solving, goal setting, commitment, information about health consequences, information about emotional consequences, information about social and environmental consequences, salience of consequences, reducing negative emotions, verbal persuasion about capability, and restructuring the social environment. These findings provided valuable insights into the most frequently applied strategies in school-based interventions across LMICs. While not all of these BCTs were directly incorporated into the intervention developed in this thesis, several informed its design, alongside findings from the school-based survey and expert workshop. This study highlighted the need for structured, theory-driven, and contextually relevant school-based interventions and served as an empirical foundation for the later stages of this thesis.

The second study was a large-scale school-based survey that examined the prevalence and determinants of ever and current tobacco use among adolescents in Dhaka, Bangladesh. The findings revealed that 16% of

adolescents had experimented with tobacco, while 7.3% were current users, with cigarette smoking being the most common form. Males and older adolescents had significantly increased odds of tobacco use, and exposure to second-hand smoke (SHS) and tobacco advertising were identified as key risk factors. Conversely, receiving anti-tobacco education was associated with a reduced likelihood of tobacco initiation, highlighting the importance of school-based preventive efforts. This study also explored the relationship between tobacco use and adolescent mental health, revealing that both ever and current tobacco users had increased odds of experiencing symptoms of depression and anxiety. Notably, exposure to SHS at home was linked to higher risks of mental health symptoms even among non-users. In addition to assessing prevalence and risk factors, the study explored adolescents' perspectives on tobacco prevention interventions, revealing strong support (86%) for implementing such programmes in schools. A substantial proportion also advocated for interventions that address household tobacco use, recognising the role of parental tobacco use in influencing adolescent behaviour. Preferences regarding a potential school-based tobacco prevention intervention delivery indicated a strong inclination towards expert-led sessions, averaging four sessions of approximately 30 minutes each. When asked about the possible contents of the intervention, students emphasised the need for “awareness-raising”, “psychological skills development”, “healthy lifestyle promotion”, “behavioural monitoring”, “moral and religious education”, and “family engagement”. These findings provided crucial empirical insights that informed the development of the intervention in this thesis, ensuring alignment with the needs and preferences of Bangladeshi adolescents.

A brief school-based intervention, the Intervention for Adolescent Tobacco Initiation Prevention (IATIP), was developed to promote the health and well-being of adolescents in Dhaka, Bangladesh, informed by the mapping of BCTs and core components identified in Study 1 and insights from Study 2. The refinement of the IATIP intervention followed a formative mixed-methods approach through a one-day expert consensus workshop. This workshop systematically evaluated the intervention's structure, session content, learning objectives, and mode of delivery through guided discussions and structured

prioritisation exercises. Key findings indicated that while the intervention was well-conceptualised, refinements were necessary to enhance engagement, simplify content, and improve alignment with adolescent experiences. Experts recommended reducing content density by merging overlapping sub-sessions and removing redundant activities. Specific suggestions included replacing statistical prevalence data with more impactful risk messages, avoiding stigmatising imagery, and framing goal-setting exercises as private rather than shared activities. Mental well-being was identified as a critical component, with participants advocating for removing clinical terminology in favour of more relatable discussions on emotional regulation and coping strategies. Additionally, the advocacy component was reframed as peer support to enhance accessibility and relevance for adolescents. Quantitative rankings reinforced the need for simplification and prioritisation, highlighting health-related consequences, interactive discussions, role-playing, decision-making exercises, and stress management techniques as key elements for engaging adolescents. These findings guided structured revisions of the IATIP intervention, ensuring it was theoretically grounded, evidence-based, and culturally tailored to the needs of Bangladeshi adolescents.

The third study employed a qualitative approach to culturally adapt the IATIP intervention by gathering insights from school adolescents, teachers, and parents through focus group discussions. This study explored the suitability of the intervention's content, its cultural and linguistic relevance, and potential implementation challenges. Findings indicated strong support for the intervention, with participants praising its relevance and comprehensiveness. However, they identified areas requiring refinement to enhance clarity, engagement, and practicality. Students emphasised the need for simplified language and interactive elements, such as role-playing and 3D animations, while teachers suggested fear-based visuals to reinforce health risks. Mental well-being was recognised as an essential component, with participants advocating for discussions on emotional resilience, social pressures, and stress management. Cultural considerations included integrating religious and moral perspectives, as many participants believed framing tobacco use as a religiously discouraged behaviour would enhance prevention efforts. Teachers

highlighted the social acceptance of smokeless tobacco, stressing the need to address this issue, while parents emphasised the importance of family involvement and suggested embedding tobacco prevention education within school curricula. Regarding practical implementation, expert-led, classroom-based sessions were preferred over peer-led or online formats. Time constraints during exam periods were noted as a potential barrier for implementation, though parents expressed strong willingness to support the initiative. These insights informed the final adaptation of the IATIP intervention, ensuring its content, delivery, and implementation strategies aligned with the socio-cultural and practical realities of Bangladeshi adolescents.

The fourth study was a pilot feasibility C-RCT evaluating the feasibility, acceptability, and potential efficacy of the IATIP intervention in preventing tobacco initiation and promoting adolescent health and well-being in Dhaka, Bangladesh. The IATIP consisted of three 40-minute interactive sessions delivered over three consecutive days. A total of 1,396 students from eight schools were recruited, achieving a high recruitment rate (88.4%) and low attrition (3.5%), demonstrating the intervention's feasibility in a school setting. Fidelity to the intervention protocol was over 95%, and nearly all students (94.6%) rated the sessions as highly acceptable. Schools generally accommodated the intervention's duration, though one school imposed a minor adjustment to session lengths. Primary feasibility outcomes indicated that the IATIP was well-integrated into the school setting with strong student engagement and adherence.

The trial also explored potential efficacy by assessing changes in tobacco-related attitudes and intentions, refusal skills, decision-making abilities, and mental well-being. Outcome measures were analysed using multilevel logistic regression for binary outcomes, multilevel ordinal logistic regression for ordinal outcomes, and multilevel linear regression for continuous variables, adjusting for clustering and baseline measures as fixed effects. Both complete-case analyses and intention-to-treat analyses using last observation carried forward were conducted. The intervention demonstrated promising efficacy, with statistically significant reductions in intention to use tobacco among intervention

participants compared with the control group. Furthermore, students in the intervention group exhibited improvements in mental well-being, refusal skills, and decision-making abilities, highlighting its broader benefits beyond tobacco prevention. Students in the intervention group showed greater confidence in resisting peer pressure and making informed choices regarding tobacco use. Implementation assessment identified minor challenges, including weather-related disruptions and academic pressures affecting session attendance. Reasons for participant withdrawal included lack of perceived personal relevance and familial disinterest. However, overall engagement remained high, indicating the practicality of delivering IATIP in school settings. Finally, the economic evaluation demonstrated that the IATIP was cost-effective, with an incremental cost-effectiveness ratio of £57.8 per additional reduction in the intention to use tobacco. This means that, compared to the control group, the intervention costs £57.78 for each additional person who changes their intention to use tobacco from “YES” to “NO”. This result provides actionable evidence for the financial viability of scaling the intervention, though further research is warranted to confirm long-term outcomes and broader applicability. Overall, these findings support the IATIP as a culturally tailored, evidence-based intervention that is feasible, acceptable, and has the potential to prevent tobacco initiation while enhancing adolescent well-being.

The fifth and final study of this PhD was a process evaluation aimed at exploring participants’ perceptions of the efficacy of the IATIP intervention and identifying areas for future improvement. Findings revealed that the IATIP was highly regarded by both students and teachers, with participants reporting increased awareness of the harms of tobacco, enhanced problem-solving, decision-making, and refusal skills, and encouraged knowledge-sharing with peers and family. Students also described sharing their knowledge with peers and family members. Teachers praised the structured content and delivery approach, noting observable improvements in students’ attitudes and behaviours. While the intervention was well-received, participants highlighted areas for refinement to further enhance the intervention’s relevance and engagement. Content expansions were recommended to include information on electronic cigarettes and screen addiction, reflecting emerging adolescent

health concerns in Bangladesh. Delivery modifications were suggested, including optimising session length, scheduling follow-up sessions, incorporating external health experts, and facilitating peer-led discussions to enhance engagement and scalability. Smaller group sizes were also suggested to improve interaction. Overall, the process evaluation confirmed the high acceptability and perceived efficacy of the IATIP intervention in preventing adolescent tobacco initiation and promoting health and well-being. By addressing these recommendations, the IATIP intervention holds promise as a scalable school-based health promotion model in LMICs.

8.3 Strengths

This thesis offers several methodological, theoretical, and practical strengths, making a significant contribution to adolescent tobacco prevention research in the context of LMICs, particularly Bangladesh. By employing a rigorous multi-stage design, this thesis systematically addressed key gaps in the literature, developed an evidence-based intervention, and evaluated its feasibility, acceptability, and potential efficacy in a real-world school setting. The integration of multiple research methods, including a systematic review, cross-sectional survey, qualitative research, an expert consensus workshop, a pilot feasibility C-RCT, and process evaluation, provides a comprehensive framework for understanding and addressing adolescent tobacco initiation and prevention while also promoting adolescent health and well-being.

A key strength of this thesis is its rigorous, multi-stage research design. The systematic review and meta-analysis (Study 1) adhered to PRISMA guidelines³³⁰ and employed robust statistical techniques to assess the effectiveness of school-based tobacco prevention interventions in LMICs. The large-scale school-based survey (Study 2), involving 2,593 participants, provided ample statistical power to estimate prevalence and assess associations with high precision. This study also used validated diagnostic tools (PHQ-9 for depression and GAD-7 for anxiety) to explore the relationship between tobacco use and mental health, marking the first study of its kind in Bangladesh. The inclusion of both smoked and smokeless tobacco ensured a comprehensive assessment of

adolescent tobacco behaviours. The IATIP refinement workshop with experts and the cultural adaptation with students, teachers, and parents using focus groups (Study 3) were further methodological strengths, each providing a rich dataset of expert and key stakeholder recommendations that significantly enhanced the validity, cultural relevance, and applicability of the intervention. The participatory and iterative approach ensured that the intervention was contextually appropriate and aligned with the needs of Bangladeshi adolescents, reinforcing the importance of mixed-methods research in refining behavioural health interventions. The pilot feasibility C-RCT (Study 4) was conducted with high methodological rigour, employing multilevel statistical analyses, including logistic, ordinal logistic, and linear regression models, adjusting for baseline differences and clustering effects within schools. The use of both complete-case and intention-to-treat analyses strengthened the robustness of findings. High recruitment and retention rates, along with fidelity exceeding 95%, demonstrated the practical feasibility of delivering IATIP in school settings. Economic evaluations are often overlooked in feasibility trials; therefore, the inclusion of a cost-effectiveness analysis was a significant strength. This policy-relevant insight informs scalability and sustainability considerations.

This thesis makes an important theoretical contribution by integrating multiple behaviour change models to develop a structured theory-driven, evidence-based intervention. The IATIP intervention was guided by the COM-B model, the TDF, and BCTs, ensuring a systematic approach to targeting key psychological and social determinants of tobacco initiation. The systematic mapping of BCTs in Study 1 offers new insights into effective adolescent tobacco prevention strategies in LMICs, serving as a valuable reference for future interventions. Additionally, this thesis contributes to the expanding field of adolescent health research by incorporating mental well-being components within a tobacco prevention programme. Unlike traditional tobacco prevention programmes that focus solely on knowledge and refusal skills ⁹⁸, the IATIP intervention incorporated mental well-being components, addressing broader psychosocial factors such as emotional regulation, problem-solving, and stress/depression/anxiety management. This holistic approach enhances the

long-term impact of the intervention by equipping adolescents with life skills that extend beyond tobacco use prevention.

Beyond its methodological and theoretical contributions, this thesis has strong practical strengths that enhance its real-world applicability. Although adolescents were not directly involved in the formal co-design of the intervention, an implicit co-design approach was adopted during the early development phase by incorporating insights gathered from a large-scale school-based survey (Chapter 3). These perspectives informed the design of IATIP, particularly in relation to content relevance, delivery preferences, and adolescent needs. Further cultural adaptation was guided by qualitative input from adolescents, parents, and teachers, ensuring that the intervention was contextually appropriate and aligned with the socio-cultural norms of Bangladeshi schools. The school-based nature of the intervention supports its potential scalability, as schools provide an accessible and structured setting for adolescent health promotion. The process evaluation (Study 5) offered valuable insights into feasibility and acceptability, with 95% of students rating the sessions as highly engaging and relevant. While a formal cost-effectiveness analysis was beyond the scope of this feasibility study, preliminary cost data were collected to inform future planning for economic evaluation and implementation at scale.

A unique strength of this thesis is its comprehensive visual documentation of the IATIP's field implementation (see Appendix 8.1). The inclusion of photographs and a video documentary capturing the intervention delivery and participant engagement provides a transparent, real-world account of implementation. Additionally, the participatory nature of the intervention, which involved co-producing outputs with students, truly engaged them in the programme and documented their efforts for posterity. This documentation not only enhances the replicability of the intervention for future studies but also serves as a valuable resource for researchers, policymakers, and public health practitioners interested in school-based tobacco prevention programmes.

8.4 Limitations

While this thesis makes important contributions to the field of adolescent tobacco prevention and mental well-being, several limitations must be acknowledged when interpreting the findings and planning future research.

First, the systematic review and meta-analysis (Study 1) included a substantial proportion of studies with high risk of bias (RoB), particularly regarding outcome measurement and reporting, which may have influenced the estimated intervention effects. While sensitivity analyses confirmed the robustness of the intervention effect, the reliance on self-reported tobacco use outcomes, without biochemical validation, increases the risk of social desirability bias.

Furthermore, some included studies failed to account for clustering effects in their design, requiring statistical adjustments that may introduce residual bias. Additionally, although meta-regression suggested shorter contact time was associated with greater intervention effectiveness, this conclusion was not based on direct comparisons and should therefore be interpreted cautiously. Due to limited availability of longitudinal data, tobacco use prevalence was used as a proxy outcome, which does not directly assess prevention effectiveness among baseline non-users.

Second, the cross-sectional school-based survey (Study 2) limited causal inference due to its observational nature. Data were self-reported and may have been affected by recall and reporting bias, particularly for stigmatised behaviours such as female tobacco use in the Bangladeshi context. Moreover, although schools were purposively selected from diverse socio-economic areas, the absence of random sampling and the urban Dhaka setting may limit generalisability to rural or other educational contexts. Important confounders, such as socioeconomic status and parental mental health, were not measured and may have influenced the findings.

Third, the qualitative cultural adaptation study (Study 3) was limited by its small sample size, particularly among adolescents and parents, and by potential interpretation bias due to single-researcher coding. The expert consensus

workshop used to refine the intervention followed a Delphi-like approach, but did not adhere to the full Delphi methodology due to practical constraints. A full Delphi study typically involves multiple iterative rounds, structured quantitative scoring, and broader expert engagement to reach consensus³³¹. In contrast, this study adopted a one-time structured workshop to gather expert feedback, prioritise intervention components, and refine the IATIP content. While this pragmatic approach enabled timely and relevant modifications to the intervention, it may have limited the depth of iterative feedback that a full Delphi process would have provided. Future intervention refinement efforts should consider implementing a more rigorous Delphi methodology to enhance the validity and replicability of expert-driven content adaptations. Furthermore, adolescents – the primary target group – were not directly involved in the intervention design. Although their insights were implicitly integrated through findings from the school-based survey, a formal co-design approach was not undertaken, limiting the participatory rigour of the intervention development process. This decision was informed by practical and developmental considerations. Future work should incorporate structured adolescent engagement to strengthen the relevance and acceptability of the intervention.

Fourth, the pilot feasibility cluster RCT (Study 4) was constrained by several factors. The use of self-reported data introduced the potential for reporting bias despite measures to ensure confidentiality and the use of validated tools. Originally, the trial aimed to assess behavioural outcomes (i.e., tobacco use) at a six-month follow-up. However, due to time limitations, the follow-up was reduced to one month, and tobacco use intention was used as a proxy. While this is a valid early indicator of behavioural change, it does not provide evidence of sustained or actual behaviour change. Additionally, the trial was conducted solely in urban schools, limiting generalisability. Operational challenges such as variations in school schedules and competing academic priorities posed difficulties for standardised intervention delivery across schools. A notable implementation limitation was the inability to deliver the dedicated parent-focused session that was originally designed as part of the IATIP intervention. Due to time and financial constraints, this component could not be conducted as planned. Given that parental involvement is a key factor in adolescent tobacco

prevention, their participation could have reinforced anti-tobacco messaging at home, strengthened parent-child communication on tobacco risks, and provided additional social support to sustain behaviour change. While school-based interventions can be highly effective, adolescent behaviours are often shaped by family environments, making parental engagement a critical component of comprehensive prevention efforts. Future implementation of the IATIP should prioritise integrating parental sessions, potentially through flexible scheduling, digital resources, or home-based activities, to maximise intervention effectiveness.

Fifth, the qualitative process evaluation (Study 5) was limited by a small sample size, and findings may not be fully generalisable to all school settings. As data were collected shortly after the one-month follow-up period, and thus the study does not assess long-term changes in attitudes, knowledge, and behaviours. Practical challenges, such as session scheduling and coordination with school authorities, also underscored barriers to scaling the intervention. While the fidelity data collection benefited from multiple sources (independent observers, student reports, and intervention operator logs), future studies may benefit from integrating automated or digital fidelity tracking tools for more scalable monitoring.

Finally, while this thesis successfully developed and tested a culturally relevant and theoretically grounded intervention, its scalability and real-world implementation remain to be evaluated. A definitive full-scale trial with longer follow-up, rural inclusion, and strengthened implementation fidelity will be necessary to assess the intervention's effectiveness and long-term impact on adolescent tobacco use and mental well-being.

8.5 Implications

This thesis offers important implications for research, policy, and practice in the field of adolescent tobacco prevention and public health in LMICs. The findings contribute both theoretically and empirically to the understanding of adolescent

tobacco use and the development and delivery of school-based interventions. The systematic development, cultural adaptation, feasibility testing, and process evaluation of the IATIP intervention provide practical insights to guide future research and implementation strategies.

8.5.1 Implications for research

This thesis advances research in adolescent tobacco prevention in several ways. The systematic review and meta-analysis (Study 1) addressed a major gap by synthesising the effectiveness of school-based interventions in LMICs and identifying common features of successful programmes. The mapping of BCTs within these interventions contributed to the theoretical advancement of intervention design by revealing which mechanisms may underlie effectiveness in resource-constrained settings.

The school-based survey (Study 2) generated original epidemiological data on tobacco use patterns among adolescents in Bangladesh and identified associations with mental health, peer influence, and socio-environmental factors. The use of validated instruments enhances the reliability and comparability of findings, offering a methodological blueprint for future research in similar contexts. The cultural adaptation study (Study 3) reinforced the value of tailoring interventions to sociocultural norms and beliefs, emphasising the importance of incorporating religion, family values, and culturally resonant materials into adolescent health promotion. While a formal co-design process with adolescents was not undertaken, their views – elicited through earlier quantitative and qualitative studies – were used to inform the intervention indirectly. Future research should explore more explicit co-design approaches with adolescents to enhance relevance and ownership.

A key research implication of this thesis is the integration of mental health promotion within tobacco prevention strategies. The findings demonstrate that addressing emotional regulation, decision-making, and psychological skills alongside tobacco education enhances intervention effectiveness. This thesis underscores the need for interdisciplinary research bridging public health,

psychology, and behavioural sciences to develop multi-faceted adolescent health interventions.

The feasibility trial (Study 4) demonstrated high recruitment and retention rates and acceptable levels of fidelity, practicality, and participant engagement. Although the study was not powered to test efficacy, the findings offer preliminary indications of potential effects and inform the selection of outcome measures and implementation strategies for future full-scale trials.

8.5.2 Implications for policy

The findings of this thesis support the inclusion of structured, school-based tobacco prevention programmes within national adolescent health strategies. Despite the limited policy emphasis on adolescent tobacco use in Bangladesh, the strong engagement observed in this trial suggests that school-based platforms are viable and well-accepted. The identification of key environmental and behavioural risk factors – including exposure to second-hand smoke, tobacco advertising, lack of prevention education, and the influence of peer norms – highlights areas where existing tobacco control policies could be strengthened ^{32 114}. Moreover, the study contributes to wider adolescent health policy by demonstrating how school-based interventions can be designed to support broader objectives, such as life skills development, emotional resilience, and health literacy. Although this feasibility study did not include a formal cost-effectiveness evaluation, it provides foundational data on the direct costs associated with delivering the intervention. Such information can inform future economic evaluations and policymaking. The findings also suggest that collaboration across sectors (education, health, community organisations) may be key to implementing sustainable, low-cost interventions in LMIC settings.

8.5.3 Implications for practice

Practically, this thesis provides evidence that brief, culturally tailored, school-based interventions can be feasibly implemented in LMIC contexts and resonate well with adolescents. Students responded positively to interactive

learning, structured content, and the integration of real-life challenges into the intervention material. Teachers played an important facilitative role, suggesting that training and involving school staff could enhance scalability.

Findings from the process evaluation (Study 5) offer practical guidance for improving programme delivery. Recommendations include: aligning session duration with school schedules; enhancing content interactivity; incorporating emerging adolescent issues (e.g., e-cigarette use, screen time); and trialling flexible delivery formats, such as peer-led or teacher-facilitated models. Strengthening parental engagement, which was not fully realised in this study, remains a priority for future iterations. Given the influence of family context on adolescent behaviour, future practice should include strategies for integrating parents, whether through direct sessions, take-home resources, or digital formats.

Additionally, the documentation of real-world implementation (Appendix 8.1) provides a valuable visual reference for practitioners, funders, and policymakers seeking to replicate or adapt similar programmes in comparable settings.

Overall, the findings from this thesis contribute to a growing body of evidence supporting school-based adolescent tobacco prevention. The IATIP model, while still requiring further testing in a full-scale trial, offers a structured, theory-driven, and contextually sensitive approach to adolescent health promotion. Future research, policy, and practice should build on this foundation to deliver scalable, sustainable interventions that address the multifaceted determinants of tobacco use and support the broader well-being of adolescents in LMICs.

8.6 Future research

The findings of this thesis highlight several key areas for future research to enhance the development, implementation, and evaluation of adolescent tobacco prevention interventions in LMICs. While the IATIP intervention demonstrated high feasibility, acceptability, and promising indications of

potential efficacy, further research is essential to assess long-term outcomes, broader applicability, and effective delivery models in diverse contexts.

A primary direction for future research is the implementation of a definitive large-scale C-RCT to evaluate the intervention's long-term effectiveness. While the pilot feasibility trial generated important preliminary insights, the short follow-up duration (one month) limits robust conclusion about sustained behavioural change. Future studies should therefore incorporate extended follow-up periods (e.g., six or twelve months) to assess whether observed improvements, particularly reductions in intention to use tobacco and enhancements in mental well-being, are maintained over time ^{332 333}. Importantly, future trials should also evaluate the intervention's impact on actual tobacco use behaviours, rather than relying solely on intention to initiate tobacco use, which, while a strong predictor, does not directly measure behavioural change ⁹⁹.

Future research should also examine scalable and sustainable delivery formats. While the current intervention was facilitated by the principal researcher and trained operators, further trials should explore alternative models, including teacher-led, peer-facilitated, or hybrid digital approaches. Investigating these delivery modes will help identify cost-efficient strategies that align with the realities of resource-constrained education systems ³³⁴. Although a formal cost-effectiveness analysis was beyond the scope of this feasibility study, forthcoming research should incorporate economic evaluations to inform resource allocation, support policy translation, and guide large-scale implementation decisions ³³⁵⁻³³⁷.

Another priority is the cultural and contextual adaptation of IATIP for delivery in diverse geographic and socio-economic settings. This feasibility trial was conducted exclusively in urban Dhaka, which limits generalisability to rural or marginalised communities, where cultural norms, tobacco use patterns, and infrastructure may differ substantially. Future research should therefore explore the intervention's adaptability in rural schools and among under-represented populations to enhance external validity and equity.

Parental involvement remains an unexplored yet critical component of adolescent tobacco prevention. While this thesis initially designed a parental intervention module, it was not implemented due to feasibility constraints. Future research should investigate effective strategies for engaging parents in adolescent health interventions, whether through structured parent sessions, digital platforms, or take-home resources ^{338 339}. Given the strong influence of family environments on adolescent behaviour, parental engagement may enhance intervention effectiveness and sustainability.

In addition, future studies could adopt more participatory research designs, including co-design methods, to strengthen adolescent engagement in intervention development. While this thesis incorporated adolescent perspectives indirectly through surveys and formative interviews, structured co-design approaches – such as participatory workshops or youth advisory panels – could enhance relevance, foster ownership, and improve implementation fidelity.

Finally, app-based digital interventions represent an emerging area of interest for adolescent health promotion. With the raising of smartphone usage among children, adolescents and young people in Bangladesh ^{340 341} and other LMICs ³⁴², smartphone applications (apps) could offer a scalable and cost-effective approach to tobacco prevention. Future research should explore hybrid models that integrate face-to-face school-based components with digital tools, such as interactive mobile app-based or gamified tools to reinforce learning, monitor progress, and increase engagement ³⁴³. Evidence suggests that app-based interventions, when designed with user engagement and behaviour change principles, may improve adherence and long-term outcomes compared to traditional in-person interventions ^{344 345}. Future trials should assess the feasibility, engagement metrics, and effectiveness of such digital interventions, particularly for delivering tailored content, tracking behavioural progress, and providing real-time feedback to adolescents.

8.7 Final remarks

This thesis represents a comprehensive and methodologically rigorous effort to develop, implement, and evaluate a culturally adapted, school-based intervention for preventing tobacco initiation and promoting mental well-being among adolescents in Bangladesh. By combining systematic evidence synthesis, stakeholder-informed intervention development, and feasibility testing, the research provides valuable insights for advancing adolescent health promotion in Bangladesh and comparable LMICs.

The findings offer promising evidence that school-based interventions, when grounded in behaviour change theory and tailored to local sociocultural contexts, can be both feasible and acceptable for adolescent populations. The IATIP intervention was delivered successfully within urban school settings, achieving high recruitment and retention rates, strong fidelity to protocol, and favourable responses from students and teachers. Notably, the integration of mental well-being components within the tobacco prevention framework reflects a holistic approach to adolescent health, which is increasingly recognised as essential in global health strategies.

While the pilot trial was not designed to establish intervention efficacy, the observed short-term improvements in refusal skills, decision-making, and mental well-being provide a useful indication of potential benefits, warranting further investigation. However, several challenges remain. The short follow-up period limited the ability to assess sustained behavioural change, and the absence of a parent-focused component constrained the intervention's reach within the adolescent social environment. Moreover, the trial was restricted to urban schools, raising questions about generalisability to rural or socio-economically diverse settings.

Although an initial economic assessment was considered, this thesis recognises that a formal cost-effectiveness evaluation lies beyond the scope of a feasibility study. Instead, the focus was placed on estimating the direct costs of intervention delivery to inform future planning and resource allocation.

Subsequent trials should explore scalable delivery models, such as teacher-led or digital formats, and conduct robust economic evaluations to support policy adoption.

Looking ahead, future research should prioritise a definitive cluster RCT with extended follow-up to assess long-term behavioural outcomes. Greater emphasis on participatory design involving adolescents, alongside innovative strategies for parental engagement and digital enhancement, could further strengthen intervention relevance and effectiveness. Collaboration with education and public health stakeholders will also be crucial for integrating school-based prevention into national systems.

In conclusion, this thesis contributes important empirical and theoretical knowledge to the field of adolescent tobacco prevention in LMICs. The IATIP intervention offers a promising and contextually grounded model that can inform future research and practice. With continued commitment to evidence-informed, culturally sensitive approaches, there is considerable potential to reduce tobacco initiation and improve adolescent well-being in Bangladesh and comparable settings.

References

1. WHO. Fact sheet on tobacco Geneva, Switzerland: World Health Organization; 2023 [Available from: <https://www.who.int/news-room/fact-sheets/detail/tobacco> accessed February 03, 2025].
2. WHO. WHO report on the global tobacco epidemic, 2023: protect people from tobacco smoke. Geneva: World Health Organization, 2023.
3. Murray CJL, Aravkin AY, Zheng P, et al. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet* 2020;396(10258):1223-49. doi: [https://doi.org/10.1016/s0140-6736\(20\)30752-2](https://doi.org/10.1016/s0140-6736(20)30752-2)
4. Reitsma MB, Kendrick PJ, Ababneh E, et al. Spatial, temporal, and demographic patterns in prevalence of smoking tobacco use and attributable disease burden in 204 countries and territories, 1990-2019: a systematic analysis from the Global Burden of Disease Study 2019. *Lancet* 2021;397(10292):2337-60. doi: 10.1016/S0140-6736(21)01169-7 [published Online First: 2021/05/31]
5. Siddiqi K, Husain S, Vidyasagaran A, et al. Global burden of disease due to smokeless tobacco consumption in adults: an updated analysis of data from 127 countries. *BMC Med* 2020;18(1):222. doi: 10.1186/s12916-020-01677-9 [published Online First: 20200812]
6. Chugh A, Arora M, Jain N, et al. The global impact of tobacco control policies on smokeless tobacco use: a systematic review. *Lancet Glob Health* 2023;11(6):e953-e68. doi: [https://doi.org/10.1016/S2214-109X\(23\)00205-X](https://doi.org/10.1016/S2214-109X(23)00205-X)
7. Siddiqi K, Gupta PC, Prasad VM, et al. Smokeless tobacco use by south Asians. *Lancet Glob Health* 2013;1(2):e71. doi: 10.1016/S2214-109X(13)70021-4 [published Online First: 20130705]
8. Wipfli H, Samet JM. One Hundred Years in the Making: The Global Tobacco Epidemic. *Annu Rev Public Health* 2016;37:149-66. doi: 10.1146/annurev-publhealth-032315-021850 [published Online First: 20160114]
9. Hebbar PB, Dsouza V, Bhojani U, et al. How do tobacco control policies work in low-income and middle-income countries? A realist synthesis. *BMJ Glob Health* 2022;7(11) doi: 10.1136/bmjgh-2022-008859
10. Byron MJ, Cohen JE, Frattaroli S, et al. Implementing smoke-free policies in low- and middle-income countries: A brief review and research agenda. *Tob Induc Dis* 2019;17:60. doi: 10.18332/tid/110007 [published Online First: 20190805]
11. Eriksen PM, Nyman LA, Whitney FC. Global tobacco use and cancer: findings and solutions from the tobacco atlas. Cancer control. 4 ed. USA: Georgia State University, 2014:43-48.

12. CTFK. THE GLOBAL TOBACCO EPIDEMIC Campaign for Tobacco-Free Kids2020 [Available from: https://www.tobaccofreekids.org/assets/global/pdfs/en/global_tobacco_epidemic_en.pdf accessed March 07, 2023].
13. Jha P, Ramasundarahettige C, Landsman V, et al. 21st-century hazards of smoking and benefits of cessation in the United States. *N Engl J Med* 2013;368(4):341-50. doi: 10.1056/NEJMsa1211128 [published Online First: 2013/01/25]
14. Reitsma MB, Flor LS, Mullany EC, et al. Spatial, temporal, and demographic patterns in prevalence of smoking tobacco use and initiation among young people in 204 countries and territories, 1990-2019. *Lancet Public Health* 2021;6(7):e472-e81. doi: [https://doi.org/10.1016/S2468-2667\(21\)00102-X](https://doi.org/10.1016/S2468-2667(21)00102-X) [published Online First: 2021/05/31]
15. Anderson CL, Becher H, Winkler V. Tobacco Control Progress in Low and Middle Income Countries in Comparison to High Income Countries. *Int J Environ Res Public Health* 2016;13(10) doi: 10.3390/ijerph13101039 [published Online First: 2016/10/27]
16. WHO. Adolescent health Geneva, Switzerland: World Health Organization; 2022 [Available from: https://www.who.int/health-topics/adolescent-health#tab=tab_1 accessed Jan 06, 2022].
17. USDHHS. U.S. Department of Health and Human Services. Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health., 2012.
18. Hatsukami DK, Stead LF, Gupta PC. Tobacco addiction. *The Lancet* 2008;371(9629):2027-38. doi: [https://doi.org/10.1016/s0140-6736\(08\)60871-5](https://doi.org/10.1016/s0140-6736(08)60871-5)
19. Birdsey J, Cornelius M, Jamal A, et al. Tobacco Product Use Among U.S. Middle and High School Students - National Youth Tobacco Survey, 2023. *MMWR Morb Mortal Wkly Rep* 2023;72(44):1173-82. doi: 10.15585/mmwr.mm7244a1 [published Online First: 20231103]
20. Steinfeld MR, Torregrossa MM. Consequences of adolescent drug use. *Transl Psychiatry* 2023;13(1):313. doi: 10.1038/s41398-023-02590-4 [published Online First: 20231006]
21. Goriounova NA, Mansvelder HD. Nicotine exposure during adolescence alters the rules for prefrontal cortical synaptic plasticity during adulthood. *Front Synaptic Neurosci* 2012;4:3. doi: 10.3389/fnsyn.2012.00003 [published Online First: 20120802]
22. Castro EM, Lotfipour S, Leslie FM. Nicotine on the developing brain. *Pharmacol Res* 2023;190:106716. doi: 10.1016/j.phrs.2023.106716 [published Online First: 20230301]

23. Komiyama M, Swati M, Yamakage H, et al. Effect of smoking initiation age on nicotine dependence. *European Heart Journal* 2023;44(Supplement_2) doi: 10.1093/eurheartj/ehad655.2527
24. DiFranza JR, Savageau JA, Fletcher K, et al. Symptoms of tobacco dependence after brief intermittent use: the Development and Assessment of Nicotine Dependence in Youth-2 study. *Arch Pediatr Adolesc Med* 2007;161(7):704-10. doi: 10.1001/archpedi.161.7.704
25. WHO. WHO global report on trends in prevalence of tobacco use 2000-2025. Fourth edition ed, 2021.
26. WHO. WHO report on the global tobacco epidemic 2019: offer help to quit tobacco use. World Health Organization 2019 [Available from: <https://www.who.int/publications/i/item/9789241516204>].
27. Stone E, Peters M. Young low and middle-income country (LMIC) smokers-implications for global tobacco control. *Transl Lung Cancer Res* 2017;6(Suppl 1):S44-S46. doi: <https://doi.org/10.21037/tlcr.2017.10.11> [published Online First: 2018/01/05]
28. Kendrick PJR, M. B.; Abbasi-Kangevari, M.; Abdoli, A. et. al. Spatial, temporal, and demographic patterns in prevalence of chewing tobacco use in 204 countries and territories, 1990-2019: a systematic analysis from the Global Burden of Disease Study 2019. *Lancet Public Health* 2021;6(7):e482-e99. doi: 10.1016/S2468-2667(21)00065-7 [published Online First: 20210528]
29. CDC. Youth and Tobacco Use Centers for Disease Prevention and Control. Available from: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/youth_data/tobacco_use/index.htm2022 [Available from: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/youth_data/tobacco_use/index.htm accessed March 07, 2023].
30. WHO. WHO global report on trends in prevalence of tobacco smoking 2000–2025. Second edition ed. Geneva, Switzerland, 2018.
31. Bafunno D, Catino A, Lamorgese V, et al. Impact of tobacco control interventions on smoking initiation, cessation, and prevalence: a systematic review. *J Thorac Dis* 2020;12(7):3844-56. doi: 10.21037/jtd.2020.02.23
32. Chung-Hall J, Craig L, Gravely S, et al. Impact of the WHO FCTC over the first decade: a global evidence review prepared for the Impact Assessment Expert Group. *Tob Control* 2019;28(Suppl 2):s119-s28. doi: 10.1136/tobaccocontrol-2018-054389 [published Online First: 20180607]
33. Conner M, Grogan S, Simms-Ellis R, et al. Do electronic cigarettes increase cigarette smoking in UK adolescents? Evidence from a 12-month prospective study. *Tob Control* 2017;27(4):365-72. doi: 10.1136/tobaccocontrol-2016-053539 [published Online First: 20170817]
34. O'Brien D, Long J, Quigley J, et al. Association between electronic cigarette use and tobacco cigarette smoking initiation in adolescents: a systematic

- review and meta-analysis. *BMC Public Health* 2021;21(1):954. doi: 10.1186/s12889-021-10935-1 [published Online First: 20210603]
35. West R. Tobacco smoking: Health impact, prevalence, correlates and interventions. *Psychol Health* 2017;32(8):1018-36. doi: 10.1080/08870446.2017.1325890 [published Online First: 2017/05/30]
 36. Xi B, Liang Y, Liu Y, et al. Tobacco use and second-hand smoke exposure in young adolescents aged 12–15 years: data from 68 low-income and middle-income countries. *The Lancet Global Health* 2016;4(11):e795-e805. doi: 10.1016/s2214-109x(16)30187-5
 37. Altwicker-Hamori S, Ackermann KA, Furchheim P, et al. Risk factors for smoking in adolescence: evidence from a cross-sectional survey in Switzerland. *BMC Public Health* 2024;24(1):1165. doi: 10.1186/s12889-024-18695-4 [published Online First: 20240425]
 38. Roby NU, Hasan MT, Hossain S, et al. Puff or pass: do social media and social interactions influence smoking behaviour of university students? A cross-sectional mixed methods study from Dhaka, Bangladesh. *BMJ Open* 2020;10(11):e038372. doi: 10.1136/bmjopen-2020-038372 [published Online First: 20201103]
 39. WHO. Global adult tobacco survey (GATS): Bangladesh. World Health Organization, Regional Office for South-East Asia, New Delhi 2018 [Available from: <https://extranet.who.int/ncdsmicrodata/index.php/catalog/870> accessed March 06, 2023.
 40. Tactics T. Tobacco Tactics: Bangladesh Country Profile UK: University of Bath; 2024 [updated 13 May 2024. Available from: <https://www.tobaccotactics.org/article/bangladesh-country-profile/> accessed 4 February 2025.
 41. Kibria MG, Hossain A, Islam T, et al. Secondhand smoke exposure and associated factors among city residents living in multiunit housing in Bangladesh. *PLoS One* 2023;18(9):e0291746. doi: 10.1371/journal.pone.0291746 [published Online First: 20230921]
 42. Zafar Ullah AN, Huque R, Akter S, et al. Children's exposure to second-hand smoke at home in Bangladesh: a community survey. *BMJ Open* 2013;3(11):e003059. doi: 10.1136/bmjopen-2013-003059 [published Online First: 20131113]
 43. Siddiqi K, Welch C, Huque R, et al. The Effect of Adult Smoking Behavior on Children's Exposure to Secondhand Smoke. An Analysis Based on Salivary Cotinine Levels Among Children in Dhaka and Karachi. *Nicotine Tob Res* 2024;26(11):1512-20. doi: 10.1093/ntr/ntae130
 44. Ahammed T, Ahmed NU, Uddin MJ. Changes in prevalence, and factors associated with tobacco use among Bangladeshi school students: evidence from two nationally representative surveys. *BMC Public Health* 2021;21(1):579. doi: 10.1186/s12889-021-10623-0 [published Online First: 2021/03/25]

45. Pradhan PM, Niraula SR, Ghimire A, et al. Tobacco use and associated factors among adolescent students in Dharan, Eastern Nepal: a cross-sectional questionnaire survey. *BMJ Open* 2013;3(2) doi: 10.1136/bmjopen-2012-002123 [published Online First: 2013/02/19]
46. Faruque GM, Ahmed M, Huq I, et al. The economic cost of tobacco in Bangladesh: A health cost approach. Bangladesh: Bangladesh Cancer Society., 2020.
47. WHO. Report of first Global School-based Student Health Survey (GSHS), Bangladesh, 2014 World Health Organization. Country Office for Bangladesh2018 [Available from: <https://apps.who.int/iris/handle/10665/330721> accessed January 19, 2022.
48. WHO. Global Youth Tobacco Survey (GYTS): Bangladesh report, 2013: World Health Organization, Regional Office for South-East Asia, New Delhi 2015 [Available from: <https://apps.who.int/iris/handle/10665/164335> accessed January 19, 2022.
49. Khan MMA, Rahman MM, Jeamin SS, et al. Psychosocial and socio-environmental factors associated with adolescents' tobacco and other substance use in Bangladesh. *PLoS One* 2020;15(11):e0242872. doi: 10.1371/journal.pone.0242872 [published Online First: 2020/11/25]
50. Anee US, Mahmud HMM, Islam A, et al. Tobacco Industry Branding Strategies and Its Influence on Young Adults. *Asian Pac J Cancer Prev* 2021;22(S2):81-88. doi: 10.31557/APJCP.2021.22.S2.81 [published Online First: 20211101]
51. Khan JR, Raheem E, Daniel M. The prevalence and correlates of tobacco use among 7-9th grade students in Bangladesh. *Children and Youth Services Review* 2019;104 doi: 10.1016/j.childyouth.2019.104406
52. Weiger C, Grant A, Cohen J. Technical Report on Tobacco Marketing at the Point-of-Sale in Dhaka, Bangladesh: Product Display, Advertising, and Promotion around Secondary Schools. Baltimore, USA: Institute for Global Tobacco Control, Johns Hopkins Bloomberg School of Public Health, 2016:19.
53. Doll R, Peto R. The Causes of Cancer: Quantitative Estimates of Avoidable Risks of Cancer in the United States Today. *JNCI: Journal of the National Cancer Institute* 1981;66(6):1192-308. doi: 10.1093/jnci/66.6.1192
54. Cornfield J, Haenszel W, Hammond EC, et al. Smoking and Lung Cancer - Recent Evidence and a Discussion of Some Questions. *Jnci-J Natl Cancer* / 1959;22(1):173-203. doi: <https://doi.org/10.1093/jnci/22.1.173>
55. Schairer E, Schoniger E. Lung cancer and tobacco consumption. *Int J Epidemiol* 2001;30(1):24-7; discussion 30-1. doi: 10.1093/ije/30.1.24
56. Doll R, Hill AB. A study of the aetiology of carcinoma of the lung. *Br Med J* 1952;2(4797):1271-86. doi: 10.1136/bmj.2.4797.1271

57. Stocks P, Campbell JM. Lung cancer death rates among non-smokers and pipe and cigarette smokers; an evaluation in relation to air pollution by benzpyrene and other substances. *Br Med J* 1955;2(4945):923-9. doi: 10.1136/bmj.2.4945.923
58. Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ* 2004;328(7455):1519. doi: 10.1136/bmj.38142.554479.AE [published Online First: 2004/06/24]
59. Dorn HF. Tobacco Consumption and Mortality from Cancer and Other Diseases. *Public Health Reports (1896-1970)* 1959;74(7) doi: 10.2307/4590516
60. Wolf PA. Cigarette Smoking as a Risk Factor for Stroke. *Jama* 1988;259(7) doi: 10.1001/jama.1988.03720070025028
61. Freund KM, Belanger AJ, D'Agostino RB, Kannel WB. The health risks of smoking. The Framingham Study: 34 years of follow-up. *Ann Epidemiol* 1993;3(4):417-24. doi: 10.1016/1047-2797(93)90070-k
62. Reitsma MB, Fullman N, Ng Mea. Smoking prevalence and attributable disease burden in 195 countries and territories, 1990-2015: a systematic analysis from the Global Burden of Disease Study 2015. *Lancet* 2017;389(10082):1885-906. doi: 10.1016/S0140-6736(17)30819-X [published Online First: 20170405]
63. Soleimani F, Dobaradaran S, De-la-Torre GE, et al. Content of toxic components of cigarette, cigarette smoke vs cigarette butts: A comprehensive systematic review. *Sci Total Environ* 2022;813:152667. doi: 10.1016/j.scitotenv.2021.152667 [published Online First: 20211225]
64. Jha P, Peto R. Global effects of smoking, of quitting, and of taxing tobacco. *N Engl J Med* 2014;370(1):60-8. doi: 10.1056/NEJMr1308383
65. Contreary KA, Chattopadhyay SK, Hopkins DP, et al. Economic Impact of Tobacco Price Increases Through Taxation: A Community Guide Systematic Review. *Am J Prev Med* 2015;49(5):800-08. doi: 10.1016/j.amepre.2015.04.026 [published Online First: 20150715]
66. CDC. Tobacco Use : Smoking & Secondhand Smoke. CDC Vital Signs. United States: National Center for Chronic Disease Prevention and Health Promotion (U.S.). Office of Smoking and Health., 2010:8.
67. Conway KP, Green VR, Kasza KA, et al. Co-occurrence of tobacco product use, substance use, and mental health problems among youth: Findings from wave 1 (2013-2014) of the population assessment of tobacco and health (PATH) study. *Addict Behav* 2018;76:208-17. doi: 10.1016/j.addbeh.2017.08.009 [published Online First: 20170818]
68. Novak G, Seeman P, Le Foll B. Exposure to nicotine produces an increase in dopamine D2(High) receptors: a possible mechanism for dopamine hypersensitivity. *Int J Neurosci* 2010;120(11):691-7. doi: 10.3109/00207454.2010.513462 [published Online First: 2010/10/15]

69. ASH. Smoking and Mental Health. Action on Smoking and Health. Available from: <https://ash.org.uk/resources/view/smoking-and-mental-health#ref162019> [Available from: <https://ash.org.uk/resources/view/smoking-and-mental-health#ref16>.]
70. Lawrence D, Mitrou F, Zubrick SR. Smoking and mental illness: results from population surveys in Australia and the United States. *BMC Public Health* 2009;9:285. doi: 10.1186/1471-2458-9-285 [published Online First: 2009/08/12]
71. Boksa P. Smoking, psychiatric illness and the brain. *J Psychiatry Neurosci* 2017;42(3):147-49. doi: 10.1503/jpn.170060 [published Online First: 2017/04/26]
72. Venable PA, Carey MP, Carey KB, Maisto SA. Smoking among psychiatric outpatients: relationship to substance use, diagnosis, and illness severity. *Psychol Addict Behav* 2003;17(4):259-65. doi: 10.1037/0893-164X.17.4.259 [published Online First: 2003/12/04]
73. Prochaska JJ. Smoking and mental illness--breaking the link. *N Engl J Med* 2011;365(3):196-8. doi: 10.1056/NEJMp1105248
74. de Leon J, Diaz FJ. A meta-analysis of worldwide studies demonstrates an association between schizophrenia and tobacco smoking behaviors. *Schizophr Res* 2005;76(2-3):135-57. doi: 10.1016/j.schres.2005.02.010 [published Online First: 2005/06/14]
75. Khantzian EJ. The self-medication hypothesis of substance use disorders: a reconsideration and recent applications. *Harv Rev Psychiatry* 1997;4(5):231-44. doi: 10.3109/10673229709030550 [published Online First: 1997/01/01]
76. Aguilar MC, Gurpegui M, Diaz FJ, de Leon J. Nicotine dependence and symptoms in schizophrenia: naturalistic study of complex interactions. *Br J Psychiatry* 2005;186:215-21. doi: 10.1192/bjp.186.3.215 [published Online First: 2005/03/02]
77. Talati A, Keyes KM, Hasin DS. Changing relationships between smoking and psychiatric disorders across twentieth century birth cohorts: clinical and research implications. *Mol Psychiatry* 2016;21(4):464-71. doi: 10.1038/mp.2015.224 [published Online First: 2016/01/27]
78. Evins AE, Korhonen T, Kinnunen TH, Kaprio J. Prospective association between tobacco smoking and death by suicide: a competing risks hazard analysis in a large twin cohort with 35-year follow-up. *Psychol Med* 2017;47(12):2143-54. doi: 10.1017/S0033291717000587 [published Online First: 2017/04/13]
79. An R, Xiang X. Smoking, heavy drinking, and depression among U.S. middle-aged and older adults. *Prev Med* 2015;81:295-302. doi: 10.1016/j.ypmed.2015.09.026 [published Online First: 2015/10/06]
80. Li D, Yang X, Ge Z, et al. Cigarette smoking and risk of completed suicide: a meta-analysis of prospective cohort studies. *J Psychiatr Res*

- 2012;46(10):1257-66. doi: 10.1016/j.jpsychires.2012.03.013 [published Online First: 2012/08/15]
81. Poorolajal J, Darvishi N. Smoking and Suicide: A Meta-Analysis. *PLoS One* 2016;11(7):e0156348. doi: 10.1371/journal.pone.0156348 [published Online First: 2016/07/09]
 82. Patton GC, Carlin JB, Coffey C, et al. Depression, anxiety, and smoking initiation: a prospective study over 3 years. *Am J Public Health* 1998;88(10):1518-22. doi: 10.2105/ajph.88.10.1518 [published Online First: 1998/10/17]
 83. Breslau N, Peterson EL, Schultz LR, et al. Major depression and stages of smoking. A longitudinal investigation. *Arch Gen Psychiatry* 1998;55(2):161-6. doi: 10.1001/archpsyc.55.2.161 [published Online First: 1998/03/07]
 84. Breslau N, Klein DF. Smoking and panic attacks: an epidemiologic investigation. *Arch Gen Psychiatry* 1999;56(12):1141-7. doi: 10.1001/archpsyc.56.12.1141 [published Online First: 1999/12/11]
 85. Fergusson DM, Lynskey MT, Horwood LJ. Comorbidity between depressive disorders and nicotine dependence in a cohort of 16-year-olds. *Arch Gen Psychiatry* 1996;53(11):1043-7. doi: 10.1001/archpsyc.1996.01830110081010 [published Online First: 1996/11/01]
 86. WHO. WHO Framework Convention on Tobacco Control. Geneva, Switzerland, 2003:44.
 87. WHO. MPOWER package of data-driven tobacco control measures helps protect up to 5 billion lives. World Health Organization. Available from: <https://www.who.int/news-room/feature-stories/detail/mpower-package-of-data-driven-tobacco-control-measures-helps-protect-up-to-5-billion-lives2021> [Available from: <https://www.who.int/news-room/feature-stories/detail/mpower-package-of-data-driven-tobacco-control-measures-helps-protect-up-to-5-billion-lives>.
 88. Bellew B, Antonio M, Limpin M, et al. Addressing the tobacco epidemic in the Philippines: progress since ratification of the WHO FCTC. *Public Health Action* 2013;3(2):103-8. doi: 10.5588/pha.13.0006 [published Online First: 2013/06/21]
 89. WHO. WHO report on the global tobacco epidemic 2021: addressing new and emerging products. World Health Organization. Available from: <https://www.who.int/publications/i/item/9789240032095>, 2021.
 90. Bangladesh Go. Smoking and Using of Tobacco Products (Control) Act, 2005 (Act No. XI of 2005). In: Ministry of Law JaPA, ed. Dhaka: Md Akther Hossain (Deputy Secretary), Deputy Controller, Bangladesh Forms and Publications Office, 2007.
 91. Sujon AI, Alam Shiekh MK, Reza MF, et al. Effective monitoring for enforcement of tobacco control law: Success from Bangladesh. *Tobacco Induced Diseases* 2021;19(1) doi: 10.18332/tid/140929

92. Bangladesh Go. Smoking and Tobacco Products Usage (Control) (Amendment) Act, 2013 (Act No. 16 of 2013). In: Parliament BN, ed. Dhaka: Abdur Rashid (Deputy Secretary), Deputy Controller, Bangladesh Forms and Publications Office, 2013:8.
93. Bangladesh Go. Smoking and Tobacco Product Usage (control) Rules, 2015. In: Welfare MoHaF, ed. Dhaka: Md Alamgir Hossain (Deputy Secretary), Deputy Controller, Bangladesh Forms and Publications Office, 2015.
94. Abdullah SM, Wagner-Rizvi T, Huque R, et al. 'A contradiction between our state and the tobacco company': conflicts of interest and institutional constraints as barriers to implementing Article 5.3 in Bangladesh. *Tob Control* 2022;31(Suppl 1):s33-s38. doi: 10.1136/tobaccocontrol-2021-057142 [published Online First: 2022/01/27]
95. Shahriar MH, Hasan MM, Alam MS, et al. Tobacco industry interference to undermine the development and implementation of graphic health warnings in Bangladesh. *Tob Control* 2024;33(5):587-95. doi: 10.1136/tc-2022-057538 [published Online First: 20240925]
96. Mahbubus Sobhan SM, Quader R, Ruhul Quddus M, et al. Overcoming stumbling blocks of tobacco control in Bangladesh. *Tobacco Induced Diseases* 2018;16(1) doi: 10.18332/tid/84609
97. CDC. Guidelines for School Health Programs to Prevent Tobacco Use and Addiction. Center for Disease Control and Prevention. Available from: <https://www.cdc.gov/mmwr/preview/mmwrhtml/00026213.htm1994> [updated 5 February 2001. Available from: <https://www.cdc.gov/mmwr/preview/mmwrhtml/00026213.htm> accessed 2 February 2025.
98. Thomas RE, McLellan J, Perera R. School-based programmes for preventing smoking. *Cochrane Database Syst Rev* 2013(4):CD001293. doi: <https://doi.org/10.1002/14651858.CD001293.pub3> [published Online First: 2013/05/02]
99. Thomas RE, McLellan J, Perera R. Effectiveness of school-based smoking prevention curricula: systematic review and meta-analysis. *BMJ Open* 2015;5(3):e006976. doi: <https://doi.org/10.1136/bmjopen-2014-006976> [published Online First: 2015/03/12]
100. Mpousiou DP, Sakkas N, Soteriades ES, et al. Evaluation of a school-based, experiential-learning smoking prevention program in promoting attitude change in adolescents. *Tob Induc Dis* 2021;19:53. doi: 10.18332/tid/134605 [published Online First: 2021/06/29]
101. Starkey F, Moore L, Campbell R, et al. Rationale, design and conduct of a comprehensive evaluation of a school-based peer-led anti-smoking intervention in the UK: the ASSIST cluster randomised trial [ISRCTN55572965]. *BMC Public Health* 2005;5:43. doi: 10.1186/1471-2458-5-43 [published Online First: 20050422]
102. Campbell R, Starkey F, Holliday J, et al. An informal school-based peer-led intervention for smoking prevention in adolescence (ASSIST): a cluster

- randomised trial. *Lancet* 2008;371(9624):1595-602. doi: 10.1016/S0140-6736(08)60692-3 [published Online First: 2008/05/13]
103. Conner M, Grogan S, West R, et al. Effectiveness and cost-effectiveness of repeated implementation intention formation on adolescent smoking initiation: A cluster randomized controlled trial. *J Consult Clin Psychol* 2019;87(5):422-32. doi: 10.1037/ccp0000387 [published Online First: 2019/03/08]
 104. Flay BR. School-based smoking prevention programs with the promise of long-term effects. *Tob Induc Dis* 2009;5(1):6. doi: 10.1186/1617-9625-5-6 [published Online First: 20090326]
 105. Chou CP, Li Y, Unger JB, et al. A randomized intervention of smoking for adolescents in urban Wuhan, China. *Preventive Medicine* 2006;42(4):280-85. doi: <https://doi.org/10.1016/j.ypmed.2006.01.002>
 106. Perry CL, Stigler MH, Arora M, Reddy KS. Preventing tobacco use among young people in India: Project MYTRI. *American Journal of Public Health* 2009;99(5):899-906. doi: <https://doi.org/10.2105/AJPH.2008.145433>
 107. Chido-Amajuoyi OG, Osaghae I, Agaku IT, et al. Exposure to school-based tobacco prevention interventions in low-income and middle-income countries and its association with psychosocial predictors of smoking among adolescents: a pooled cross-sectional analysis of Global Youth Tobacco Survey data from 38 countries. *BMJ Open* 2024;14(2):e070749. doi: <https://doi.org/10.1136/bmjopen-2022-070749> [published Online First: 20240226]
 108. Siddiqi K. A trial to assess the effectiveness and cost-effectiveness of a school-based Smoke-Free Intervention in reducing children's exposure to second-hand smoke ISRCTN registry2020 [accessed March 07, 2023].
 109. Huque R, Dogar O, Cameron I, et al. Children Learning About Second-Hand Smoking: A Feasibility Cluster Randomized Controlled Trial. *Nicotine & Tobacco Research* 2015;17(12):1465-72. doi: 10.1093/ntr/ntv015
 110. Siddiqi K, Huque R, Kanaan M, et al. Children Learning About Secondhand Smoke (CLASS II): A Pilot Cluster Randomized Controlled Trial. *Nicotine & Tobacco Research* 2019;21(5):670-77. doi: 10.1093/ntr/nty090
 111. Gilmore AB, Fooks G, Drope J, et al. Exposing and addressing tobacco industry conduct in low-income and middle-income countries. *The Lancet* 2015;385(9972):1029-43. doi: [https://doi.org/10.1016/S0140-6736\(15\)60312-9](https://doi.org/10.1016/S0140-6736(15)60312-9)
 112. Yang H, Ma C, Zhao M, et al. Prevalence and trend of smokeless tobacco use and its associated factors among adolescents aged 12-16 years in 138 countries/territories, 1999-2019. *BMC Med* 2022;20(1):460. doi: <https://doi.org/10.1186/s12916-022-02662-0> [published Online First: 20221125]
 113. Siddiqi K, Shah S, Abbas SM, et al. Global burden of disease due to smokeless tobacco consumption in adults: analysis of data from 113

- countries. *BMC Med* 2015;13:194. doi: <https://doi.org/10.1186/s12916-015-0424-2> [published Online First: 2015/08/19]
114. Mehrotra R, Yadav A, Sinha DN, et al. Smokeless tobacco control in 180 countries across the globe: call to action for full implementation of WHO FCTC measures. *The Lancet Oncology* 2019;20(4):e208-e17. doi: [https://doi.org/10.1016/s1470-2045\(19\)30084-1](https://doi.org/10.1016/s1470-2045(19)30084-1)
 115. Ward JL, Azzopardi PS, Francis KL, et al. Global, regional, and national mortality among young people aged 10–24 years, 1950–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet* 2021;398(10311):1593-618. doi: [https://doi.org/10.1016/s0140-6736\(21\)01546-4](https://doi.org/10.1016/s0140-6736(21)01546-4)
 116. Patton GC, Sawyer SM, Santelli JS, et al. Our future: a Lancet commission on adolescent health and wellbeing. *Lancet* 2016;387(10036):2423-78. doi: [https://doi.org/10.1016/S0140-6736\(16\)00579-1](https://doi.org/10.1016/S0140-6736(16)00579-1) [published Online First: 20160509]
 117. Catalano RF, Fagan AA, Gavin LE, et al. Worldwide application of prevention science in adolescent health. *The Lancet* 2012;379(9826):1653-64. doi: [https://doi.org/10.1016/s0140-6736\(12\)60238-4](https://doi.org/10.1016/s0140-6736(12)60238-4)
 118. Vidyasagaran AL, Siddiqi K, Kanaan M. Use of smokeless tobacco and risk of cardiovascular disease: A systematic review and meta-analysis. *Eur J Prev Cardiol* 2016;23(18):1970-81. doi: <https://doi.org/10.1177/2047487316654026> [published Online First: 2016/06/04]
 119. Ba-Break M, Bewick B, Huss R, et al. Systematic review of intervention functions, theoretical constructs and cultural adaptations of school-based smoking prevention interventions in low-income and middle-income countries. *BMJ Open* 2023;13(2):e066613. doi: <https://doi.org/10.1136/bmjopen-2022-066613> [published Online First: 20230214]
 120. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ* 2009;339:b2535. doi: <https://doi.org/10.1136/bmj.b2535> [published Online First: 20090721]
 121. WBG. World Bank Country and Lending Groups: The World Bank Group; 2022 [Available from: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups> accessed Feb 10, 2022.
 122. Cochrane. LMIC Databases: The Cochrane Collaboration; 2013 [Available from: <https://epoc.cochrane.org/lmic-databases> accessed March 14, 2022.
 123. Norris E, Wright AJ, Hastings J, et al. Specifying who delivers behaviour change interventions: development of an Intervention Source Ontology. *Wellcome Open Res* 2021;6:77. doi:

<https://doi.org/10.12688/wellcomeopenres.16682.1> [published Online First: 2021/09/10]

124. Michie S, Richardson M, Johnston M, et al. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Ann Behav Med* 2013;46(1):81-95. doi: <https://doi.org/10.1007/s12160-013-9486-6> [published Online First: 2013/03/21]
125. Higgins JPT, Thomas J, Chandler J, et al. Cochrane handbook for systematic reviews of interventions UK: John Wiley & Sons; 2021 [Available from: <https://training.cochrane.org/handbook> accessed January 03, 2022.
126. Resnicow K, Reddy SP, James S, et al. Comparison of two school-based smoking prevention programs among South African high school students: Results of a randomized trial. *Annals of Behavioral Medicine* 2008;36(3):231-43. doi: <https://doi.org/10.1007/s12160-008-9072-5>
127. Gabrhelik R, Duncan A, Miovsky M, et al. 'Unplugged': A school-based randomized control trial to prevent and reduce adolescent substance use in the Czech Republic. *Drug and Alcohol Dependence* 2012;124(1-2):79-87. doi: 10.1016/j.drugalcdep.2011.12.010
128. Lotrean LM, Dijk F, Mesters I, et al. Evaluation of a peer-led smoking prevention programme for Romanian adolescents. *Health education research* 2010;25(5):803-14. doi: <https://doi.org/10.1093/her/cyq034>
129. Reddy KS, Arora M, Perry CL, et al. Tobacco and alcohol use outcomes of a school-based intervention in New Delhi. *American journal of health behavior* 2002;26(3):173-81. doi: <https://doi.org/10.5993/ajhb.26.3.2>
130. Seal N. Preventing tobacco and drug use among Thai high school students through life skills training. *Nursing and Health Sciences* 2006;8(3):164-68. doi: <https://doi.org/10.1111/j.1442-2018.2006.00275.x>
131. Wen X, Chen W, Gans KM, et al. Two-year effects of a school-based prevention programme on adolescent cigarette smoking in Guangzhou, China: a cluster randomized trial. *International Journal of Epidemiology* 2010;39(3):860-76. doi: <https://doi.org/10.1093/ije/dyq001>
132. Al-sheyab NA, Khader YS, Shah S, et al. The Effect of a "Class Smoke Free Pledge" on Breath Carbon Monoxide in Arabic Male Adolescents. *Nicotine & Tobacco Research* 2018;20(5):568-74. doi: <https://doi.org/10.1093/ntr/ntx050>
133. Filho VCB, Bandeira ADS, Minatto G, et al. Effect of a multicomponent intervention on lifestyle factors among brazilian adolescents from low human development index areas: A cluster-randomized controlled trial. *International Journal of Environmental Research and Public Health* 2019;16(2) doi: <https://doi.org/10.3390/ijerph16020267>
134. Guo JL, Lee TC, Liao JY, Huang CM. Prevention of illicit drug use through a school-based program: results of a longitudinal, cluster-randomized controlled trial. *J Adolesc Health* 2015;56(3):314-22. doi:

<https://doi.org/10.1016/j.jadohealth.2014.12.003> [published Online First: 2015/02/24]

135. Hussain A, Zaheer S, Shafique K. School-based behavioral intervention to reduce the habit of smokeless tobacco and betel quid use in high-risk youth in Karachi: A randomized controlled trial. *PLoS ONE* 2018;13(11) doi: <https://doi.org/10.1371/journal.pone.0206919>
136. Kulis SS, Marsiglia FF, Medina-Mora ME, et al. Keepin' It REAL-Mantente REAL in Mexico: a Cluster Randomized Controlled Trial of a Culturally Adapted Substance Use Prevention Curriculum for Early Adolescents. *Prevention Science* 2021;22(5):645-57. doi: <https://doi.org/10.1007/s11121-021-01217-8>
137. Mall K, Sunil A, Aroor B. An Informal School--based, Peer-led Intervention for Prevention of Tobacco Consumption in Adolescence: A Cluster Randomized Trial in Rural Gandhinagar. *Indian Journal of Community Medicine* 2017;42(3):143-46. doi: https://doi.org/10.4103/ijcm.IJCM_25_16
138. Lisboa OC, Bernardes-Souza B, Xavier LEDF, et al. A Smoking Prevention Program Delivered by Medical Students to Secondary Schools in Brazil Called "Education Against Tobacco": Randomized Controlled Trial. *Journal of Medical Internet Research* 2019;21(2):N.PAG-N.PAG. doi: <https://doi.org/10.2196/12854>
139. Mohammed M, Eggers SM, Alotaiby FF, et al. Effects of a randomized controlled trial to assess the six-months effects of a school based smoking prevention program in Saudi Arabia. *Preventive Medicine* 2016;90:100-06. doi: <https://doi.org/10.1016/j.ypmed.2016.06.032>
140. Mohammadi M, Ghaleiha A, Rahnema R. Effectiveness of a peer-led behavioral intervention program on tobacco use-related knowledge, attitude, normative beliefs, and intention to smoke among adolescents at Iranian Public High Schools. *International Journal of Preventive Medicine* 2019;10(1) doi: https://doi.org/10.4103/ijpvm.IJPVM_493_17
141. Nakkash R, Lotfi T, Bteddini D, et al. A randomized controlled trial of a theory-informed school-based intervention to prevent waterpipe tobacco smoking: Changes in knowledge, attitude, and behaviors in 6th and 7th graders in Lebanon. *International Journal of Environmental Research and Public Health* 2018;15(9) doi: <https://doi.org/10.3390/ijerph15091839>
142. Rozi S, Zahid N, Roome T, et al. Effectiveness of a School Based Smokeless Tobacco Intervention: A Cluster Randomized Trial. *Journal of community health* 2019;44(6):1098-110. doi: <https://doi.org/10.1007/s10900-019-00689-8>
143. Sanchez ZM, Valente JY, Galvao PP, et al. A cluster randomized controlled trial evaluating the effectiveness of the school-based drug prevention program #Tamojunto2.0. *Addiction (Abingdon, England)* 2020;116(6):1580-92. doi: <https://doi.org/10.1111/add.15358>

144. Sanchez ZM, Valente JY, Sanudo A, et al. Effectiveness evaluation of the school-based drug prevention program #Tamojunto in Brazil: 21-month follow-up of a randomized controlled trial. *International Journal of Drug Policy* 2018;60:10-17. doi: <https://doi.org/10.1016/j.drugpo.2018.07.006>
145. Sanchez ZM, Valente JY, Gusmoes JDP, et al. Effectiveness of a school-based substance use prevention program taught by police officers in Brazil: Two cluster randomized controlled trials of the PROERD. *International Journal of Drug Policy* 2021;98 doi: <https://doi.org/10.1016/j.drugpo.2021.103413>
146. Vigna-Taglianti F, Mehanovic E, Alesina M, et al. Effects of the "Unplugged" school-based substance use prevention program in Nigeria: A cluster randomized controlled trial. *Drug Alcohol Depend* 2021;228:108966. doi: <https://doi.org/10.1016/j.drugalcdep.2021.108966> [published Online First: 2021/09/13]
147. Tahlil T, Woodman RJ, Coveney J, Ward PR. Six-months follow-up of a cluster randomized trial of school-based smoking prevention education programs in Aceh, Indonesia. *BMC Public Health* 2015;15(1):1-10. doi: <https://doi.org/10.1186/s12889-015-2428-4>
148. Saraf DS, Gupta SK, Pandav CS, et al. Effectiveness of a school based intervention for prevention of non-communicable diseases in middle school children of rural North India: a randomized controlled trial. *Indian Journal of Pediatrics* 2015;82(4):354-62. doi: <https://doi.org/10.1007/s12098-014-1562-9>
149. Kaur S, Kumar R, Lakshmi PVM, Kaur M. Effectiveness of a school-based behavioural change intervention in reducing chronic disease risk factors in Chandigarh, India: a cluster-randomised controlled trial. *Lancet Reg Health Southeast Asia* 2024;21:100353. doi: <https://doi.org/10.1016/j.lansea.2024.100353> [published Online First: 20240124]
150. Gabrhelik R, Duncan A, Miovsky M, et al. "Unplugged": a school-based randomized control trial to prevent and reduce adolescent substance use in the Czech Republic. *Drug & Alcohol Dependence* 2012;124(1/2):79-87. doi: <https://doi.org/10.1016/j.drugalcdep.2011.12.010>
151. Jackson SE, McGowan JA, Ubhi HK, et al. Modelling continuous abstinence rates over time from clinical trials of pharmacological interventions for smoking cessation. *Addiction* 2019;114(5):787-97. doi: <https://doi.org/10.1111/add.14549> [published Online First: 20190129]
152. Gottfredson DC, Cook TD, Gardner FE, et al. Standards of Evidence for Efficacy, Effectiveness, and Scale-up Research in Prevention Science: Next Generation. *Prev Sci* 2015;16(7):893-926. doi: <https://doi.org/10.1007/s11121-015-0555-x>
153. Leask CF, Sandlund M, Skelton DA, et al. Framework, principles and recommendations for utilising participatory methodologies in the co-creation and evaluation of public health interventions. *Res Involv*

Engagem 2019;5:2. doi: <https://doi.org/10.1186/s40900-018-0136-9>
[published Online First: 20190109]

154. Barrera M, Jr., Castro FG, Strycker LA, Toobert DJ. Cultural adaptations of behavioral health interventions: a progress report. *J Consult Clin Psychol* 2013;81(2):196-205. doi: <https://doi.org/10.1037/a0027085> [published Online First: 2012/02/01]
155. Thomas J, Petticrew M, Noyes J, et al. Chapter 17: Intervention complexity. In: Higgins JPT, Thomas J, Chandler J, et al., eds. *Cochrane Handbook for Systematic Reviews of Interventions* version 642023.
156. Flay BR. The promise of long-term effectiveness of school-based smoking prevention programs: a critical review of reviews. *Tob Induc Dis* 2009;5(1):7. doi: <https://doi.org/10.1186/1617-9625-5-7> [published Online First: 20090326]
157. Latkin CA, Edwards C, Davey-Rothwell MA, Tobin KE. The relationship between social desirability bias and self-reports of health, substance use, and social network factors among urban substance users in Baltimore, Maryland. *Addict Behav* 2017;73:133-36. doi: <https://doi.org/10.1016/j.addbeh.2017.05.005> [published Online First: 20170509]
158. Althubaiti A. Information bias in health research: definition, pitfalls, and adjustment methods. *J Multidiscip Healthc* 2016;9:211-7. doi: <https://doi.org/10.2147/JMDH.S104807> [published Online First: 20160504]
159. Das JK, Salam RA, Arshad A, et al. Interventions for Adolescent Substance Abuse: An Overview of Systematic Reviews. *J Adolesc Health* 2016;59(4S):S61-S75. doi: <https://doi.org/10.1016/j.jadohealth.2016.06.021>
160. Purcell KR, O'Rourke K, Rivis M. Tobacco control approaches and inequity-how far have we come and where are we going? *Health Promot Int* 2015;30 Suppl 2:ii89-101. doi: <https://doi.org/10.1093/heapro/dav075>
161. Alderwick H, Hutchings A, Briggs A, Mays N. The impacts of collaboration between local health care and non-health care organizations and factors shaping how they work: a systematic review of reviews. *BMC Public Health* 2021;21(1):753. doi: <https://doi.org/10.1186/s12889-021-10630-1> [published Online First: 20210419]
162. Theilmann M, Lemp JM, Winkler V, et al. Patterns of tobacco use in low and middle income countries by tobacco product and sociodemographic characteristics: nationally representative survey data from 82 countries. *BMJ* 2022;378:e067582. doi: 10.1136/bmj-2021-067582 [published Online First: 20220830]
163. Tauras JA. Tobacco control in low-income and middle-income countries: findings from WHO FCTC investment cases. *Tob Control* 2024;33(Suppl 1):s1-s2. doi: 10.1136/tc-2024-058717 [published Online First: 20240502]

164. Shankar A, Parascandola M, Sakthivel P, et al. Advancing Tobacco Cessation in LMICs. *Curr Oncol* 2022;29(12):9117-24. doi: 10.3390/curroncol29120713 [published Online First: 20221123]
165. Savell E, Gilmore AB, Fooks G. How does the tobacco industry attempt to influence marketing regulations? A systematic review. *PLoS One* 2014;9(2):e87389. doi: 10.1371/journal.pone.0087389 [published Online First: 20140205]
166. Pierce JP, Choi WS, Gilpin EA, et al. Tobacco industry promotion of cigarettes and adolescent smoking. *JAMA* 1998;279(7):511-5. doi: 10.1001/jama.279.7.511
167. Okoli CT, Kodet J. A systematic review of secondhand tobacco smoke exposure and smoking behaviors: Smoking status, susceptibility, initiation, dependence, and cessation. *Addict Behav* 2015;47:22-32. doi: 10.1016/j.addbeh.2015.03.018 [published Online First: 20150324]
168. Veeranki SP, Mamudu HM, Anderson JL, Zheng S. Worldwide never-smoking youth susceptibility to smoking. *J Adolesc Health* 2014;54(2):144-50. doi: 10.1016/j.jadohealth.2013.07.036 [published Online First: 20130920]
169. Cole AG, Kennedy RD, Chaurasia A, Leatherdale ST. Exploring the Predictive Validity of the Susceptibility to Smoking Construct for Tobacco Cigarettes, Alternative Tobacco Products, and E-Cigarettes. *Nicotine Tob Res* 2019;21(3):323-30. doi: 10.1093/ntr/ntx265
170. Lovato C, Watts A, Stead LF. Impact of tobacco advertising and promotion on increasing adolescent smoking behaviours. *Cochrane Database Syst Rev* 2011;2011(10):CD003439. doi: 10.1002/14651858.CD003439.pub2 [published Online First: 20111005]
171. Robertson L, Cameron C, McGee R, et al. Point-of-sale tobacco promotion and youth smoking: a meta-analysis. *Tob Control* 2016;25(e2):e83-e89. doi: 10.1136/tobaccocontrol-2015-052586 [published Online First: 20160104]
172. Koh HK, Alpert HR, Judge CM, et al. Understanding worldwide youth attitudes towards smoke-free policies: an analysis of the Global Youth Tobacco Survey. *Tob Control* 2011;20(3):219-25. doi: 10.1136/tc.2010.038885 [published Online First: 20110126]
173. Fluharty M, Taylor AE, Grabski M, Munafo MR. The Association of Cigarette Smoking With Depression and Anxiety: A Systematic Review. *Nicotine Tob Res* 2017;19(1):3-13. doi: 10.1093/ntr/ntw140 [published Online First: 20160519]
174. Gehricke JG, Loughlin SE, Whalen CK, et al. Smoking to self-medicate attentional and emotional dysfunctions. *Nicotine Tob Res* 2007;9 Suppl 4:S523-36. doi: 10.1080/14622200701685039
175. Prochaska JJ, Das S, Young-Wolff KC. Smoking, Mental Illness, and Public Health. *Annu Rev Public Health* 2017;38:165-85. doi: 10.1146/annurev-publhealth-031816-044618 [published Online First: 2016/12/20]

176. WHO. The vicious cycle of tobacco use and mental illness – a double burden on health World Health Organization. WHO Regional Office for Europe, Copenhagen, Denmark.2021 [Available from: <https://www.euro.who.int/en/health-topics/disease-prevention/tobacco/news/news/2021/11/the-vicious-cycle-of-tobacco-use-and-mental-illness-a-double-burden-on-health> accessed May 26, 2022.
177. Boden JM, Fergusson DM, Horwood LJ. Cigarette smoking and depression: tests of causal linkages using a longitudinal birth cohort. *Br J Psychiatry* 2010;196(6):440-6. doi: 10.1192/bjp.bp.109.065912
178. Rohde P, Lewinsohn PM, Brown RA, et al. Psychiatric disorders, familial factors and cigarette smoking: I. Associations with smoking initiation. *Nicotine Tob Res* 2003;5(1):85-98. doi: 10.1080/1462220031000070507 [published Online First: 2003/05/15]
179. Escobedo LG, Reddy M, Giovino GA. The relationship between depressive symptoms and cigarette smoking in US adolescents. *Addiction* 1998;93(3):433-40. doi: 10.1046/j.1360-0443.1998.93343311.x [published Online First: 1999/05/18]
180. Dierker LC, Avenevoli S, Stolar M, Merikangas KR. Smoking and depression: an examination of mechanisms of comorbidity. *Am J Psychiatry* 2002;159(6):947-53. doi: 10.1176/appi.ajp.159.6.947
181. Schulenberg JE, Patrick ME, Johnston LD, et al. Monitoring the Future National Survey Results on Drug Use, 1975-2020. Volume II, College Students & Adults Ages 19-60. Ann Arbor, Michigan: Institute for Social Research, University of Michigan, 2021:532.
182. Xie W, Mridha MK, Gupta A, et al. Smokeless and combustible tobacco use among 148,944 South Asian adults: a cross-sectional study of South Asia Biobank. *BMC Public Health* 2023;23(1):2465. doi: 10.1186/s12889-023-17394-w [published Online First: 20231209]
183. Hossain S, Hossain S, Ahmed F, et al. Prevalence of Tobacco Smoking and Factors Associated with the Initiation of Smoking among University Students in Dhaka, Bangladesh. *Cent Asian J Glob Health* 2017;6(1):244. doi: 10.5195/cajgh.2017.244 [published Online First: 2017/11/16]
184. Anjum A, Hossain S, Hasan MT, et al. Depressive Symptom and Associated Factors Among School Adolescents of Urban, Semi-Urban and Rural Areas in Bangladesh: A Scenario Prior to COVID-19. *Front Psychiatry* 2021;12:708909. doi: 10.3389/fpsy.2021.708909 [published Online First: 2021/10/16]
185. Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)—A metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics* 2009;42(2):377-81. doi: 10.1016/j.jbi.2008.08.010
186. Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: Building an international community of software platform partners. *J Biomed Inform*

2019;95:103208. doi: 10.1016/j.jbi.2019.103208 [published Online First: 20190509]

187. WHO. Global Youth Tobacco Survey. 2023;World Health Organization. Available from: <https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/global-youth-tobacco-survey>
188. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med* 2001;16(9):606-13. doi: 10.1046/j.1525-1497.2001.016009606.x
189. Hossain S, Anjum A, Hasan MT, et al. Self-perception of physical health conditions and its association with depression and anxiety among Bangladeshi university students. *J Affect Disord* 2020;263:282-88. doi: 10.1016/j.jad.2019.11.153 [published Online First: 2019/12/11]
190. Anjum A, Hossain S, Hasan MT, et al. Anxiety among urban, semi-urban and rural school adolescents in Dhaka, Bangladesh: Investigating prevalence and associated factors. *PLoS One* 2022;17(1):e0262716. doi: 10.1371/journal.pone.0262716 [published Online First: 20220121]
191. Lowe B, Decker O, Muller S, et al. Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Med Care* 2008;46(3):266-74. doi: 10.1097/MLR.0b013e318160d093 [published Online First: 2008/04/05]
192. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology* 2006;3(2):77-101. doi: 10.1191/1478088706qp063oa
193. Islam MM. Effective tobacco control measures in Bangladesh require a whole-of-government approach. *Policy Design and Practice* 2023;7(1):105-13. doi: 10.1080/25741292.2023.2237652
194. Islam SM, Johnson CA. Correlates of smoking behavior among Muslim Arab-American adolescents. *Ethn Health* 2003;8(4):319-37. doi: 10.1080/13557850310001631722 [published Online First: 2003/12/09]
195. Yong HH, Savvas S, Borland R, et al. Secular versus religious norms against smoking: which is more important as a driver of quitting behaviour among Muslim Malaysian and Buddhist Thai smokers? *Int J Behav Med* 2013;20(2):252-8. doi: 10.1007/s12529-012-9225-6 [published Online First: 2012/02/04]
196. Alasqah I, Mahmud I, East L, Usher K. A systematic review of the prevalence and risk factors of smoking among Saudi adolescents. *Saudi Med J* 2019;40(9):867-78. doi: 10.15537/smj.2019.9.24477 [published Online First: 2019/09/16]
197. Widyaningrum N, Yu J. Tobacco Use Among the Adult Muslim Population in Indonesia: A Preliminary Study on Religion, Cultural, and Socioeconomic Factors. *Journal of Drug Issues* 2018;48(4):676-88. doi: 10.1177/0022042618789491

198. Mushtaq N, Huque R, Beebe LA, et al. Evaluation of tobacco dependence measures in South Asian smokeless tobacco users. *Drug Alcohol Depend* 2019;203:66-71. doi: 10.1016/j.drugalcdep.2019.05.034 [published Online First: 20190730]
199. Kakde S, Bhopal RS, Jones CM. A systematic review on the social context of smokeless tobacco use in the South Asian population: implications for public health. *Public Health* 2012;126(8):635-45. doi: 10.1016/j.puhe.2012.05.002 [published Online First: 20120717]
200. Alotaibi SA, Alsuliman MA, Durgampudi PK. Smoking tobacco prevalence among college students in the Kingdom of Saudi Arabia: Systematic review and meta-analysis. *Tob Induc Dis* 2019;17:35. doi: 10.18332/tid/105843 [published Online First: 2019/09/14]
201. Tyas SL, Pederson LL. Psychosocial factors related to adolescent smoking: a critical review of the literature. *Tob Control* 1998;7(4):409-20. doi: 10.1136/tc.7.4.409 [published Online First: 1999/03/27]
202. Botvin GJ, Baker E, Goldberg CJ, et al. Correlates and predictors of smoking among black adolescents. *Addict Behav* 1992;17(2):97-103. doi: 10.1016/0306-4603(92)90014-m [published Online First: 1992/01/01]
203. Escobedo LG. Sports Participation, Age at Smoking Initiation, and the Risk of Smoking Among US High School Students. *JAMA: The Journal of the American Medical Association* 1993;269(11) doi: 10.1001/jama.1993.03500110059035
204. Ma J, Zhu J, Li N, et al. Cigarette smoking in Chinese adolescents: importance of controlling the amount of pocket money. *Public Health* 2013;127(7):687-93. doi: 10.1016/j.puhe.2013.04.016 [published Online First: 20130711]
205. Hossain S, Anjum A, Uddin ME, et al. Regulating tobacco retail outlets in Bangladesh: retailers' views and implications for tobacco control advocacy. *Tob Control* 2021;30(6):687-91. doi: 10.1136/tobaccocontrol-2019-055418 [published Online First: 2020/09/10]
206. Tate C, Kumar R, Murray JM, et al. Socio-environmental and psychosocial predictors of smoking susceptibility among adolescents with contrasting socio-cultural characteristics: a comparative analysis. *BMC Public Health* 2021;21(1):2240. doi: 10.1186/s12889-021-12351-x [published Online First: 20211209]
207. Mishu MP, Siddiqui F, Shukla R, et al. Predictors of Cigarette Smoking, Smokeless Tobacco Consumption, and Use of both forms in Adolescents in South Asia: A Secondary Analysis of the Global Youth Tobacco Surveys. *Nicotine Tob Res* 2021;23(6):956-65. doi: 10.1093/ntr/ntaa202
208. Donaldson SI, Dormanesh A, Perez C, et al. Association Between Exposure to Tobacco Content on Social Media and Tobacco Use: A Systematic Review and Meta-analysis. *JAMA Pediatr* 2022;176(9):878-85. doi: 10.1001/jamapediatrics.2022.2223

209. Henriksen L. Comprehensive tobacco marketing restrictions: promotion, packaging, price and place. *Tob Control* 2012;21(2):147-53. doi: 10.1136/tobaccocontrol-2011-050416
210. Chawla M, Garrison KA. Neurobiological Considerations for Tobacco Use Disorder. *Curr Behav Neurosci Rep* 2018;5(4):238-48. doi: 10.1007/s40473-018-0168-3 [published Online First: 20181030]
211. Chaiton MO, Cohen JE, O'Loughlin J, Rehm J. A systematic review of longitudinal studies on the association between depression and smoking in adolescents. *BMC Public Health* 2009;9:356. doi: 10.1186/1471-2458-9-356 [published Online First: 20090922]
212. Dai X, Gakidou E, Lopez AD. Evolution of the global smoking epidemic over the past half century: strengthening the evidence base for policy action. *Tob Control* 2022;31(2):129-37. doi: 10.1136/tobaccocontrol-2021-056535
213. Craig P, Dieppe P, Macintyre S, et al. Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ* 2008;337:a1655. doi: 10.1136/bmj.a1655 [published Online First: 20080929]
214. Petticrew M. When are complex interventions 'complex'? When are simple interventions 'simple'? *Eur J Public Health* 2011;21(4):397-8. doi: 10.1093/eurpub/ckr084
215. Skivington K, Matthews L, Simpson SA, et al. A new framework for developing and evaluating complex interventions: update of Medical Research Council guidance. *BMJ* 2021;374:n2061. doi: 10.1136/bmj.n2061 [published Online First: 2021/10/02]
216. Oakley A, Strange V, Bonell C, et al. Process evaluation in randomised controlled trials of complex interventions. *BMJ* 2006;332(7538):413-6. doi: 10.1136/bmj.332.7538.413
217. Foy R, Ivers NM, Grimshaw JM, Wilson PM. What is the role of randomised trials in implementation science? *Trials* 2023;24(1):537. doi: 10.1186/s13063-023-07578-5 [published Online First: 20230816]
218. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* 2011;6:42. doi: 10.1186/1748-5908-6-42 [published Online First: 2011/04/26]
219. Michie S, Atkins L, West R. The Behaviour Change Wheel - A Guide To Designing Interventions. 1st ed ed: Silverback Publishing 2014.
220. French SD, Green SE, O'Connor DA, et al. Developing theory-informed behaviour change interventions to implement evidence into practice: a systematic approach using the Theoretical Domains Framework. *Implement Sci* 2012;7:38. doi: 10.1186/1748-5908-7-38 [published Online First: 20120424]

221. Davis R, Campbell R, Hildon Z, et al. Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review. *Health Psychol Rev* 2015;9(3):323-44. doi: 10.1080/17437199.2014.941722 [published Online First: 20140808]
222. Levati S, Campbell P, Frost R, et al. Optimisation of complex health interventions prior to a randomised controlled trial: a scoping review of strategies used. *Pilot Feasibility Stud* 2016;2:17. doi: 10.1186/s40814-016-0058-y [published Online First: 20160315]
223. Collins LM, Baker TB, Mermelstein RJ, et al. The multiphase optimization strategy for engineering effective tobacco use interventions. *Ann Behav Med* 2011;41(2):208-26. doi: 10.1007/s12160-010-9253-x
224. Atkins L, Francis J, Islam R, et al. A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implement Sci* 2017;12(1):77. doi: 10.1186/s13012-017-0605-9 [published Online First: 2017/06/24]
225. Nilsen P. Making sense of implementation theories, models and frameworks. *Implement Sci* 2015;10:53. doi: 10.1186/s13012-015-0242-0 [published Online First: 20150421]
226. Michie S, West R, Campbell R, et al. ABC of Behaviour Change Theories: Silverback Publishing 2014.
227. West R, Brown J. Theory of Addiction. 2nd ed ed: John Wiley & Sons, Ltd. 2013.
228. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implement Sci* 2012;7:37. doi: 10.1186/1748-5908-7-37 [published Online First: 20120424]
229. Michie S, Johnston M, Abraham C, et al. Making psychological theory useful for implementing evidence based practice: a consensus approach. *Qual Saf Health Care* 2005;14(1):26-33. doi: 10.1136/qshc.2004.011155
230. Michie S, Richardson M, Johnston M, et al. The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions. *Annals of Behavioral Medicine* 2013;46(1):81-95. doi: 10.1007/s12160-013-9486-6
231. Marques MM, Carey RN, Norris E, et al. Delivering Behaviour Change Interventions: Development of a Mode of Delivery Ontology. *Wellcome Open Res* 2020;5:125. doi: 10.12688/wellcomeopenres.15906.2 [published Online First: 20210226]
232. Marsiglia FF, Booth JM. Cultural Adaptation of Interventions in Real Practice Settings. *Res Soc Work Pract* 2015;25(4):423-32. doi: 10.1177/1049731514535989

233. Look MA, Maskarinec GG, de Silva M, et al. Developing culturally-responsive health promotion: insights from cultural experts. *Health Promot Int* 2023;38(2) doi: 10.1093/heapro/daad022
234. McCallops K, Barnes TN, Berte I, et al. Incorporating culturally responsive pedagogy within social-emotional learning interventions in urban schools: An international systematic review. *International Journal of Educational Research* 2019;94:11-28. doi: 10.1016/j.ijer.2019.02.007
235. Young C, Perović N, UCL. ABC Learning Design London, UK: UCL; 2022 [Available from: <https://blogs.ucl.ac.uk/abc-ld/> accessed 24/01/2024.
236. Nadkarni A, Gaikwad L, Sequeira M, et al. Behavioral Interventions for Tobacco Cessation in Low and Middle-Income Countries: A Systematic Review and Meta-analysis. *Nicotine Tob Res* 2024 doi: 10.1093/ntr/ntae259 [published Online First: 20241101]
237. Ennett ST, Foshee VA, Bauman KE, et al. A social contextual analysis of youth cigarette smoking development. *Nicotine Tob Res* 2010;12(9):950-62. doi: 10.1093/ntr/ntq122 [published Online First: 20100805]
238. Creswell JW, Poth CN. Qualitative Inquiry and Research Design: Choosing Among Five Approaches. 5 ed. Thousand Oaks, California: Sage 2023:549.
239. Schifano J, Niederberger M. How Delphi studies in the health sciences find consensus: a scoping review. *Systematic Reviews* 2025;14(1) doi: 10.1186/s13643-024-02738-3
240. Diamond IR, Grant RC, Feldman BM, et al. Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies. *J Clin Epidemiol* 2014;67(4):401-9. doi: 10.1016/j.jclinepi.2013.12.002
241. Williams T, Wiles J, Smith M, Ward K. Combining action research and grounded theory in health research: A structured narrative review. *SSM - Qualitative Research in Health* 2022;2 doi: 10.1016/j.ssmqr.2022.100093
242. Pichardo JI, López-Medina EF, Mancha-Cáceres O, et al. Students and Teachers Using Mentimeter: Technological Innovation to Face the Challenges of the COVID-19 Pandemic and Post-Pandemic in Higher Education. *Education Sciences* 2021;11(11) doi: 10.3390/educsci11110667
243. Piper ME, Fiore MC, Smith SS, et al. Identifying effective intervention components for smoking cessation: a factorial screening experiment. *Addiction* 2016;111(1):129-41. doi: 10.1111/add.13162 [published Online First: 20151119]
244. Bernal G, Jiménez-Chafey MI, Domenech Rodríguez MM. Cultural adaptation of treatments: A resource for considering culture in evidence-based practice. *Professional Psychology: Research and Practice* 2009;40(4):361-68. doi: 10.1037/a0016401

245. Hamilton AB, Finley EP. Qualitative methods in implementation research: An introduction. *Psychiatry Res* 2019;280:112516. doi: 10.1016/j.psychres.2019.112516 [published Online First: 20190810]
246. Sweller J. Element Interactivity and Intrinsic, Extraneous, and Germane Cognitive Load. *Educational Psychology Review* 2010;22(2):123-38. doi: 10.1007/s10648-010-9128-5
247. Hossain S, Anjum A, Uddin ME, et al. Impacts of socio-cultural environment and lifestyle factors on the psychological health of university students in Bangladesh: A longitudinal study. *J Affect Disord* 2019;256:393-403. doi: 10.1016/j.jad.2019.06.001 [published Online First: 2019/06/22]
248. Fiske AP. Using individualism and collectivism to compare cultures--a critique of the validity and measurement of the constructs: comment on Oyserman et al. (2002). *Psychol Bull* 2002;128(1):78-88. doi: 10.1037/0033-2909.128.1.78 [published Online First: 2002/02/15]
249. Moore G, Campbell M, Copeland L, et al. Adapting interventions to new contexts-the ADAPT guidance. *BMJ* 2021;374:n1679. doi: 10.1136/bmj.n1679 [published Online First: 2021/08/05]
250. Vincze L, Barnes K, Somerville M, et al. Cultural adaptation of health interventions including a nutrition component in Indigenous peoples: a systematic scoping review. *Int J Equity Health* 2021;20(1):125. doi: 10.1186/s12939-021-01462-x [published Online First: 20210522]
251. Griner D, Smith TB. Culturally adapted mental health intervention: A meta-analytic review. *Psychotherapy (Chic)* 2006;43(4):531-48. doi: 10.1037/0033-3204.43.4.531 [published Online First: 2006/01/01]
252. Smith TB, Rodríguez MD, Bernal G. Culture. *Journal of Clinical Psychology* 2011;67(2):166-75. doi: 10.1002/jclp.20757
253. Bernal G, Adames C. Cultural Adaptations: Conceptual, Ethical, Contextual, and Methodological Issues for Working with Ethnocultural and Majority-World Populations. *Prev Sci* 2017;18(6):681-88. doi: 10.1007/s11121-017-0806-0 [published Online First: 2017/06/03]
254. Burlew AK, Copeland VC, Ahuama-Jonas C, Calsyn DA. Does cultural adaptation have a role in substance abuse treatment? *Soc Work Public Health* 2013;28(3-4):440-60. doi: 10.1080/19371918.2013.774811
255. Domenech-Rodriguez M, Weiling E. Developing culturally appropriate, evidence-based treatments for interventions with ethnic minority populations. In: Rastogin M, Weiling E, eds. *Voices of color: First person accounts of ethnic minority therapists*. Thousand Oaks, CA: Sage 2004:313-33.
256. Bernal G, Bonilla J, Bellido C. Ecological validity and cultural sensitivity for outcome research: issues for the cultural adaptation and development of psychosocial treatments with Hispanics. *J Abnorm Child Psychol* 1995;23(1):67-82. doi: 10.1007/BF01447045

257. Resnicow K, Baranowski T, Ahluwalia JS, Braithwaite RL. Cultural sensitivity in public health: defined and demystified. *Ethnicity & Disease* 1999;9(1):10-21.
258. Karlsson AW, Kragh-Sorensen A, Borgesen K, et al. Roles, outcomes, and enablers within research partnerships: A rapid review of the literature on patient and public involvement and engagement in health research. *Res Involv Engagem* 2023;9(1):43. doi: 10.1186/s40900-023-00448-z [published Online First: 20230615]
259. Price A, Albarqouni L, Kirkpatrick J, et al. Patient and public involvement in the design of clinical trials: An overview of systematic reviews. *J Eval Clin Pract* 2018;24(1):240-53. doi: 10.1111/jep.12805 [published Online First: 20171027]
260. Malterud K, Siersma VD, Guassora AD. Sample Size in Qualitative Interview Studies: Guided by Information Power. *Qual Health Res* 2016;26(13):1753-60. doi: 10.1177/1049732315617444 [published Online First: 20160710]
261. Bergen N, Labonte R. "Everything Is Perfect, and We Have No Problems": Detecting and Limiting Social Desirability Bias in Qualitative Research. *Qual Health Res* 2020;30(5):783-92. doi: 10.1177/1049732319889354 [published Online First: 20191213]
262. Kaaristo M. Everyday power dynamics and hierarchies in qualitative research: The role of humour in the field. *Qualitative Research* 2022;22(5):743-60. doi: 10.1177/14687941221096597
263. Gale NK, Heath G, Cameron E, et al. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol* 2013;13:117. doi: 10.1186/1471-2288-13-117 [published Online First: 2013/09/21]
264. Waid J, Kelly M. Supporting family engagement with child and adolescent mental health services: A scoping review. *Health Soc Care Community* 2020;28(5):1333-42. doi: 10.1111/hsc.12947 [published Online First: 20200117]
265. Baig T, Ganesan GS, Ibrahim H, et al. The association of parental involvement with adolescents' well-being in Oman: evidence from the 2015 Global School Health Survey. *BMC Psychol* 2021;9(1):175. doi: 10.1186/s40359-021-00677-5 [published Online First: 20211108]
266. Hassett A, Green C, Zundel T. Parental Involvement: A Grounded Theory of the Role of Parents in Adolescent Help Seeking for Mental Health Problems. *Sage Open* 2018;8(4) doi: 10.1177/2158244018807786
267. Moe-Byrne T, Evans E, Benhebil N, Knapp P. The effectiveness of video animations as information tools for patients and the general public: A systematic review. *Front Digit Health* 2022;4:1010779. doi: 10.3389/fdgth.2022.1010779 [published Online First: 20221031]
268. Noar SM, Rohde JA, Prentice-Dunn H, et al. Evaluating the actual and perceived effectiveness of E-cigarette prevention advertisements among

- adolescents. *Addict Behav* 2020;109:106473. doi: 10.1016/j.addbeh.2020.106473 [published Online First: 20200519]
269. Stellern J, Xiao KB, Grennell E, et al. Emotion regulation in substance use disorders: a systematic review and meta-analysis. *Addiction* 2023;118(1):30-47. doi: 10.1111/add.16001 [published Online First: 20220811]
 270. Jackson C, Al Azdi Z, Kellar I, et al. "Everything the hujur tells is very educative but if I cannot apply those in my own life then there is no meaning": a mixed-methods process evaluation of a smoke-free homes intervention in Bangladesh. *BMC Public Health* 2022;22(1):1889. doi: 10.1186/s12889-022-14283-6 [published Online First: 20221011]
 271. Kellar I, Al Azdi Z, Jackson C, et al. Muslim Communities Learning About Second-hand Smoke in Bangladesh (MCLASS II): a combined evidence and theory-based plus partnership intervention development approach. *Pilot Feasibility Stud* 2022;8(1):136. doi: 10.1186/s40814-022-01100-5 [published Online First: 20220702]
 272. Siddiqi K, Arora M, Gupta PC. Common assumptions in tobacco control that may not hold true for South-East Asia. *Lancet Reg Health Southeast Asia* 2023;8:100088. doi: 10.1016/j.lansea.2022.100088
 273. Siddiqui F, Croucher R, Ahmad F, et al. Smokeless Tobacco Initiation, Use, and Cessation in South Asia: A Qualitative Assessment. *Nicotine Tob Res* 2021;23(10):1801-04. doi: 10.1093/ntr/ntab065
 274. Yadav A, Singh PK, Yadav N, et al. Smokeless tobacco control in India: policy review and lessons for high-burden countries. *BMJ Glob Health* 2020;5(7) doi: 10.1136/bmjgh-2020-002367
 275. Salta K, Paschalidou K, Tsetseri M, Koulougliotis D. Shift From a Traditional to a Distance Learning Environment during the COVID-19 Pandemic: University Students' Engagement and Interactions. *Sci Educ (Dordr)* 2022;31(1):93-122. doi: 10.1007/s11191-021-00234-x [published Online First: 20210608]
 276. He H, Pan Z, Wu J, et al. Health Effects of Tobacco at the Global, Regional, and National Levels: Results From the 2019 Global Burden of Disease Study. *Nicotine Tob Res* 2022;24(6):864-70. doi: 10.1093/ntr/ntab265
 277. Viner RM, Hargreaves DS, Motta J, et al. Adolescence and Later Life Disease Burden: Quantifying the Contribution of Adolescent Tobacco Initiation From Longitudinal Cohorts. *J Adolesc Health* 2017;61(2):171-78. doi: 10.1016/j.jadohealth.2017.02.011
 278. Hu T, Gall SL, Widome R, et al. Childhood/Adolescent Smoking and Adult Smoking and Cessation: The International Childhood Cardiovascular Cohort (i3C) Consortium. *J Am Heart Assoc* 2020;9(7):e014381. doi: 10.1161/JAHA.119.014381 [published Online First: 20200408]
 279. Ninivaggi FJ. Physician Wellness: Engaging Mindfulness. In: Ninivaggi FJ, ed. *Learned Mindfulness*: Academic Press, 2020:113-35.

280. Hernandez R, Bassett SM, Boughton SW, et al. Psychological Well-being and Physical Health: Associations, Mechanisms, and Future Directions. *Emot Rev* 2018;10(1):18-29. doi: 10.1177/1754073917697824 [published Online First: 20171020]
281. Chang YH, Yang CT, Hsieh S. Social support enhances the mediating effect of psychological resilience on the relationship between life satisfaction and depressive symptom severity. *Sci Rep* 2023;13(1):4818. doi: 10.1038/s41598-023-31863-7 [published Online First: 20230324]
282. Young I. Health promotion in schools - a historical perspective. *Promot Educ* 2005;12(3-4):112-7, 84-90, 205-11. doi: 10.1177/10253823050120030103
283. Kolbe LJ. School Health as a Strategy to Improve Both Public Health and Education. *Annu Rev Public Health* 2019;40:443-63. doi: 10.1146/annurev-publhealth-040218-043727 [published Online First: 20181219]
284. Sklad M, Diekstra R, Ritter MD, et al. Effectiveness of school-based universal social, emotional, and behavioral programs: Do they enhance students' development in the area of skill, behavior, and adjustment? *Psychology in the Schools* 2012;49(9):892-909. doi: 10.1002/pits.21641
285. Hossain S, Tattan-Birch H, Beard E, Shahab L. Adolescent tobacco use prevention interventions in low-and middle-income countries (LMICs): A systematic review and meta-analysis. SRNT-Europe. London, 2023.
286. Hale DR, Fitzgerald-Yau N, Viner RM. A systematic review of effective interventions for reducing multiple health risk behaviors in adolescence. *Am J Public Health* 2014;104(5):e19-41. doi: 10.2105/AJPH.2014.301874 [published Online First: 20140313]
287. Botvin GJ, Kantor LW. Preventing Alcohol and Tobacco Use Through Life Skills Training. *Alcohol Res Health* 2000;24(4):250–57.
288. Cocks K, Torgerson DJ. Sample size calculations for pilot randomized trials: a confidence interval approach. *J Clin Epidemiol* 2013;66(2):197-201. doi: 10.1016/j.jclinepi.2012.09.002 [published Online First: 20121127]
289. Sanetti LMH, Cook BG, Cook L. Treatment Fidelity: What It Is and Why It Matters. *Learning Disabilities Research & Practice* 2021;36(1):5-11. doi: 10.1111/ldrp.12238
290. Krach SK, McCreery MP, Monk MM, Bagnieris JR. Fidelity in School-Based Positive Behavioral Interventions and Supports: Current Status of Compliance. *J Sch Health* 2022 doi: 10.1111/josh.13286 [published Online First: 20221119]
291. Campbell R, Rawlins E, Wells S, et al. Intervention fidelity in a school-based diet and physical activity intervention in the UK: Active for Life Year 5. *Int J Behav Nutr Phys Act* 2015;12:141. doi: 10.1186/s12966-015-0300-7 [published Online First: 20151111]

292. Stewart-Brown S, Tennant A, Tennant R, et al. Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): a Rasch analysis using data from the Scottish Health Education Population Survey. *Health Qual Life Outcomes* 2009;7:15. doi: 10.1186/1477-7525-7-15 [published Online First: 20090219]
293. Ng Fat L, Scholes S, Boniface S, et al. Evaluating and establishing national norms for mental wellbeing using the short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS): findings from the Health Survey for England. *Qual Life Res* 2017;26(5):1129-44. doi: 10.1007/s11136-016-1454-8 [published Online First: 20161116]
294. Anjum A, Hossain S, Hasan MT, et al. Stress symptoms and associated factors among adolescents in Dhaka, Bangladesh: findings from a cross-sectional study. *BMC Psychiatry* 2022;22(1):807. doi: 10.1186/s12888-022-04340-0 [published Online First: 2022/12/20]
295. Anjum A, Hossain S, Sikder T, et al. Investigating the prevalence of and factors associated with depressive symptoms among urban and semi-urban school adolescents in Bangladesh: a pilot study. *Int Health* 2019 doi: 10.1093/inthealth/ihz092 [published Online First: 2019/11/07]
296. Wen XM, Chen WP, Qian ZP, et al. Differences in Students' Smoking-Related Knowledge, Attitudes, and Behaviors Among Public, Factory, and Private Secondary Schools in Guangzhou, China. *The Journal of School Health* 2008;78(1):46.
297. Ramirez S, Gana S, Godoy MI, et al. Validation of the European Drug Addiction Prevention Trial Questionnaire (EU-Dap) for substance use screening and to assess risk and protective factors among early adolescents in Chile. *PLoS One* 2021;16(10):e0258288. doi: 10.1371/journal.pone.0258288 [published Online First: 20211011]
298. Carreras G, Bosi S, Angelini P, Gorini G. Mediating factors of a school-based multi-component smoking prevention intervention: the LdP cluster randomized controlled trial. *Health Educ Res* 2016;31(4):439-49. doi: 10.1093/her/cyw031 [published Online First: 20160610]
299. Salgado G, Gaete J, Gana S, et al. Acceptability, feasibility and fidelity of the culturally adapted version of Unplugged ("Yo Se Lo Que Quiero"), a substance use preventive program among adolescents in Chile: a pilot randomized controlled study. *BMC Public Health* 2024;24(1):2026. doi: 10.1186/s12889-024-19499-2 [published Online First: 20240729]
300. Siddiqi K, Dogar O, Rashid R, et al. Behaviour change intervention for smokeless tobacco cessation: its development, feasibility and fidelity testing in Pakistan and in the UK. *BMC Public Health* 2016;16:501. doi: 10.1186/s12889-016-3177-8 [published Online First: 20160610]
301. Brown JSL, Blackshaw E, Stahl D, et al. School-based early intervention for anxiety and depression in older adolescents: A feasibility randomised controlled trial of a self-referral stress management workshop programme ("DISCOVER"). *J Adolesc* 2019;71:150-61. doi: 10.1016/j.adolescence.2018.11.009 [published Online First: 20190207]

302. Lloyd J, Dean S, Creanor S, et al. Intervention fidelity in the definitive cluster randomised controlled trial of the Healthy Lifestyles Programme (HeLP) trial: findings from the process evaluation. *Int J Behav Nutr Phys Act* 2017;14(1):163. doi: 10.1186/s12966-017-0616-6 [published Online First: 20171128]
303. Faggiano F, Galanti MR, Bohrn K, et al. The effectiveness of a school-based substance abuse prevention program: EU-Dap cluster randomised controlled trial. *Prev Med* 2008;47(5):537-43. doi: 10.1016/j.ypmed.2008.06.018 [published Online First: 20080709]
304. Kreeft PVD, Wiborg G, Galanti MR, et al. 'Unplugged': A new European school programme against substance abuse. *Drugs: Education, Prevention and Policy* 2009;16(2):167-81. doi: 10.1080/09687630701731189
305. Ren M, Lotfipour S. Nicotine Gateway Effects on Adolescent Substance Use. *West J Emerg Med* 2019;20(5):696-709. doi: 10.5811/westjem.2019.7.41661 [published Online First: 20190820]
306. Moore GF, Audrey S, Barker M, et al. Process evaluation of complex interventions: Medical Research Council guidance. *BMJ* 2015;350:h1258. doi: 10.1136/bmj.h1258 [published Online First: 2015/03/21]
307. Grant A, Treweek S, Dreischulte T, et al. Process evaluations for cluster-randomised trials of complex interventions: a proposed framework for design and reporting. *Trials* 2013;14:15. doi: 10.1186/1745-6215-14-15 [published Online First: 20130112]
308. Hawe P, Shiell A, Riley T, Gold L. Methods for exploring implementation variation and local context within a cluster randomised community intervention trial. *J Epidemiol Community Health* 2004;58(9):788-93. doi: 10.1136/jech.2003.014415
309. Durlak JA. Why Program Implementation is Important. *Journal of Prevention & Intervention in the Community* 1998;17(2):5-18. doi: 10.1300/J005v17n02_02
310. Linnan L, Steckler A. Process evaluation for public health interventions and research: an overview. In: Steckler A, Linnan L, eds. *Process Evaluation for Public Health Interventions and Research* Edited by San Francisco: Jossey-Bass; 2002:1–23. San Francisco: Jossey-Bass 2002:1-23.
311. Lewin S, Glenton C, Oxman AD. Use of qualitative methods alongside randomised controlled trials of complex healthcare interventions: methodological study. *BMJ* 2009;339:b3496. doi: 10.1136/bmj.b3496 [published Online First: 20090910]
312. Hulscher ME, Laurant MG, Grol RP. Process evaluation on quality improvement interventions. *Qual Saf Health Care* 2003;12(1):40-6. doi: 10.1136/qhc.12.1.40
313. Cook TD. Emergent Principles for the Design, Implementation, and Analysis of Cluster-Based Experiments in Social Science. *The ANNALS of the*

American Academy of Political and Social Science 2005;599(1):176-98.
doi: 10.1177/0002716205275738

314. Bonell C, Oakley A, Hargreaves J, et al. Assessment of generalisability in trials of health interventions: suggested framework and systematic review. *BMJ* 2006;333(7563):346-9. doi: 10.1136/bmj.333.7563.346
315. O'Cathain A, Croot L, Duncan E, et al. Guidance on how to develop complex interventions to improve health and healthcare. *BMJ Open* 2019;9(8):e029954. doi: 10.1136/bmjopen-2019-029954 [published Online First: 20190815]
316. Murtagh MJ, Thomson RG, May CR, et al. Qualitative methods in a randomised controlled trial: the role of an integrated qualitative process evaluation in providing evidence to discontinue the intervention in one arm of a trial of a decision support tool. *Qual Saf Health Care* 2007;16(3):224-9. doi: 10.1136/qshc.2006.018499
317. Boaz A, Hanney S, Borst R, et al. How to engage stakeholders in research: design principles to support improvement. *Health Res Policy Syst* 2018;16(1):60. doi: 10.1186/s12961-018-0337-6 [published Online First: 20180711]
318. Maurer M, Mangrum R, Hilliard-Boone T, et al. Understanding the Influence and Impact of Stakeholder Engagement in Patient-centered Outcomes Research: a Qualitative Study. *J Gen Intern Med* 2022;37(Suppl 1):6-13. doi: 10.1007/s11606-021-07104-w [published Online First: 20220329]
319. Sohn H, Tucker A, Ferguson O, et al. Costing the implementation of public health interventions in resource-limited settings: a conceptual framework. *Implement Sci* 2020;15(1):86. doi: 10.1186/s13012-020-01047-2 [published Online First: 20200929]
320. Hilton S, Weishaar H, Sweeting H, et al. E-cigarettes, a safer alternative for teenagers? A UK focus group study of teenagers' views. *BMJ Open* 2016;6(11):e013271. doi: 10.1136/bmjopen-2016-013271 [published Online First: 20161116]
321. Ceasar RC, Braymiller JL, Kechter A, et al. Perceiving E-Cigarettes as Safe and Safer Alternative to Cigarettes Among Young Adults. *Subst Use Addctn J* 2024;45(2):181-90. doi: 10.1177/29767342231218533 [published Online First: 20240128]
322. Mogren A, Gericke N, Scherp H-Å. Whole school approaches to education for sustainable development: a model that links to school improvement. *Environmental Education Research* 2018;25(4):508-31. doi: 10.1080/13504622.2018.1455074
323. Herlitz L, MacIntyre H, Osborn T, Bonell C. The sustainability of public health interventions in schools: a systematic review. *Implement Sci* 2020;15(1):4. doi: 10.1186/s13012-019-0961-8 [published Online First: 20200106]
324. Mantzari E, Vogt F, Shemilt I, et al. Personal financial incentives for changing habitual health-related behaviors: A systematic review and

meta-analysis. *Prev Med* 2015;75:75-85. doi: 10.1016/j.ypmed.2015.03.001 [published Online First: 20150402]

325. Vlaev I, King D, Darzi A, Dolan P. Changing health behaviors using financial incentives: a review from behavioral economics. *BMC Public Health* 2019;19(1):1059. doi: 10.1186/s12889-019-7407-8 [published Online First: 20190807]
326. Vigna-Taglianti FD, Galanti MR, Burkhardt G, et al. "Unplugged," a European school-based program for substance use prevention among adolescents: overview of results from the EU-Dap trial. *New Dir Youth Dev* 2014;2014(141):67-82, 11-2. doi: 10.1002/yd.20087
327. Georgie JM, Sean H, Deborah MC, et al. Peer-led interventions to prevent tobacco, alcohol and/or drug use among young people aged 11-21 years: a systematic review and meta-analysis. *Addiction* 2016;111(3):391-407. doi: 10.1111/add.13224
328. Sun L, Booth A, Sworn K. Adaptability, Scalability and Sustainability (ASaS) of complex health interventions: a systematic review of theories, models and frameworks. *Implement Sci* 2024;19(1):52. doi: 10.1186/s13012-024-01375-7 [published Online First: 20240717]
329. Sawyer SM, Afifi RA, Bearinger LH, et al. Adolescence: a foundation for future health. *Lancet* 2012;379(9826):1630-40. doi: 10.1016/S0140-6736(12)60072-5 [published Online First: 20120425]
330. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71 [published Online First: 20210329]
331. Junger S, Payne SA, Brine J, et al. Guidance on Conducting and REporting DElphi Studies (CREDES) in palliative care: Recommendations based on a methodological systematic review. *Palliat Med* 2017;31(8):684-706. doi: 10.1177/0269216317690685 [published Online First: 20170213]
332. Kasza KA, Edwards KC, Tang Z, et al. Correlates of tobacco product initiation among youth and adults in the USA: findings from the PATH Study Waves 1-3 (2013-2016). *Tob Control* 2020;29(Suppl 3):s191-s202. doi: 10.1136/tobaccocontrol-2020-055671
333. Campbell MK, Piaggio G, Elbourne DR, et al. Consort 2010 statement: extension to cluster randomised trials. *BMJ* 2012;345:e5661. doi: 10.1136/bmj.e5661 [published Online First: 20120904]
334. Drummond MF, Sculpher MJ, Claxton K, et al. Methods for the Economic Evaluation of Health Care Programmes. 4th ed. Oxford: Oxford University Press 2015:445.
335. Leao T, Perelman J, Clancy L, et al. Economic Evaluation of Five Tobacco Control Policies Across Seven European Countries. *Nicotine Tob Res* 2020;22(7):1202-09. doi: 10.1093/ntr/ntz124
336. Oosterhoff M, Bosma H, van Schayck OCP, et al. A systematic review on economic evaluations of school-based lifestyle interventions targeting

- weight-related behaviours among 4-12 year olds: Issues and ways forward. *Prev Med* 2018;114:115-22. doi: 10.1016/j.ypmed.2018.06.015 [published Online First: 20180627]
337. Dopp AR, Kerns SEU, Panattoni L, et al. Translating economic evaluations into financing strategies for implementing evidence-based practices. *Implement Sci* 2021;16(1):66. doi: 10.1186/s13012-021-01137-9 [published Online First: 20210629]
 338. Wu TS, Chaffee BW. Parental Awareness of Youth Tobacco Use and the Role of Household Tobacco Rules in Use Prevention. *Pediatrics* 2020;146(5) doi: 10.1542/peds.2019-4034 [published Online First: 20201005]
 339. DiClemente RJ, Wingood GM, Crosby R, et al. Parental monitoring: association with adolescents' risk behaviors. *Pediatrics* 2001;107(6):1363-8. doi: 10.1542/peds.107.6.1363
 340. Abdulla F, Hossain MM, Huq MN, et al. Prevalence, determinants and consequences of problematic smartphone use among preschoolers (3-5 years) from Dhaka, Bangladesh: A cross-sectional investigation. *J Affect Disord* 2023;329:413-27. doi: 10.1016/j.jad.2023.02.094 [published Online First: 20230228]
 341. Ahmed T, Lucas H, Khan AS, et al. eHealth and mHealth initiatives in Bangladesh: a scoping study. *BMC Health Serv Res* 2014;14:260. doi: 10.1186/1472-6963-14-260 [published Online First: 20140616]
 342. McCool J, Dobson R, Whittaker R, Paton C. Mobile Health (mHealth) in Low- and Middle-Income Countries. *Annu Rev Public Health* 2022;43:525-39. doi: 10.1146/annurev-publhealth-052620-093850 [published Online First: 20211014]
 343. Mulenga R, Shilongo H. Hybrid and Blended Learning Models: Innovations, Challenges, and Future Directions in Education. *Acta Pedagogica Asiana* 2024;4(1):1-13. doi: 10.53623/apga.v4i1.495
 344. Milne-Ives M, Homer SR, Andrade J, Meinert E. Potential associations between behavior change techniques and engagement with mobile health apps: a systematic review. *Front Psychol* 2023;14:1227443. doi: 10.3389/fpsyg.2023.1227443 [published Online First: 20230918]
 345. Larsen ME, Nicholas J, Christensen H. A Systematic Assessment of Smartphone Tools for Suicide Prevention. *PLoS One* 2016;11(4):e0152285. doi: 10.1371/journal.pone.0152285 [published Online First: 20160413]

Appendices: Supplementary materials

Appendix 1

There is no supplementary material for Chapter 1.

Appendix 2

Appendix 2.1: Search strategies for MEDLINE (Ovid SP) database

Search terms/ Key words	Search strategy
Adolescent	1. adolescent\$.mp. 2. teenage\$.mp. 3. youth\$.mp. 4. young people.mp. 5. young adult\$.mp. 6. girl\$.mp. 7. boy\$.mp. 8. exp Adolescent/ 9. child\$.mp. 10.or/1-9
School-based	11.school\$.mp. 12.college\$.mp. 13.academies.mp. 14.education centre\$.mp. 15.further education.mp. 16.training unit\$.mp. 17.referral unit\$.mp. 18.or/11-17 19.18 and 10

Search terms/ Key words	Search strategy
Tobacco use	20.combustible tobacco\$.mp. 21.tobacco\$.mp. 22.exp Smoking/ or smoking.mp. 23.smok\$.mp. 24.cigarette\$.mp. 25.bidi\$.mp. 26.cheroot\$.mp. 27.hookah\$.mp. 28.pipe\$.mp. 29.nicotine\$.mp. 30.non-combustible tobacco\$.mp. 31.smokeless\$.mp. 32.zarda\$.mp. 33.dip\$.mp. 34.snuff\$.mp. 35.snus\$.mp. 36.exp Chewing tobacco/ or spit tobacco.mp. 37.or/20-36 38.37 and 19
Prevention programme	39.primary prevention.mp. or exp Primary Prevention/ 40.health promotion.mp. or exp Health Promotion/ 41.health education.mp. or exp Health Education/ 42.(campaign or teach\$ or advis\$ or counsel\$ or promot\$ or encourag\$).mp. 43.(program\$ or lectur\$ or train\$ or workshop\$ or seminar\$ or lesson\$ or learn\$ or curricul\$ or course\$ or educat\$).mp. 44.intervention\$.mp. 45.Social Behavior?r/ 46.((prevent\$ or abstain\$ or abstin\$ or stop\$ or discourag\$ or anti\$ or no or non) adj2 smok\$).mp. 47.or/39-46 48.47 and 38
Study design	49.randomized controlled trial\$.mp. 50.controlled clinical trial\$.mp. 51.cluster\$ trial\$.mp 52.random\$ trial\$.mp 53.control\$ trial\$.mp 54.clinic\$ trial\$.mp. 55.rct\$.mp. 56.or/49-55 57.56 and 48
LMICs (country names)	58.Afghanistan\$.mp. 59.Albania\$.mp. 60.Algeria\$.mp. 61.American Samoa\$.mp. 62.Angola\$.mp.

Search terms/ Key words	Search strategy
	63. Argentina\$.mp. 64. Armenia\$.mp. 65. Azerbaijan\$.mp. 66. Bangladesh\$.mp. 67. Belarus\$.mp. 68. Belize\$.mp. 69. Benin\$.mp. 70. Bhutan\$.mp. 71. Bolivia\$.mp. 72. Bosnia and Herzegovina\$.mp. 73. Botswana\$.mp. 74. Brazil\$.mp. 75. Bulgaria\$.mp. 76. Burkina Faso\$.mp. 77. Burundi\$.mp. 78. Cabo Verde\$.mp. 79. Cambodia\$.mp. 80. Camero\$.mp. 81. Central African Republic\$.mp. 82. Chad\$.mp. 83. China\$.mp. 84. Colombia\$.mp. 85. Comoros\$.mp. 86. Congo\$.mp. 87. Costa Rica\$.mp. 88. Cote D'ivoire\$.mp. 89. Cuba\$.mp. 90. Djibouti\$.mp. 91. Dominica\$.mp. 92. Ecuador\$.mp. 93. Egypt\$.mp. 94. El Salvador\$.mp. 95. Equatorial Guinea\$.mp. 96. Eritrea\$.mp. 97. Eswatini\$.mp. 98. Ethiopia\$.mp. 99. Fiji\$.mp. 100. Gabon\$.mp. 101. Gambia\$.mp. 102. Georgia\$.mp. 103. Ghana\$.mp. 104. Grenada\$.mp. 105. Guatemala\$.mp. 106. Guinea\$.mp. 107. Guinea-Bissau\$.mp. 108. Guyana\$.mp. 109. Haiti\$.mp.

Search terms/ Key words	Search strategy
	110. Honduras\$.mp. 111. India\$.mp. 112. Indonesia\$.mp. 113. Iran\$.mp. 114. Iraq\$.mp. 115. Jamaica\$.mp. 116. Jordan\$.mp. 117. Kazakh\$.mp. 118. Kenya\$.mp. 119. Kiribati\$.mp. 120. Korea\$.mp. 121. Kosovo\$.mp. 122. Kyrgyz\$.mp. 123. Lao\$.mp. 124. Lebanon\$.mp. 125. Lesotho\$.mp. 126. Liberia\$.mp. 127. Libya\$.mp. 128. Madagascar\$.mp. 129. Malawi\$.mp. 130. Malaysia\$.mp. 131. Maldives\$.mp. 132. Mali\$.mp. 133. Marshall Islands\$.mp. 134. Mauritania\$.mp. 135. Mauritius\$.mp. 136. Mexico\$.mp. 137. Micronesia\$.mp. 138. Moldova\$.mp. 139. Mongolia\$.mp. 140. Montenegro\$.mp. 141. Morocco\$.mp. 142. Mozambique\$.mp. 143. Myanmar\$.mp. 144. Namibia\$.mp. 145. Nepal\$.mp. 146. Nicaragua\$.mp. 147. Niger\$.mp. 148. North Macedonia\$.mp. 149. Palestine\$.mp. 150. Pakistan\$.mp. 151. Panama\$.mp. 152. Papua New Guinea\$.mp. 153. Paraguay\$.mp. 154. Peru\$.mp. 155. Philippines\$.mp. 156. Romania\$.mp.

Search terms/ Key words	Search strategy
	157. Russia\$.mp. 158. Rwanda\$.mp. 159. Samoa\$.mp. 160. São Tomé and Príncipe\$.mp. 161. Senegal\$.mp. 162. Serbia\$.mp. 163. Sierra Leone\$.mp. 164. Solomon Islands\$.mp. 165. Somalia\$.mp. 166. South Africa\$.mp. 167. South Sudan\$.mp. 168. Sri Lanka\$.mp. 169. Saint Lucia\$.mp. 170. Sudan\$.mp. 171. Surinam\$.mp. 172. Syria\$.mp. 173. Tajikistan\$.mp. 174. Tanzania\$.mp. 175. Thailand\$.mp. 176. Timor-Leste\$.mp. 177. Togo\$.mp. 178. Tonga\$.mp. 179. Tunisia\$.mp. 180. Turkey\$.mp. 181. Turkmen\$.mp. 182. Tuvalu\$.mp. 183. Uganda\$.mp. 184. Ukraine\$.mp. 185. Uzbek\$.mp. 186. Vanuatu\$.mp. 187. Vietnam\$.mp. 188. Yemen\$.mp. 189. Zambia\$.mp. 190. Zimbabwe\$.mp. 191. Antigua and Barbuda\$.mp. 192. Aruba\$.mp. 193. Bahrain\$.mp. 194. Barbados\$.mp. 195. Dahomey\$.mp. 196. Upper Volta\$.mp. 197. Chile\$.mp. 198. Kampuchea\$.mp. 199. Khmer Republic\$.mp. 200. Mayotte\$.mp. 201. Zaire\$.mp. 202. Ivory coast\$.mp. 203. Croatia\$.mp.

Search terms/ Key words	Search strategy
	204. Cyprus\$.mp. 205. Czech Republic\$.mp. 206. Czechoslovakia\$.mp. 207. French Somaliland\$.mp. 208. United Arab Republic\$.mp. 209. Spanish Guinea\$.mp. 210. Estonia\$.mp. 211. Gold Coast\$.mp. 212. Gibraltar\$.mp. 213. Greece\$.mp. 214. Guam\$.mp. 215. Guiana\$.mp. 216. Hispaniola\$.mp. 217. Isle of Man\$.mp. 218. Kirghiz\$.mp. 219. Kirgizstan\$.mp. 220. Latvia\$.mp. 221. Jamahiriya\$.mp. 222. Lithuania\$.mp. 223. Macau\$.mp. 224. Macao\$.mp. 225. Malagasy Republic\$.mp. 226. Nyasaland\$.mp. 227. Malta\$.mp. 228. Nauru\$.mp. 229. Northern Mariana Islands\$.mp. 230. Palau\$.mp. 231. Ifni\$.mp. 232. Burma\$.mp. 233. Netherlands Antilles\$.mp. 234. Oman\$.mp. 235. Poland\$.mp. 236. Polish people's Republic\$.mp. 237. Portugal\$.mp. 238. Puerto Rico\$.mp. 239. Soviet Union\$.mp. 240. Socialist Republics\$.mp. 241. Pacific Islands\$.mp. 242. Samoan Islands\$.mp. 243. Saudi Arabia\$.mp. 244. Seychelles\$.mp. 245. Slovenia\$.mp. 246. Melanesia\$.mp. 247. Norfolk Island\$.mp. 248. Ceylon\$.mp. 249. Saint Kitts and Nevis\$.mp. 250. Saint Vincent\$.mp.

Search terms/ Key words	Search strategy
	251. Grenadines\$.mp. 252. Tanganyika\$.mp. 253. Siam\$.mp. 254. Trinidad\$.mp. 255. Tobago\$.mp. 256. Ubangi Shari\$.mp. 257. Uruguay\$.mp. 258. New Hebrides\$.mp. 259. Venezuela\$.mp. 260. West Bank\$.mp. 261. Gaza\$.mp. 262. Yugoslavia\$.mp. 263. Northern Rhodesia\$.mp. 264. Magreb\$.mp. 265. or/58-264
LMICs (economy names)	266. LMIC\$.mp. 267. (low\$ adj income adj (countr\$ or nation\$ or population\$ or econom\$)).mp. 268. (middle\$ adj income adj (countr\$ or nation\$ or population\$ or econom\$)).mp. 269. ((deprived or developing or less developed or under developed or underserved or third world or poor\$ or transitional) adj (countr\$ or nation\$ or population\$ or econom\$)).mp. 270. or/266-270 271. 270 or 265 272. 271 and 57

Appendix 2.2: Data extraction form

Category	Attributes/ Variables
General information	- Reviewer id - Author's name - DOI of the article - Other records of the same study - DOIs of associated protocols and articles - Trial name (if applicable)
Description of participants	- Randomization unit - Randomization group - Number of schools - Number of classes - Number of eligible participants

Category	Attributes/ Variables
	- Number of participants at baseline - Number of dropouts from baseline - Number of participants in the cohort - Mean age at baseline (SD) - Lower age - Upper age - Student grade at baseline - Sex - Ethnicity - Socio-economic status (SES) - Baseline status of tobacco use %(n/N)
Methods	- Country/setting of study - Area - Study design - Study duration - Study objectives - Participants' recruitment: inclusion criteria - Participants' recruitment: exclusion criteria - Recruitment rate - Pre-registration (Yes/No) - Power calculation - Intra-class correlation (ICC) - Methods of analysis
Description of intervention	- Intervention duration - Intervention category - Intervention components - Intervention sessions - Control components - Control sessions - Intervention focus - Intervention operator - Mode of intervention delivery - Quality of intervention delivery - Intervention tailoring (Is this intervention newly developed/culturally adapted? If culturally adapted, from which...)
Outcomes	- Primary outcome measure (definitions of outcome; method of collection and time point of assessment) - Primary outcome data (intervention group) - Primary outcome data (control group) - Secondary outcome measures (definitions of outcome; method of collection and time point) - Secondary outcome data (intervention group) - Secondary outcome data (control group) - Overall intervention effect (RR, OR etc.)

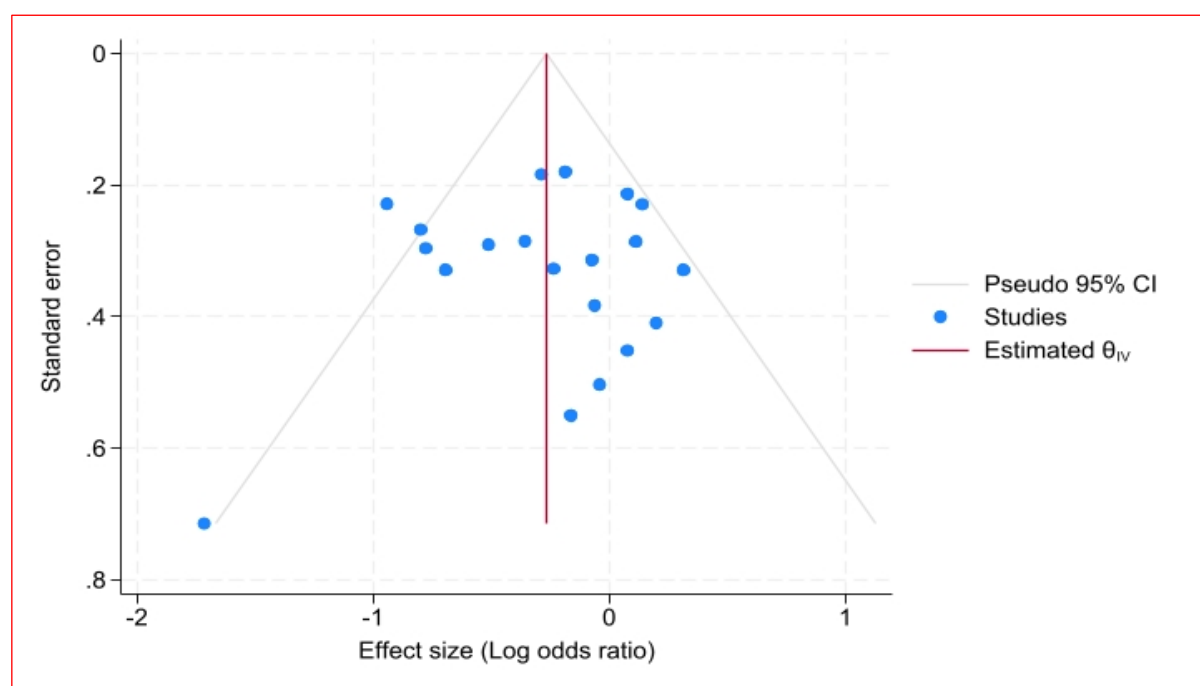
Category	Attributes/ Variables
Others	- Date of publication - Cost of study (cost per student/ whether the intervention is cost-effective or not) - Source of study funding - Additional information - Adverse effects of intervention - Process evaluation / implementation (if applicable) - Suggestion/future implication

Appendix 2.3: Risk of bias assessment

Study	D1a	D1b	D2	D3	D4	D5	Overall
Kaur 2024	+	+	+	+	!	+	+
Kulis 2021	+	+	!	+	-	-	-
Sanchez 2021	+	+	!	-	-	!	-
Vigna-Taglianti 2021	+	+	!	+	-	-	-
Sanchez 2020	+	+	!	-	!	+	-
Filho 2019	!	+	-	+	-	+	-
Lisboa 2019	+	+	+	+	!	+	+
Mohammadi 2019	+	+	!	+	-	+	-
Rozi 2019	+	+	+	+	+	+	+
Al-sheyab 2018	+	+	+	+	!	+	!
Hussain 2018	+	+	!	!	-	+	-
Nakkash 2018	+	+	!	-	-	-	-
Sanchez 2018	+	+	!	-	-	+	-
Mall 2017	+	!	-	-	-	!	-
Mohammed 2016	+	+	+	+	+	+	+
Guo 2015	+	+	+	+	!	+	+
Saraf 2015	+	+	!	-	-	+	-
Tahlil 2015	+	-	!	+	-	+	-
Gabrhelik 2012	+	+	+	+	!	+	+
Lotrean 2010	+	+	+	+	!	+	+
Wen 2010	+	+	+	!	!	+	!
Wen 2010	+	+	+	!	!	+	!
Perry 2009	+	+	!	+	!	+	!
Resnicow 2008	!	+	+	-	-	+	-
Chou 2006	+	+	!	-	-	+	-
Seal 2006	+	+	!	+	-	!	-
Reddy 2002	+	+	-	!	-	!	-

	 Low risk	 Some concerns	 High risk
D1a	Randomisation process		
D1b	Timing of identification or recruitment of participants		
D2	Deviations from the intended interventions		
D3	Missing outcome data		
D4	Measurement of the outcome		
D5	Selection of the reported result		

Appendix 2.4: Funnel plot of studies included in primary meta-analysis*



*Standard error of effect size and odds ratio of estimated outcome (tobacco prevention)

Egger's regression test

meta bias, egger

Effect-size label: Effect size

Effect size: ln_OR

Std. err.: _meta_se

Regression-based Egger test for small-study effects

Random-effects model
Method: REML

H0: $\beta_1 = 0$; no small-study effects

$\beta_1 = -0.30$

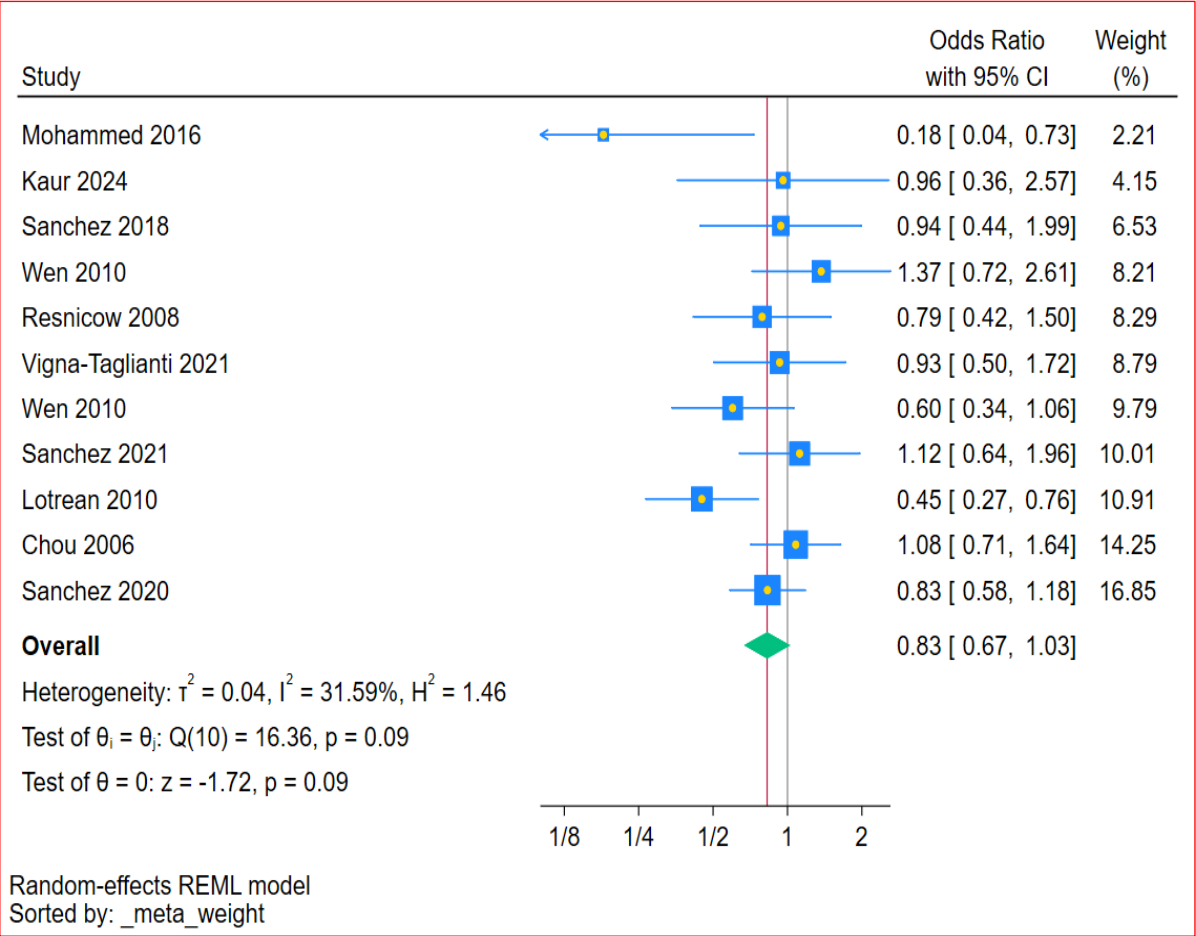
SE of $\beta_1 = 0.935$

$z = -0.32$

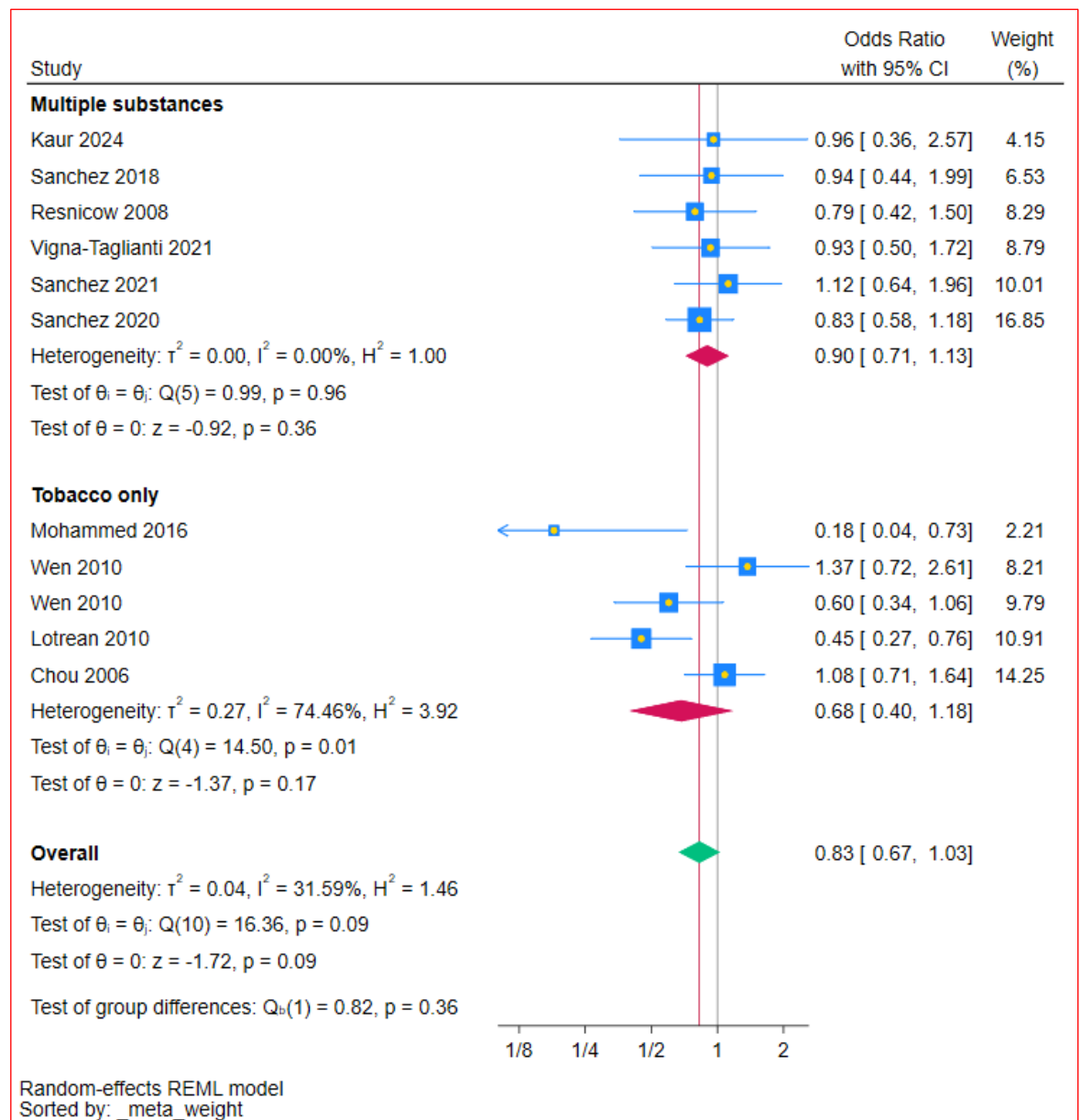
Prob > $|z| = 0.7471$

Authors' interpretation: Based on the Egger's regression test results of our meta-analysis, as the coefficient (β_1) is negative we can say there is a slight tendency for smaller studies included in our meta-analysis to report more positive or larger effect sizes, which could indicate publication bias. However, the z-value ($z = -0.32$) and p-value (Prob > $|z| = 0.75$; insignificant at 0.05 level) suggest that there is no strong evidence of funnel plot asymmetry or publication bias in our meta-analysis. Despite the presence of outliers and moderate heterogeneity in our meta-analysis, the funnel plot appears to be symmetric overall, and the Egger's test does not provide strong evidence to suggest that publication bias is influencing the results. The absence of significant funnel plot asymmetry based on the Egger's test results provides some reassurance regarding the robustness of our meta-analysis findings.

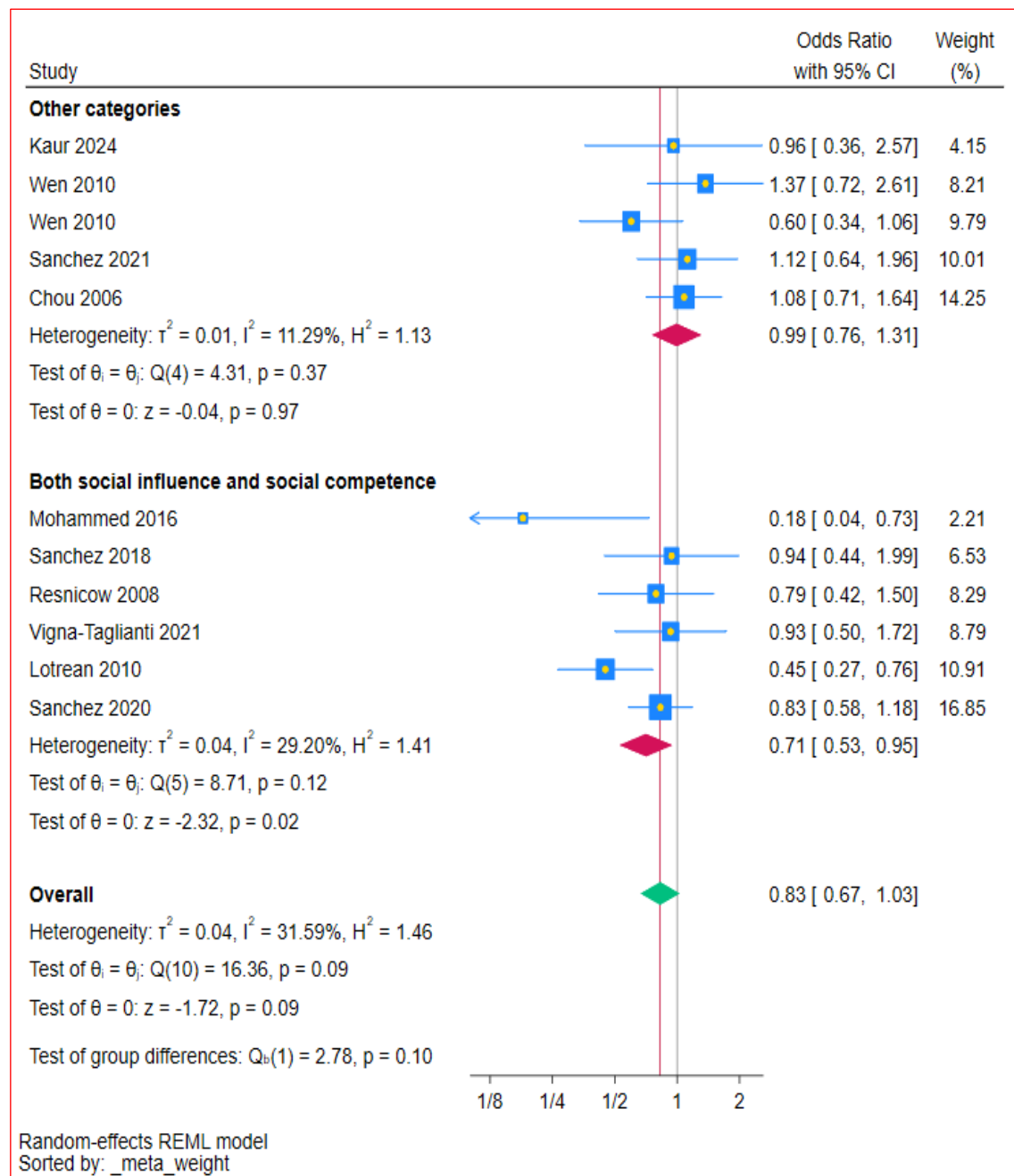
Appendix 2.5 (Sensitivity analysis): Forest plot for meta-analysis of studies with not using imputed ICC, showing the effect of interventions on tobacco use prevention among adolescents



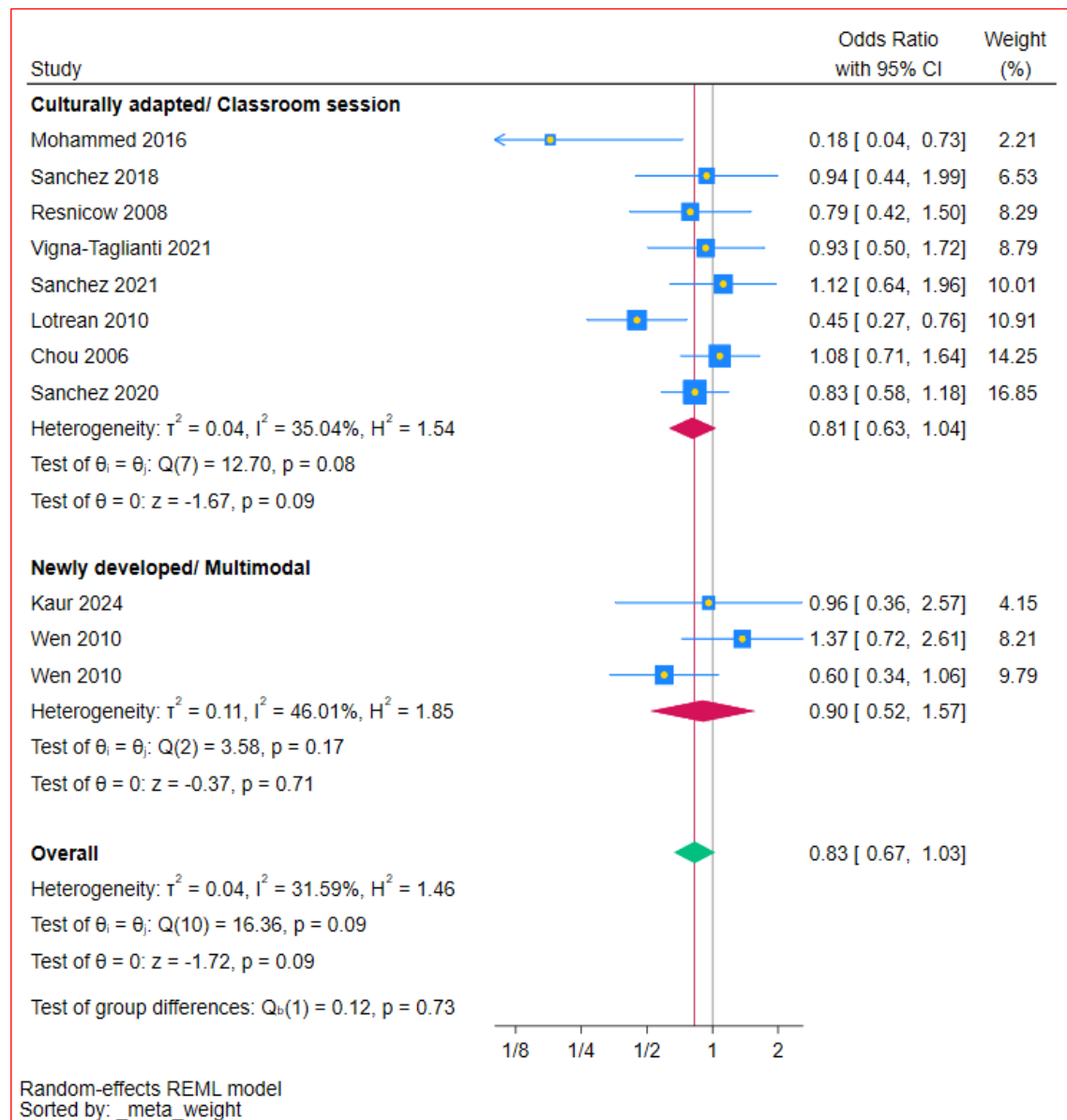
Appendix 2.5.1 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by intervention focus



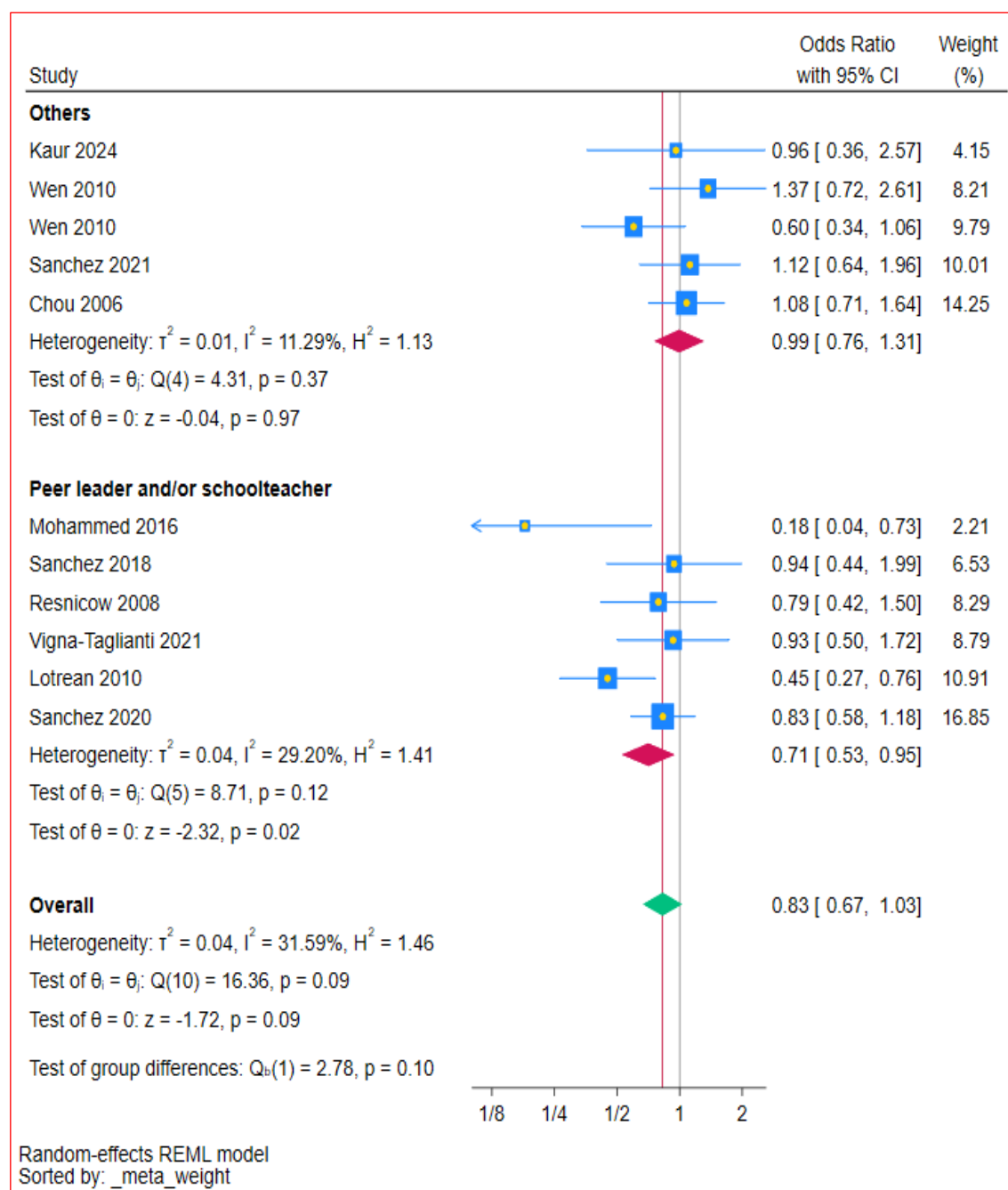
Appendix 2.5.2 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by intervention category



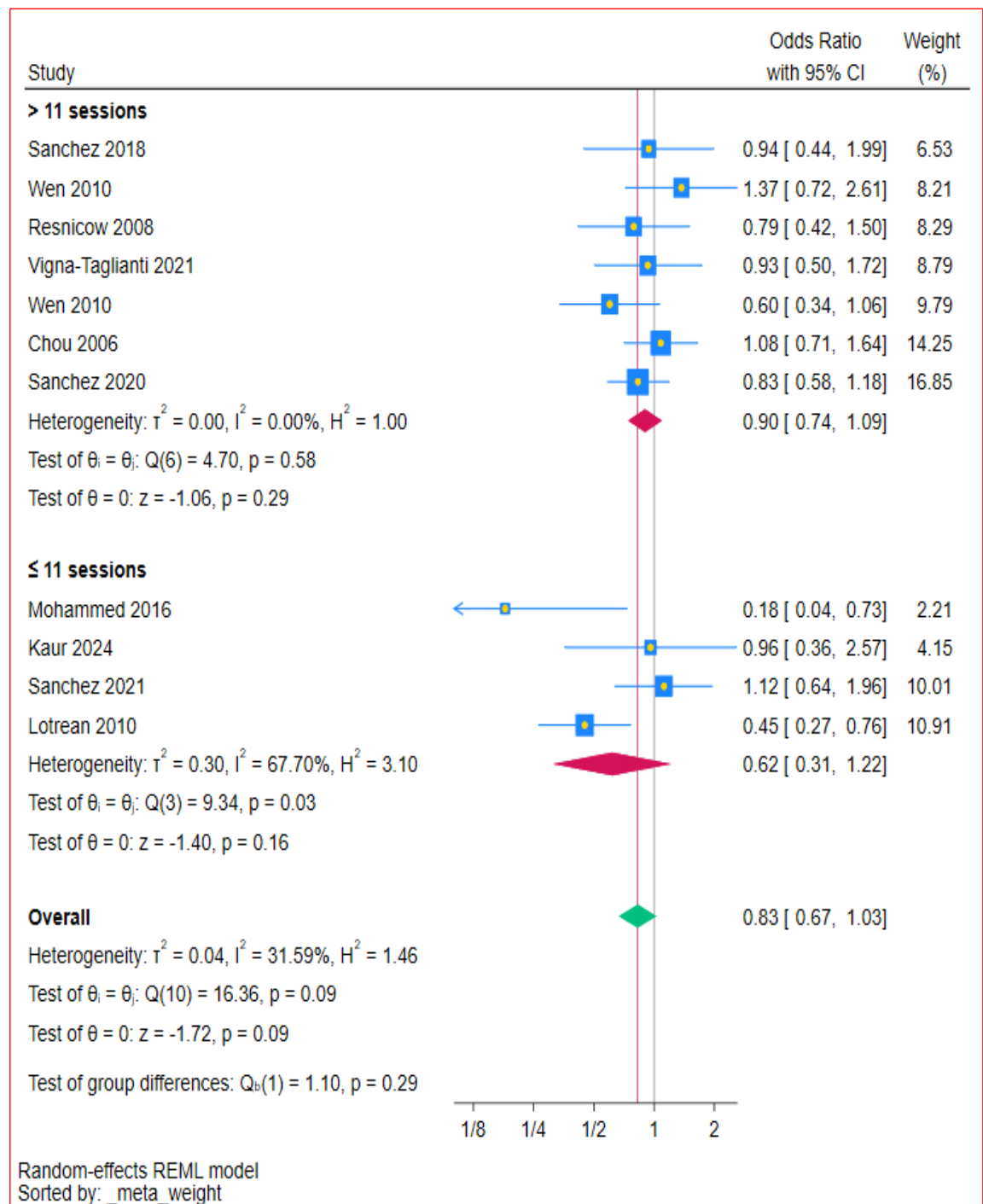
Appendix 2.5.3 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by intervention provenance/ mode of delivery



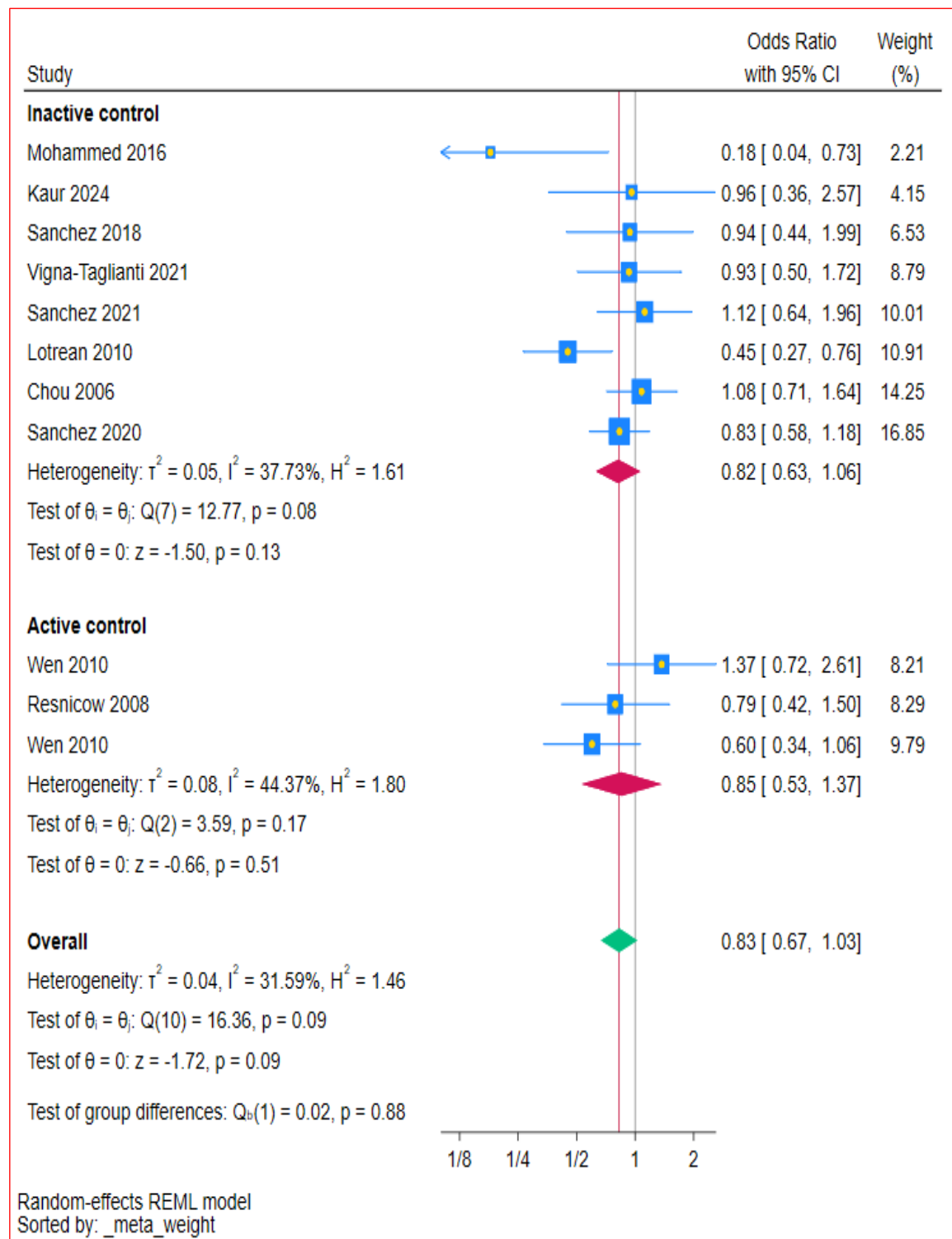
Appendix 2.5.4 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by intervention operator



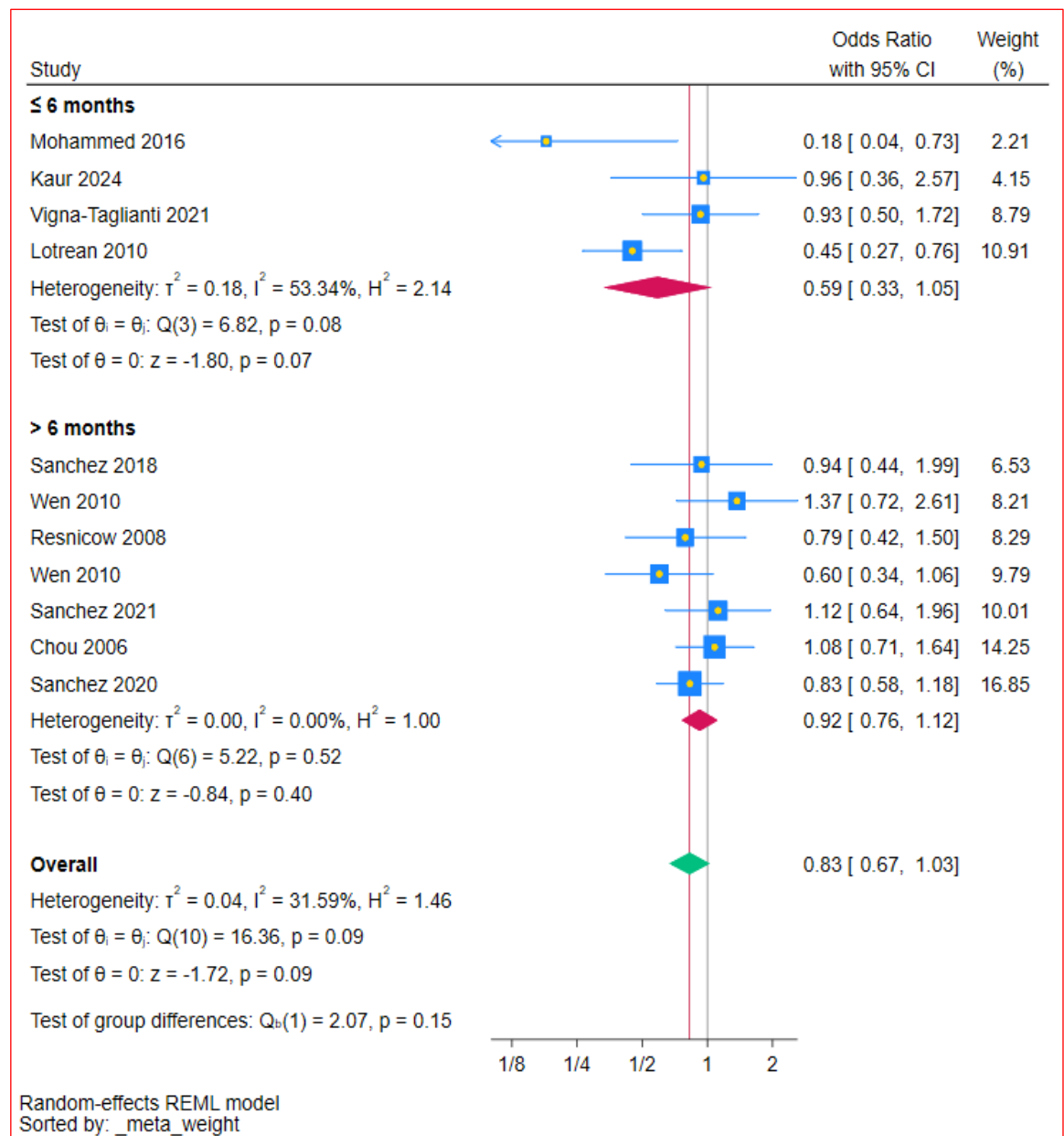
Appendix 2.5.5 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by number of sessions



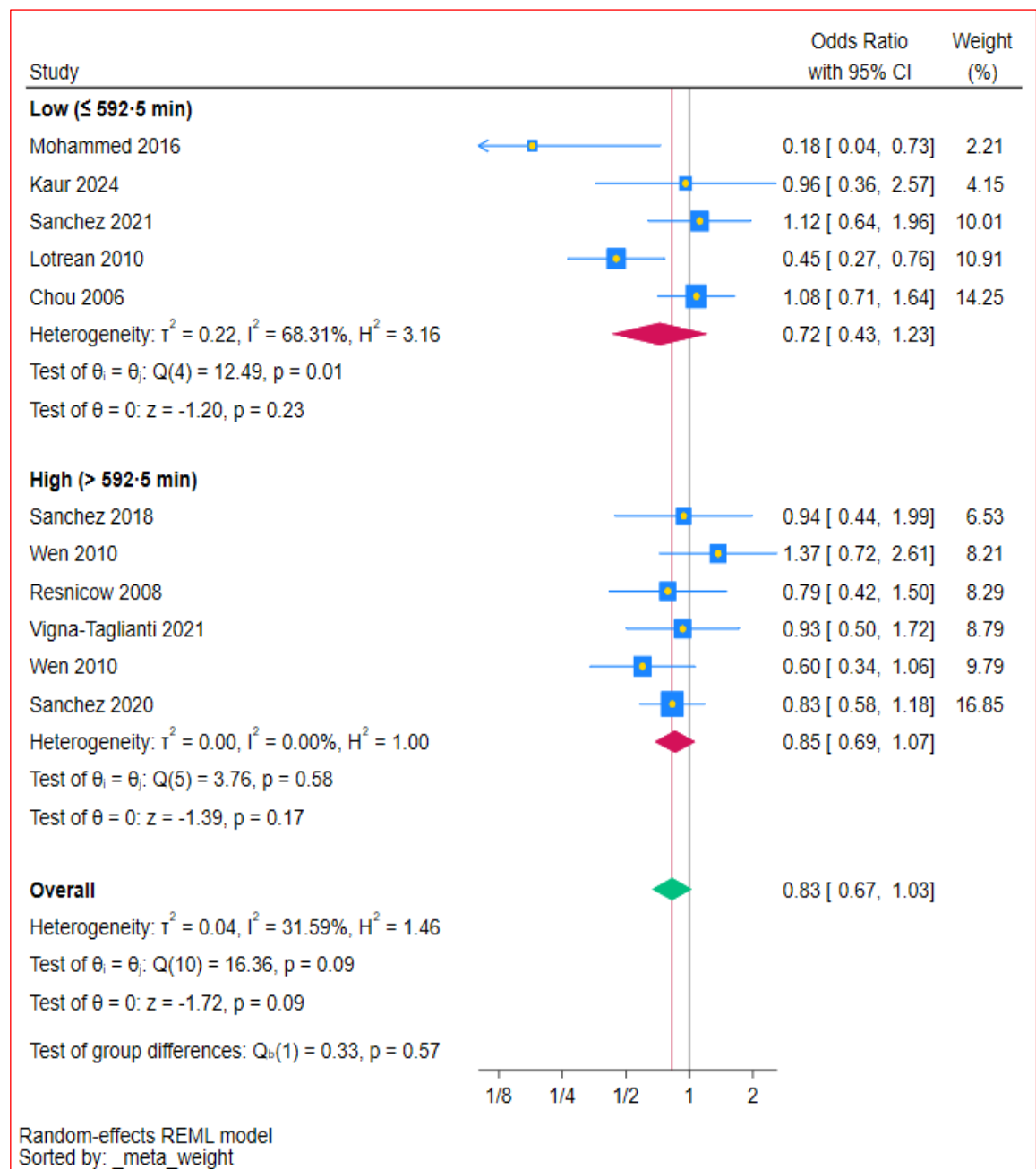
Appendix 2.5.6 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by control condition



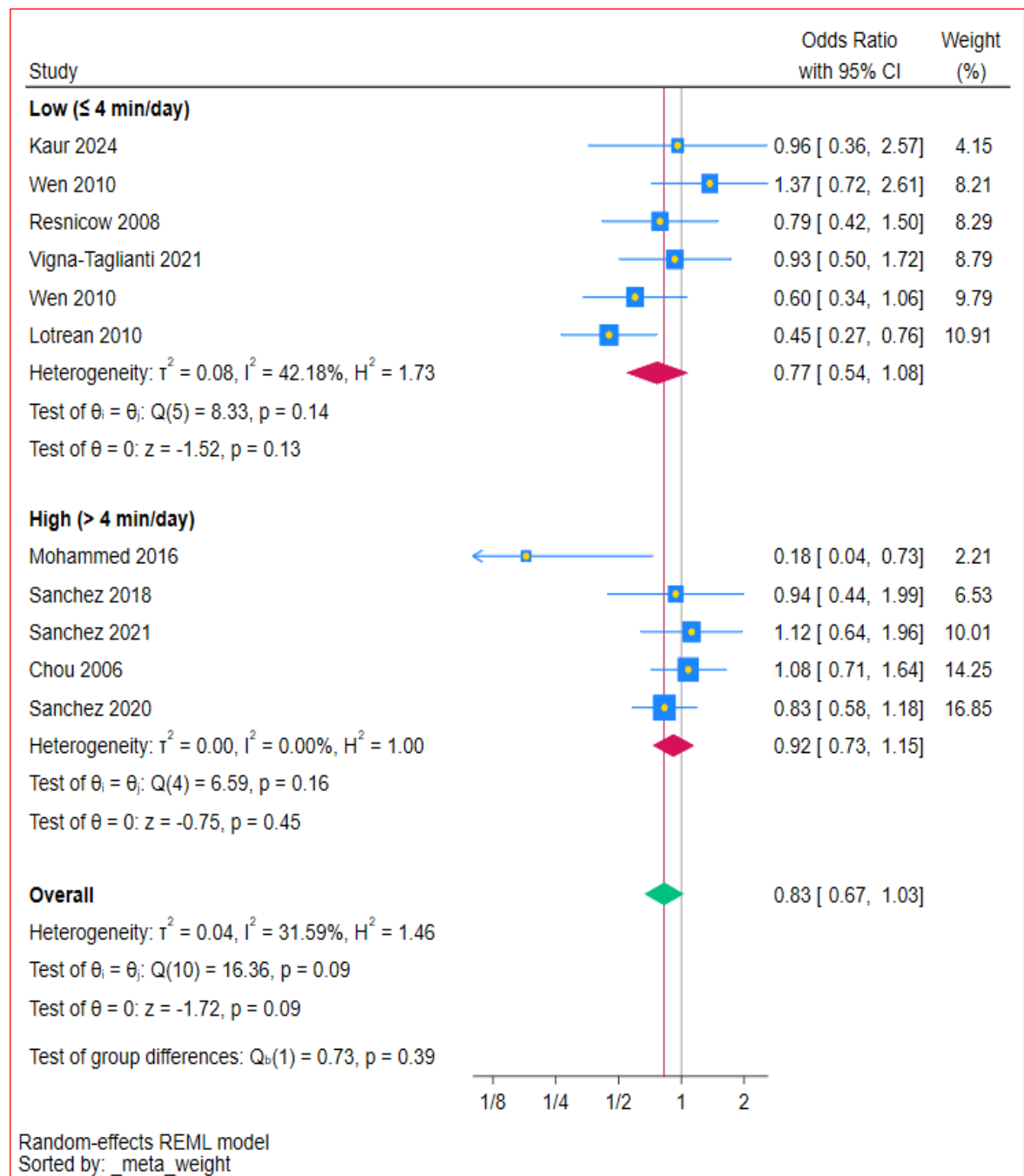
Appendix 2.5.7 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by follow-up length



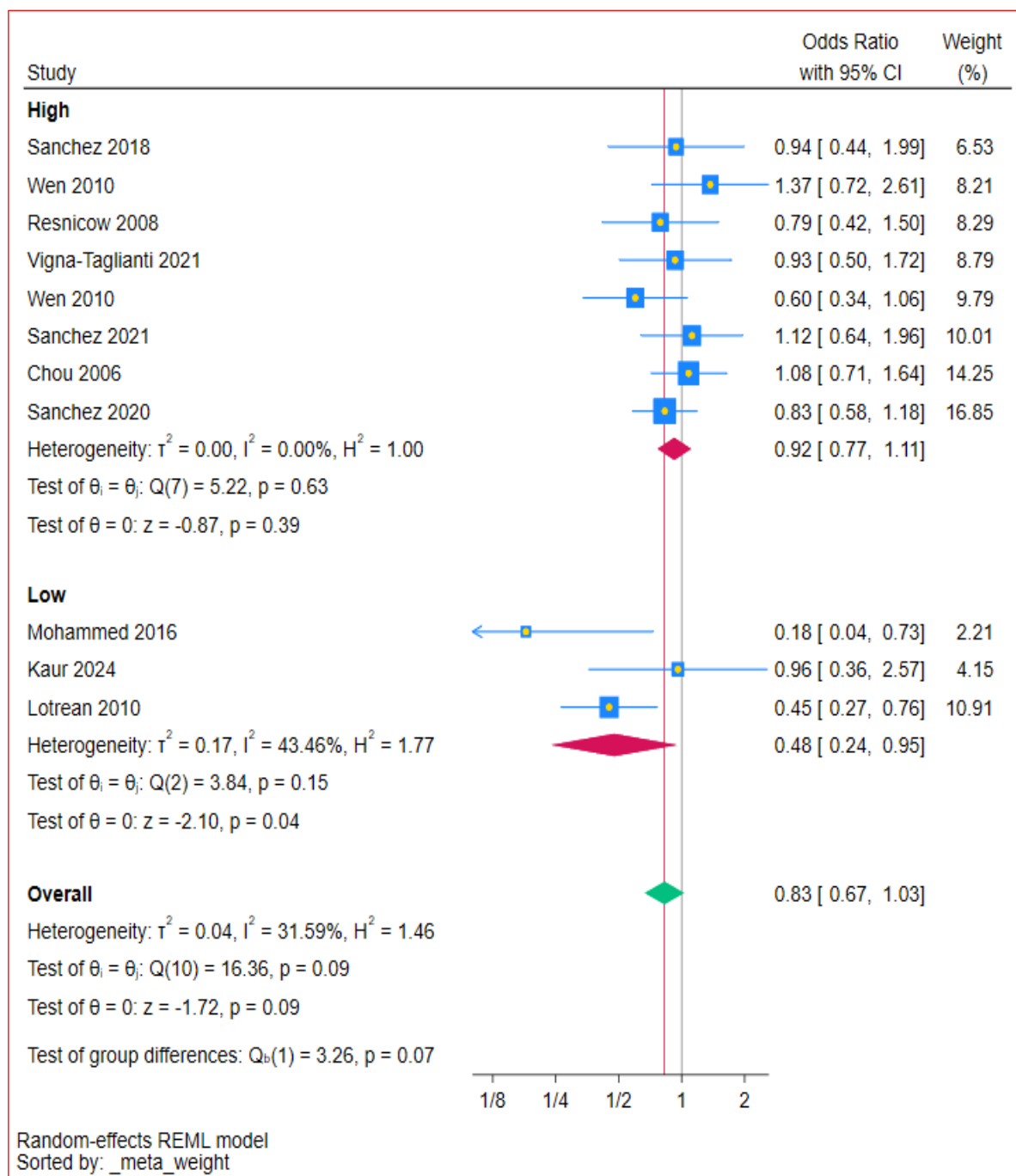
Appendix 2.5.8 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by total contact time



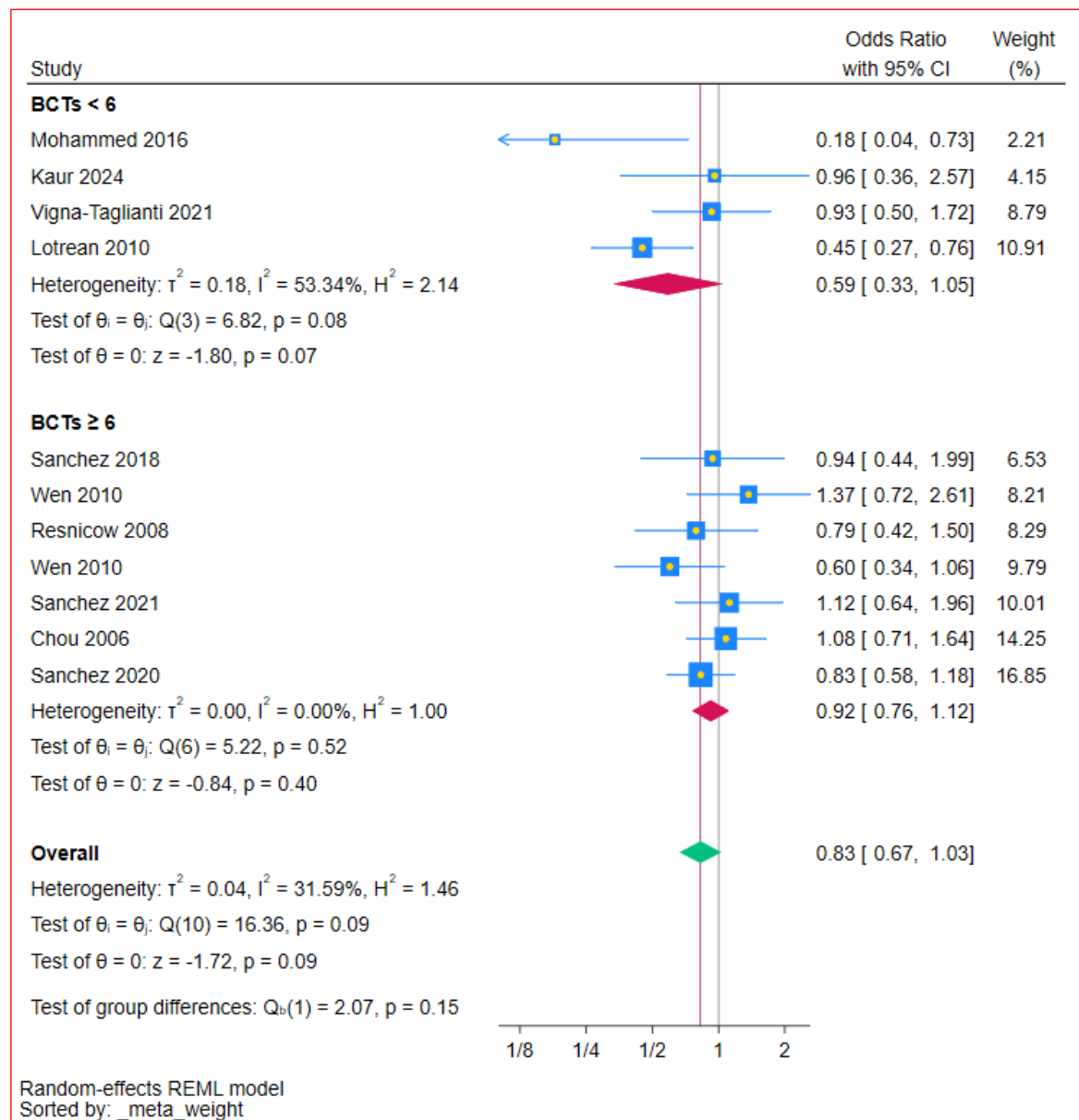
Appendix 2.5.9 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by delivery intensity



Appendix 2.5.10 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by risk of bias



Appendix 2.5.11 (Sensitivity analysis): Forest plot for meta-analysis of studies reporting the effect of interventions on tobacco use prevention among adolescents, stratified by number of BCTs



Appendix 2.6: Frequency of BCTs used in the included studies in this systematic review

Author	No of BCTs	BCTs
Resnicow 2008	8	1.2. Problem solving; 4.1. Instruction on how to perform the behaviour; 5.1. Information about health consequences; 5.3. Information about social and environmental consequences; 5.6. Information about emotional consequences; 9.2. Pros and cons; 11.2. Reduce negative emotions; 15.1. Verbal persuasion about capability
Chou 2006	12	1.2. Problem solving; 1.3. Goal setting (outcome); 1.9. Commitment; 2.3. Self-monitoring of behaviour; 3.1. Social support (unspecified); 5.1. Information about health consequences; 5.3. Information about social and environmental consequences; 6.1. Demonstration of the behaviour; 12.2. Restructuring the social environment; 12.3. Avoidance/reducing exposure to cues for the behaviour; 13.1. Identification of self as role model; 15.1. Verbal persuasion about capability
Gabrhelik 2012	7	1.2. Problem solving; 1.3. Goal setting (outcome); 5.1. Information about health consequences; 5.2. Salience of consequences; 5.6. Information about emotional consequences; 12.2. Restructuring the social environment; 15.1. Verbal persuasion about capability
Lotrean 2010	4	1.2. Problem solving; 5.1. Information about health consequences; 5.3. Information about social and environmental consequences; 5.6. Information about emotional consequences
Perry 2009	7	1.2. Problem solving; 5.1. Information about health consequences; 5.3. Information about social and environmental consequences; 5.6. Information about emotional consequences; 12.2. Restructuring the social environment; 12.3. Avoidance/reducing exposure to cues for the behaviour; 13.1. Identification of self as role model
Reddy 2002	2	1.2. Problem solving; 12.2. Restructuring the social environment
Seal 2006	5	1.2. Problem solving; 4.1. Instruction on how to perform the behaviour; 11.2. Reduce negative emotions; 12.3. Avoidance/reducing exposure to cues for the behaviour; 15.1. Verbal persuasion about capability
Wen 2010	7	1.2. Problem solving; 1.9. Commitment; 4.2. Information about Antecedents; 5.1. Information about health consequences; 5.2. Salience of consequences; 11.2. Reduce negative emotions; 12.2. Restructuring the social environment

Wen 2010	7	1.2. Problem solving; 1.9. Commitment; 4.2. Information about Antecedents; 5.1. Information about health consequences; 5.2. Salience of consequences; 11.2. Reduce negative emotions; 12.2. Restructuring the social environment
Guo 2015	7	1.2. Problem solving; 1.9. Commitment; 3.1. Social support (unspecified); 5. Natural consequences; 5.3. Information about social and environmental consequences; 11.2. Reduce negative emotions; 12.3. Avoidance/reducing exposure to cues for the behaviour; 15.1. Verbal persuasion about capability
Hussain 2018	5	1.3. Goal setting (outcome); 5.1. Information about health consequences; 5.3. Information about social and environmental consequences; 5.6. Information about emotional consequences; 11.2. Reduce negative emotions
Mall 2017	4	5.1. Information about health consequences; 5.3. Information about social and environmental consequences; 9.2. Pros and cons; 15.1. Verbal persuasion about capability
Lisboa 2019	3	5.1. Information about health consequences; 5.2. Salience of consequences; 6.1. Demonstration of the behaviour
Mohammed 2016	6	1.2. Problem solving; 1.9. Commitment; 5.1. Information about health consequences; 6.1. Demonstration of the behaviour; 12.3. Avoidance/reducing exposure to cues for the behaviour; 15.1. Verbal persuasion about capability
Sanchez 2020	8	1.2. Problem solving; 1.3. Goal setting (outcome); 3.1. Social support (unspecified); 5.1. Information about health consequences; 5.2. Salience of consequences; 5.6. Information about emotional consequences; 11.2. Reduce negative emotions; 15.1. Verbal persuasion about capability
Sanchez 2018	7	1.2. Problem solving; 1.3. Goal setting (outcome); 5.1. Information about health consequences; 5.2. Salience of consequences; 5.6. Information about emotional consequences; 12.2. Restructuring the social environment; 15.1. Verbal persuasion about capability
Sanchez 2021	2	1.2. Problem solving; 15.1. Verbal persuasion about capability
Vigna-Taglianti 2021	7	1.2. Problem solving; 1.3. Goal setting (outcome); 5.1. Information about health consequences; 5.2. Salience of consequences; 5.6. Information about emotional consequences; 12.2. Restructuring the social environment; 15.1. Verbal persuasion about capability
Saraf 2015	3	4.1. Instruction on how to perform the behaviour; 5.1. Information about health consequences; 12.2. Restructuring the social environment

Appendix 3

Appendix 3.1: A sample copy of the school invitation letter

School of Life and Medical Sciences
Faculty of Population Health Science
Institute of Epidemiology and Health Care

**UCL**

DEPARTMENT OF BEHAVIOURAL SCIENCE AND HEALTH
1-19 Torrington Place
London WC1E 7HN

Telephone +44 (0)20 7679 6642
Fax +44 (0)20 7679 8354
Direct line +44 (0)20 7679 1895

Date:

To: **Name**
The Principal/Headmaster
Name of School
Address

Dear Sir,

Re: Invitation to participate in a school-based intervention programme to prevent tobacco uptake and promote mental health and well-being of school adolescents in Dhaka, Bangladesh

It is our pleasure to invite your school and/or college to take part in an intervention programme on the above-mentioned subject, conducted between 2022 and 2023 in Dhaka, Bangladesh. The programme will be led by Mr Sahadat Hossain, Lecturer in Public Health at Jahangirnagar University, Bangladesh and PhD Researcher at University College London in the United Kingdom. Furthermore, this programme will be supervised by Professor Lion Shahab, Professor of Health Psychology at University College London, and Dr Emma Beard, Principal Research Fellow at University College London.

The broad aim of this programme is to prevent Bangladeshi school adolescents (aged 13 to 17 years) from all types of tobacco use and improve their mental health and wellbeing through behavioural and cognitive skill development of social competence and social influence curricula intervention. It will focus on social learning processes, life skills for resisting interpersonal or media influences, increased self-control and self-esteem, coping strategies for stress etc. training in which students will be taught how to deal with pressure, high risk situations, refuse attempts to persuade tobacco use from direct and indirect sources. This programme has following three parts –

- (i) a pre survey before the intervention (the survey will investigate students' tobacco use and mental health condition, and it will be very brief in nature on online – no longer than 25 minutes to complete),
- (ii) intervention period (exact format will be based on best research evidence following a systematic review, incorporating a culturally adapted existing intervention; delivered over 1h in each class – or whatever else we will decide), and
- (iii) post-intervention follow-up assessment (should take about 20-25 minutes to complete).

Overall, the whole study programme will involve 7 visits to classes over an 8-month period. The location of the intervention will be school premises, and our expert pool of research team will visit the school for delivering the intervention modules as well as for conducting surveys before and after the intervention. Students of grade 8, 9, 10, and/or 11 are the target population and thus eligible to participate in this programme. The confidentiality of all participants will be protected in compliance with the biomedical research with human population policies and procedures of University College London and Jahangirnagar University ethics boards.

University College London, Gower Street, London WC1E 6BT
Tel: +44 (0)20 7679 2000
lion.shahab@ucl.ac.uk
www.ucl.ac.uk

**CANCER
RESEARCH
UK**

There is no risk of involving in this programme, rather the potential positive outcomes of the programme will add a new dimension in tobacco uptake prevention program and policies in Bangladesh. Additionally, the intervention will be beneficial for the adolescents in order to manage their behavioural and psychological disorders, and therefore to promote society and public health as a whole. Therefore, we would like to invite your school and/or college to join our programme. We hope that you will find this letter worthy of consideration. If you want more information before deciding or have any questions or concerns regarding this programme and your students' participation, please do not hesitate to contact us, via email or phone, mentioned below.

We are looking forward to hearing your response soon.

Sincerely,

[Redacted Signature]	[Redacted Signature]	[Redacted Signature]
Sahadat Hossain , PhD Student Dept. of Behavioural Science and Health University College London London, WC1E 6BT UK Contact: Mob: [Redacted] Email: [Redacted] Lecturer in Public Health and Informatics Jahangirnagar University, Dhaka-1342 BD Contact: Mob: [Redacted] Email: [Redacted]	Dr Emma Beard Principal Research Fellow Dept. of Behavioural Science and Health University College London London, WC1E 6BT Tel: [Redacted] Email: [Redacted]	Professor Lion Shahab Professor of Health Psychology Dept. of Behavioural Science and Health Co-Director, UCL Tobacco and Alcohol Research Group University College London London, WC1E 6BT Tel: [Redacted] Email: [Redacted]

Appendix 3.2: A sample copy of the recruitment leaflet circulated by the school authority for the survey

School-based survey on tobacco and health in Dhaka, Bangladesh

বিজ্ঞপ্তি

একটি অনলাইন জরিপে অংশগ্রহণের জন্য শিক্ষার্থীদের আমন্ত্রণ

প্রিয় শিক্ষার্থীবৃন্দ,

তোমাদেরকে আনন্দের সাথে জানাচ্ছি যে মাইলস্টোন স্কুল অ্যান্ড কলেজ “বাংলাদেশের স্কুল শিক্ষার্থীদের তামাক ব্যবহার ও মানসিক স্বাস্থ্যের অবস্থা নিরূপণে স্কুল-ভিত্তিক জরিপ” শীর্ষক একটি গবেষণায় অংশগ্রহণ করছে। এই গবেষণাটি যুক্তরাজ্যের লন্ডনে অবস্থিত ইউনিভার্সিটি কলেজ লন্ডন (UCL) দ্বারা পরিচালিত হচ্ছে। ইউসিএল-এর স্বাস্থ্য মনোবিজ্ঞানের অধ্যাপক লিয়ন শাহাবের তত্ত্বাবধানে বাংলাদেশের জাহাঙ্গীরনগর বিশ্ববিদ্যালয়ের পাবলিক হেলথের শিক্ষক সাহাদাত হোসেন গবেষণাটির নেতৃত্ব দিচ্ছেন। এই গবেষণার লক্ষ্য হল ঢাকা শহরের স্কুল শিক্ষার্থীদের (৮ম থেকে একাদশ শ্রেণী) মধ্যে তামাক ব্যবহারের বর্তমান ব্যাপকতা এবং তামাক ব্যবহারের সাথে সম্পর্কিত কারণগুলি জানা। পাশাপাশি, এই গবেষণায় অংশগ্রহণকারীদের মানসিক স্বাস্থ্যের অবস্থা নিরূপণ এবং তামাক ব্যবহারের সাথে এর সম্পর্ক পর্যালোচনা করা হবে।

তোমরা সবাই গবেষণার মানদণ্ডের উপর ভিত্তি করে এই গবেষণায় অংশগ্রহণের যোগ্য। অতএব, আমরা তোমাদেরকে এই অনলাইন জরিপে অংশগ্রহণের জন্য আমন্ত্রণ জানাচ্ছি। জরিপের লিঙ্কটি তোমাদেরকে আমরা সরবরাহ করবো।

লিঙ্কের শুরুতে তোমরা একটি তথ্যপত্র পাবে (৮ম ও ৯ম শ্রেণীর শিক্ষার্থীদের জন্য পিতামাতা বা অভিভাবকের জন্য একটি আলাদা তথ্যপত্র থাকবে)। এরপর একটি অনলাইন সম্মতিপত্র থাকবে। সম্মতিপত্রের পরেই থাকবে জরিপের মূল প্রশ্নপত্র।

সম্মতিপ্রদান এবং অংশগ্রহণের পদ্ধতিগুলি নিম্নরূপ:

১। প্রথমে তোমরা তথ্যপত্রটি মনোযোগ সহকারে পড়বে এবং সম্মতিপত্রটি সম্পূর্ণ করবে (৮ম ও ৯ম শ্রেণীর শিক্ষার্থীদের জন্য অভিভাবকের সম্মতিও প্রদান করতে হবে)।

২। সম্মতি প্রদানের পর জরিপের প্রশ্নপত্রের পাতা আসবে। অনুগ্রহ করে পুরো প্রশ্নপত্রটি মনোযোগের সাথে সম্পূর্ণ করবে।

৩। প্রশ্নপত্রটি পূরণ করার সময় তোমরা নিজ রুমে শান্ত ভাবে বসে তা পূরণ করবে। এবং প্রশ্নপত্রের শেষে ‘সাবমিট’ অপশনে ক্লিক করে তা জমা দিবে।

৪। এই গবেষণার কোন বিষয় সম্পর্কে তোমার কোন প্রশ্ন বা মতামত থাকলে তা গবেষণার তথ্যপত্রের শেষে দেওয়া গবেষকদের ইমেইল আইডি/ ফোন নম্বরে যোগাযোগ করে জানাতে পারবে।

৫। এই গবেষণাটি কমনওয়েলথ স্কলারশীপের আওতায় একটি পিএইচডি ডিগ্রির অংশ। তাই তোমাদের কাছে বিশেষ আহ্বান এই যে পুরো প্রশ্নপত্রের সবগুলো প্রশ্নের উত্তর তোমার ক্ষেত্রে যেটা সত্য তা প্রদান করবে। এই গবেষণাটি তোমার তথ্যের শতভাগ নিরাপত্তা নিশ্চিত করতে অঙ্গীকারবদ্ধ।

তোমাদের সবাইকে এই গবেষণায় অংশগ্রহণ করার জন্য আহ্বান জানানো হচ্ছে।

প্রফেসর মোঃ শহিদুল ইসলাম

অধ্যক্ষ

মাইলস্টোন স্কুল অ্যান্ড কলেজ

সেক্টর-১১, উত্তরা, ঢাকা-১২৩০

Appendix 3.3: Parental information sheet for parents of students of grade 8 & 9

Title of study

School-based survey on tobacco and health in Dhaka, Bangladesh

UCL Research Ethics Committee Approval ID Number: 22645/001

Department: Department of Behavioural Science and Health

Name and Contact Details of the Principal Researcher:

Professor Lion Shahab
Professor of Health Psychology
Programme Lead, MSc Health Psychology
Co-Director, UCL Tobacco and Alcohol Research Group
Department of Behavioural Science and Health
University College London
1-19 Torrington Place, LONDON, WC1E 7HB
Tel: [REDACTED]
[REDACTED]

1. Introduction

The purpose of this form is to provide you (as the parent/guardian of a prospective research study participant) with information that may affect your decision as to whether or not to let your child participate in this research study. Read the information below and ask any questions, using the contact information at the end of this form, you might have before deciding whether or not to give your permission for your child to take part. If you decide to let your child be involved in this study, this form will be used to record your permission.

2. What is the project's purpose?

The purpose of the survey is to collect data on the prevalence and factors associated with tobacco use and mental health of Bangladeshi school students.

3. Why has my child been chosen?

Your child has been approached because the study requires information from your child as s/he meets the following inclusion criteria:

- Your child is a Bangladeshi school student
- Your child is a student of Year 8 to 11
- The age of your child is between 13 and 17 years

Furthermore, your child has been chosen because the authority of your child's school and/or college agreed to participate in this study. Like your child, we are approaching all students who met the inclusion criteria in the school as well as other schools in Dhaka city.

4. Does my child have to participate?

It is entirely up to you and your child to decide. You can agree to allow your child (if s/he wishes to participate) to be in the study now and change your mind later without any penalty. Your child's participation in this study is voluntary. Your child may decline to participate or to withdraw from participation at any time.

5. What is my child going to be asked to do?

If you allow your child to participate in this study, they will be asked to complete the survey questionnaire. It will take about 20-25 minutes to complete. We will collect information about your child's tobacco use behaviour, exposure to environmental tobacco smoke, tobacco-related advertisement and promotion, knowledge, attitudes and beliefs about tobacco use, and overall mental health and well-being. No identifying information will be linked to the completed questionnaire; instead, we will use a code during analysis that makes your child's data anonymous. We would like to confirm you that we will only collect three of your child's pseudonymised personal data (initials of their name, DOB and school name). However, the design of this survey is cross-sectional, so we will not contact your child further.

6. Will my child's privacy and confidentiality be protected if s/he participates in this research study?

Yes, all the information that we will collect in this survey will be kept strictly confidential. The survey is being conducted using a secure online survey software called REDCap, authorized by UCL. No data will be transferred to any third parties (e.g., commercial organisations). Only the research team (Research Supervisors, Administrator and the Researcher) will have access to the data. However, during the survey, if your child discloses anything that may highlight harm to them, the researcher has a duty of care to report this to your child's school/ relevant teacher to protect their health, but otherwise, your child's privacy and confidentiality will be maintained throughout.

7. What are the possible disadvantages and risks involved in this study?

There are no anticipated disadvantages, side effects, and risks of taking part in this survey. Since the questionnaire contains questions about the mental well-being of your child, this may cause some discomfort in completing the questionnaire.

8. What are the possible benefits of taking part?

Whilst there are no immediate benefits for the participants of this survey, it is hoped that the findings will have implications for designing a tobacco prevention trial for school students in Bangladesh.

9. What will happen to the results of the research project?

The results of the study will be published in a PhD thesis; peer-reviewed articles and conference proceedings may also be prepared for publication in academic journals. Your child will not be able to be identified in any ensuing reports or publications. However, the pseudonymised data will be stored securely at least for 10 years in a password protected computer of the principal researcher. If the data collected from this study are needed by either the current or a future researcher to answer a new research question, data will be de-identified prior to using them, and no researcher will have access to information that could identify your child.

10. Local Data Protection Privacy Notice

Notice:

The controller for this project will be University College London (UCL). The UCL Data Protection Officer provides oversight of UCL activities involving the processing of personal data, and can be contacted at data-protection@ucl.ac.uk

This 'local' privacy notice sets out the information that applies to this particular study. Further information on how UCL uses participant information can be found in our 'general' privacy notice:

For participants in health and care research studies, click [here](#)

The information that is required to be provided to participants under data protection legislation (GDPR and DPA 2018) is provided across both the 'local' and 'general' privacy notices.

The categories of your child's personal data used will be as follows:

Initials of your child's name

The school name of your child

Your child's date of Birth

Special category personal data

This type of data is about your child's sex, religious belief, health data (how do your child describe his or her general state of health now; Over the last 2 weeks, how often have your child been bothered by any of the following problems, e.g., feeling nervous, anxious").

The lawful basis that would be used to process your *personal data* will be performance of a task in the public interest. The lawful basis used to process *special category personal data* will be for scientific and historical research or statistical purposes.

If you are concerned about how the personal data of your child is being processed, or if you would like to contact us about your child's rights, please contact UCL in the first instance at data-protection@ucl.ac.uk.

11. Who is organising and funding the research?

This survey is a part of Sahadat Hossain's PhD project. The Commonwealth Scholarship Commission in the UK (CSC) provides SH a Commonwealth Scholarship (CSC Reference Number: BDCS-2021-607) to financially support for the degree of PhD at University College London.

12. Contact for further information

If you have any questions about any aspect of this research project, or your child's participation in the survey, not answered by this Information Sheet, you may contact the research team, using the following email and/or contact number.

Name and Contact Details of the Researcher(s):

Sahadat Hossain, Email: [REDACTED] Mob: [REDACTED]
(BD); [REDACTED]

Dr Emma Beard, Email: [REDACTED]

Professor Lion Shahab, Email: [REDACTED]

Note: The “BD mobile contact number” will be active and available between June and July 2022. After this period, please contact us by email if you have any queries.

Please go to the consent page, and let us know your decision about your child's participation.

Thank you for reading this information sheet and considering your child participating in this study. Additionally, we need your child's consent in another form after your consent, as we will not seek to collect data from your child against his/her will. Please provide your child access to the online survey link to read the Participant Information Sheet and complete the short questionnaire on the basis of consent.

Appendix 3.4: Participant information sheet

Title of study

School-based survey on tobacco and health in Dhaka, Bangladesh

UCL Research Ethics Committee Approval ID Number: 22645/001

Department: Department of Behavioural Science and Health

Name and Contact Details of the Principal Researcher:

Professor Lion Shahab
Professor of Health Psychology
Programme Lead, MSc Health Psychology
Co-Director, UCL Tobacco and Alcohol Research Group
Department of Behavioural Science and Health
University College London
1-19 Torrington Place, LONDON WC1E 6BT
Tel: [REDACTED]

1. Invitation paragraph

You are being invited to participate in this online survey which is a part of a PhD research project at University College London. Before you decide whether to take part, you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully and feel free to ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. By joining, you will help us investigate and understand the nature of tobacco use and the mental health condition of Bangladeshi school students and help suggest how an

intervention for tobacco use prevention might be developed. So our questionnaire will seek information related to your tobacco use behaviour and mental health. There is no known risk as well as compensation associated with participating in this study. Your participation is voluntary and you can withdraw from the survey after having agreed to participate. You have the right to refuse to participate and to skip any question you do not wish to answer. This decision will not affect you in any way. All data collected for the purpose of this study will remain confidential and accessible only to the research team. Thank you for reading this.

2. What is the project's purpose?

The purpose of the survey is to collect data on the prevalence and factors associated with tobacco use and mental health of Bangladeshi school students.

3. Why have I been chosen?

You have been approached because you meet the following inclusion criteria:

- You are a Bangladeshi school student
- You are a student of Year 8 to 11
- Your age is between 13 and 17 years

Furthermore, you have been chosen because the authority of your school and/or college agreed to participate in this study. Like you, we are approaching all students, who met the inclusion criteria in your school as well as other schools in Dhaka city.

4. Do I have to take part?

It is entirely up to you (students of Year 10 & 11) to decide. If you choose to participate in the online survey, you will be asked to complete a series of consent agreements at the start of the survey. For students of Year 8 & 9, we need both your and your parent's consent to participate in the study.

5. What will happen to me if I take part?

If you (for students of Year 8 & 9, both you and your parent) are happy to take part after reading this information sheet (for the parent, there is a separate parental information sheet), please continue with the survey. The survey will ask you about your tobacco user behaviour, your exposure to environmental tobacco smoke, tobacco related advertisement and promotion, your knowledge, attitudes and beliefs about tobacco using, and your overall mental health and wellbeing. The survey will take about 20-25 minutes to complete. No identifying information will be linked to your completed questionnaire; instead, we will use a code during analysis that makes your data anonymous. We would like to confirm you that we will only collect two of your pseudonymised personal data (initials of your name, your school name, and DOB), and these data will not be sufficient for us to identify you. However, the design of this survey is cross-sectional, so we will not contact you further.

6. What are the possible disadvantages and risks of taking part?

There are no anticipated disadvantages, side effects, and risks of taking part in this survey. Since the questionnaire contains questions about your mental well-being, this may cause some discomfort in completing the questionnaire.

7. What are the possible benefits of taking part?

Whilst there are no immediate benefits for the participants of this survey, it is hoped that the findings will have implications for designing a tobacco prevention trial for school students in Bangladesh.

8. Will my taking part in this project be kept confidential?

Whether you provide consent directly (Year 10 & 11) or your parent provides consent for you (Year 8 & 9), all the information that we collect about you in this survey will be kept strictly confidential. The survey is being conducted using a secure online survey software called REDCap, authorized by UCL. No data will be transferred to any third parties (e.g., commercial organisations). Only the research team (Research Supervisors, Administrator and the Researcher) will have access to the data. If during the course of the survey you should disclose anything which may highlight harm to you, the Researcher has a duty of care to report this to your school/ relevant teacher for protecting your health, but otherwise, your confidentiality will be maintained throughout.

9. What will happen to the results of the research project?

The results of the study will be published in a PhD thesis; peer-reviewed articles and conference proceedings may also be prepared for publication in academic journals. You will not be able to be identified in any ensuing reports or publications. However, the pseudonymised data (data that doesn't contain identifiable information of participants) will be stored securely at least for 10 years in a password protected computer of the principal researcher. If the data collected from this study are needed by either the current or a future researcher to answer a new research question, data will be de-identified prior to using them, and no researcher will have access to information that could identify you.

10. Local Data Protection Privacy Notice

Notice:

The controller for this project will be University College London (UCL). The UCL Data Protection Officer provides oversight of UCL activities involving the processing of personal data, and can be contacted at data-protection@ucl.ac.uk

This 'local' privacy notice sets out the information that applies to this particular study. Further information on how UCL uses participant information can be found in our 'general' privacy notice:

For participants in health and care research studies, click [here](#)

The information that is required to be provided to participants under data protection legislation (GDPR and DPA 2018) is provided across both the 'local' and 'general' privacy notices.

The categories of personal data used will be as follows:

Initials of your name

School name

Date of Birth

Special category personal data

This type of data is about your sex, religious belief, health data (How do you describe your general state of health now?; Over the last 2 weeks, how often have you been bothered by any of the following problems? e.g., Feeling nervous, anxious”).

The lawful basis that would be used to process your *personal data* will be performance of a task in the public interest. The lawful basis used to process *special category personal data* will be for scientific and historical research or statistical purposes.

Your personal data will be processed so long as it is required for the research project. If we are able to anonymise or pseudonymise the personal data you provide we will undertake this, and will endeavour to minimise the processing of personal data wherever possible.

If you are concerned about how your personal data is being processed, or if you would like to contact us about your rights, please contact UCL in the first instance at data-protection@ucl.ac.uk.

11. Who is organising and funding the research?

This survey is a part of Sahadat Hossain's PhD project. The Commonwealth Scholarship Commission in the UK (CSC) provides SH a Commonwealth Scholarship (CSC Reference Number: BDCS-2021-607) to financially support for the degree of PhD at University College London.

12. Contact for further information

If you have any questions about any aspect of this research project, or your child's participation in the survey, not answered by this Information Sheet, you may contact the research team, using the following email and/or contact number.

Name and Contact Details of the Researcher(s):

Sahadat Hossain, Email: [REDACTED]; Mob: [REDACTED]
(BD), [REDACTED]

Dr Emma Beard, Email: [REDACTED]

Professor Lion Shahab, Email: [REDACTED]

Note: The "BD mobile contact number" will be active and available between June and July 2022. After this period, please contact us by email if you have any queries.

Thank you for reading this information sheet and for considering to take part in this research study.

Appendix 3.5: Parental consent form (for students of grade 8 & 9)

Title of study

School-based survey on tobacco and health in Dhaka, Bangladesh

UCL Research Ethics Committee Approval ID Number: 22645/001

Parental consent form (for students of grade 8 & 9)

Thank you for reading our information sheet. If your child agreed and you're happy to allow your child to participate in this study, we'll need you to give your consent. To do this, please **read the statements below** and **tick the appropriate box**.

Receiving information about the study

I confirm that:

- I have read and understood the Information Sheet for the above study.
- I have had an opportunity to consider the information and what will be expected of if my child take part in the study.
- I have had the opportunity to ask questions about my child's participation in the study, and any questions asked have been answered to my satisfaction.

Data collection in online experiments

I understand that:

- This study involves collection of data via an online REDCap platform which is fully compliant with UCL General Data Protection Regulation (2018) that protects the privacy of personal information.
- My child's data will be stored temporarily online in the platform's secure database, and no-one other than the researchers will have access to this online data.
- Data stored in the online database will not include directly identifying information (such as email addresses) unless the researchers need this information in order to complete the study.
- My child's data will be moved by the researchers from the online database to secure encrypted UCL computing systems as soon as is practicable.

Understanding the right to withdraw from the study

I understand that:

- My child's participation in this study is voluntary and that s/he is free to withdraw from the study without giving a reason.
- After completing the study, my child can withdraw his/her data from the study at any time before the research is submitted for publication in a scientific journal by contacting the researchers.
- If we decide to withdraw, any personal data my child has provided up to that point will be deleted unless we agree otherwise.

Understanding potential risks of study participation

I understand the potential risks of participating and the support that will be available to my child should s/he experience any adverse physical or mental effects during the course of the research.

Understanding the potential benefits of study participation

I understand that:

- Participating in this study will not be of direct benefit to my child but may indirectly benefit others.
- My child will not benefit financially from this study or from any possible outcome that may result from this research in the future.

Understanding who will have access to the data

I understand that:

- The data will not be made available to any third parties (e.g., commercial organisations) and is solely the responsibility of the researchers undertaking this study.

Publication and future use of data

I understand that:

- My child's data may be included in published reports or applications for research funding, or may be presented to other researchers at scientific meetings.
- My child will not be able to be identified in any ensuing reports or publications.
- I agree that the anonymised research data of my child may be used again in future studies by the researchers carrying out this study, and by others collaborating with these researchers.
- I would be happy for the data my child provides to be archived anonymously in a data repository as "Open Data" (e.g. Open Science Framework, Academic Peer-reviewed Journals).

<i>Agreement to participate</i>	<i>Disagreement to participate</i>
I am making a decision about allowing my child to participate in this study based on his/her consent. ☐ Tick here to confirm	☐ Tick here if you disagree to allow your child to participate in the study

Appendix 3.6: Participant consent form (for students of grade 8 & 9)

Title of study

School-based survey on tobacco and health in Dhaka, Bangladesh

UCL Research Ethics Committee Approval ID Number: 22645/001

Participant consent form (for students of grade 8 & 9)

Thank you for reading our information sheet. If you're happy to take part, we'll need you to give your consent. To do this, please **read the statements below** and **tick the appropriate boxes**.

Receiving information about the study

I confirm that:

- I have read and understood the Information Sheet for the above study.
- I have had an opportunity to consider the information and what will be expected of me if I take part in the study.
- I have had the opportunity to ask questions about participating in the study, and any questions asked have been answered to my satisfaction.

Data collection in online experiments

I understand that:

- This study involves collection of data via an online REDCap platform which is fully compliant with UCL General Data Protection Regulation (2018) that protects the privacy of personal information.
- My data will be stored temporarily online in the platform's secure database, and no-one other than the researchers will have access to this online data.
- Data stored in the online database will not include directly identifying information (such as email addresses) unless the researchers need this information in order to complete the study.
- My data will be moved by the researchers from the online database to secure encrypted UCL computing systems as soon as is practicable.

Understanding the right to withdraw from the study

I understand that:

- My participation in this study is voluntary and that I am free to withdraw from the study without giving a reason.
- After completing the study, I can withdraw my data at any time before the research is submitted for publication in a scientific journal by contacting the researchers.
- If I decide to withdraw, any personal data I have provided up to that point will be deleted unless I agree otherwise.

Understanding potential risks of study participation

I understand the potential risks of participating and the support that will be available to me should I experience any adverse physical or mental effects during the course of the research.

Understanding the potential benefits of study participation

I understand that:

- Participating in this study will not be of direct benefit to me but may indirectly benefit others.
- I will not benefit financially from this study or from any possible outcome that may result from this research in the future.

Understanding who will have access to the data

I understand that:

- The data will not be made available to any third parties (e.g., commercial organisations) and is solely the responsibility of the researchers undertaking this study.

Publication and Future use of the data

I understand that:

- My data may be included in published reports or applications for research funding, or may be presented to other researchers at scientific meetings.
- I agree that my anonymised research data may be used again in future studies by the researchers carrying out this study, and by others collaborating with these researchers.
- I would be happy for the data I provide to be archived anonymously in a data repository as “Open Data” (e.g. Open Science Framework, Academic Peer-reviewed Journals).

<i>Agreement to participate</i>	<i>Disagreement to participate</i>
I voluntarily agree to take part in this study. ☐ Tick here to confirm	☐ Tick here if you disagree to participate in the study

Appendix 3.7: Participant consent form (for students of grade 10 & 11)

Title of study

School-based survey on tobacco and health in Dhaka, Bangladesh

UCL Research Ethics Committee Approval ID Number: 22645/001

Participant consent form (for students of grade 10 & 11)

Thank you for reading our information sheet. If you're happy to take part, we'll need you to give your consent. To do this, please **read the statements below** and **tick the appropriate boxes**.

Receiving information about the study

I confirm that:

- I have read and understood the Information Sheet for the above study.
- I have had an opportunity to consider the information and what will be expected of me if I take part in the study.
- I have had the opportunity to ask questions about participating in the study, and any questions asked have been answered to my satisfaction.

Data collection in online experiments

I understand that:

- This study involves collection of data via an online REDCap platform which is fully compliant with UCL General Data Protection Regulation (2018) that protects the privacy of personal information.
- My data will be stored temporarily online in the platform's secure database, and no-one other than the researchers will have access to this online data.
- Data stored in the online database will not include directly identifying information (such as email addresses) unless the researchers need this information in order to complete the study.
- My data will be moved by the researchers from the online database to secure encrypted UCL computing systems as soon as is practicable.

Understanding the right to withdraw from the study

I understand that:

- My participation in this study is voluntary and that I am free to withdraw from the study without giving a reason.
- After completing the study, I can withdraw my data at any time before the research is submitted for publication in a scientific journal by contacting the researchers.
- If I decide to withdraw, any personal data I have provided up to that point will be deleted unless I agree otherwise.

Understanding potential risks of study participation

I understand the potential risks of participating and the support that will be available to me should I experience any adverse physical or mental effects during the course of the research.

Understanding the potential benefits of study participation

I understand that:

- Participating in this study will not be of direct benefit to me but may indirectly benefit others.
- I will not benefit financially from this study or from any possible outcome that may result from this research in the future.

Understanding who will have access to the data

I understand that:

- The data will not be made available to any third parties (e.g., commercial organisations) and is solely the responsibility of the researchers undertaking this study.

Publication and Future use of the data

I understand that:

- My data may be included in published reports or applications for research funding, or may be presented to other researchers at scientific meetings.
- I agree that my anonymised research data may be used again in future studies by the researchers carrying out this study, and by others collaborating with these researchers.
- I would be happy for the data I provide to be archived anonymously in a data repository as “Open Data” (e.g. Open Science Framework, Academic Peer-reviewed Journals).

<i>Agreement to participate</i>	<i>Disagreement to participate</i>
I voluntarily agree to take part in this study. ☐ Tick here to confirm	☐ Tick here if you disagree to participate in the study

Appendix 3.8: Survey questionnaire

Title of study

School-based survey on tobacco and health in Dhaka, Bangladesh

Questionnaire

Instructions

- Please read each question carefully before answering it.
- Choose the answer that best describes what you believe and feel to be correct.
- Some of the questions will ask about smoking **cigarettes**.
- Other questions may ask about **smoking tobacco** in general that includes cigarettes and other types of smoked tobacco products (e.g., Pipes, Cigars, Waterpipes/hookah/shisha, Bidis).
- Other questions may ask about using **smokeless tobacco** (e.g., Snuff, Chewing tobacco–zarda with pan, tobacco leaf, gul, panmasala–Betel quid with tobacco, Gutka), which is tobacco that is not smoked, but is sniffed through the nose, held in the mouth, or chewed.
- Other questions may ask about any tobacco use or any tobacco products – this includes smoking cigarettes, smoking tobacco other than cigarettes, and using smokeless tobacco.
- Finally, other questions may ask about your mental health and well-being.

Section A: Demographic information

The following questions ask for some background information about yourself.

SL	Question	Response options
A1	Please provide the initials of your name	
A2	What is the name of your school/college?	1 = XYZ 2 = ABC (Note: The names of the schools have been removed from this sheet in compliance with ethics guidelines.)
A3	In what class are you?	1 = 8 (Eight) 2 = 9 (Nine) 3 = 10 (Ten) 4 = 11 (Eleven)

A4	Please provide your Date of Birth (DD/MM/YYYY)	
A5	What is your sex?	1 = Female 2 = Male
A6	What is your religion?	1 = Islam 2 = Hinduism 3 = Buddhism 4 = Christianity 5 = No religious belief
A7	How many siblings do you have?	
A8	What is the highest level of education of your mother?	1 = No formal education 2 = Primary (1-5) 3 = Secondary (6-10) 4 = Higher Secondary (11-12) 5 = Bachelor degree 6 = Master's degree 7 = Doctoral
A9	What is the highest level of education of your Father?	1 = No formal education 2 = Primary (1-5) 3 = Secondary (6-10) 4 = Higher Secondary (11-12) 5 = Bachelor degree 6 = Master's degree 7 = Doctoral
A10	During an average week, how much money do you have that you can spend on yourself, however you want? (in Taka)	Taka
A11	What is the current status of your housing tenure/ living accommodation?	1 = School/College hostel 2 = Private hostel 3 = Rented house with friends 4 = Rented house with parents 5 = Owned property with parents 6 = Other
A11.6	Show the field ONLY if: [a11] = '6' Please specify...	[Text]

Section B: Information about tobacco use

The following questions ask about your use of tobacco.

SL	Question	Response options
B1	Have you ever tried or experimented with cigarette smoking?	1 = Yes 2 = No
B2	How old were you when you first tried a cigarette?	

B3	During the past 30 days, on how many days did you smoke cigarettes?	1 = 0 days 2 = 1 or 2 days 3 = 3 to 5 days 4 = 6 to 9 days 5 = 10 to 19 days 6 = 20 to 29 days 7 = All 30 days
B4	Please think about the days you smoked cigarettes during the past 30 days. How many times did you usually smoke per day?	1 = Less than once per day 2 = Once per day 3 = 2 to 5 times per day 4 = 6 to 10 times per day 5 = 11 to 20 times per day 6 = More than 20 times per day
B5	Have you ever tried or experimented with any form of smoked tobacco products other than cigarettes (pipes, cigars, waterpipes, hookah, shisha, bidis)?	1 = Yes 2 = No
B6	How old were you when you first tried that tobacco product?	
B7	During the past 30 days, on how many days did you use any form of smoked tobacco products other than cigarettes (e.g., pipes, cigars, waterpipes, hookah, shisha, bidis)?	1 = 0 days 2 = 1 or 2 days 3 = 3 to 5 days 4 = 6 to 9 days 5 = 10 to 19 days 6 = 20 to 29 days 7 = All 30 days
B8	Please think about the days you smoked tobacco products other than cigarettes (e.g., pipes, cigars, waterpipes, hookah, shisha, bidis) during the past 30 days. How many times did you usually smoke per day?	1 = Less than once per day 2 = Once per day 3 = 2 to 5 times per day 4 = 6 to 10 times per day 5 = 11 to 20 times per day 6 = More than 20 times per day
B9	Have you ever tried or experimented with any form of smokeless tobacco products (zorda with pan, tobacco leaf, gul, khaini, panmasala)?	1 = Yes 2 = No
B10	How old were you when you first tried using smokeless tobacco?	
B11	During the past 30 days, on how many days did you use smokeless tobacco?	1 = 0 days 2 = 1 or 2 days 3 = 3 to 5 days 4 = 6 to 9 days 5 = 10 to 19 days

		6 = 20 to 29 days 7 = All 30 days
B12	Please think about the days you used smokeless tobacco during the past 30 days. How many times did you usually use smokeless tobacco per day?	1 = Less than once per day 2 = Once per day 3 = 2 to 5 times per day 4 = 6 to 10 times per day 5 = 11 to 20 times per day 6 = More than 20 times per day
B13	What are the reasons behind your tobacco use? (Tick all that apply)	1 = Curiosity 2 = Tobacco makes me look more attractive 3 = Peer influence 4 = Tobacco users in the family 5 = Family conflict 6 = School factors 7 = Poor academic achievement 8 = Lack of self-esteem 9 = Anxiety/Desperation/Stress 10 = Availability of tobacco 11 = Exposure to advertisements/promotions at points of sale 12 = Seen people using tobacco when watched TV, videos or movies 13 = Others
B13.13	Show the field ONLY if: [b13(13)] = '1' Please specify	[Text]
B14	Would you please let us know about your motivation toward stopping tobacco use? (Please select the best option for you from the list)	1 = I don't want to stop tobacco use 2 = I think I should stop tobacco use but don't really want to 3 = I want to stop tobacco use but haven't thought about when 4 = I REALLY want to stop tobacco use but I don't know when I will 5 = I want to stop tobacco use and hope soon 6 = I REALLY want to stop tobacco use and intend to in the next 3 months 7 = I REALLY want to stop tobacco use and intend to in the next month
B15	During the past 12 months, have you ever try to stop tobacco use?	1 = Yes 2 = No
B16	Have you ever received help or advice to help you stop tobacco use? (Tick all that apply)	1 = No 2 = Yes, from a health care professional (e.g., doctor) 3 = Yes, from a teacher 4 = Yes, from a family member

		5 = Yes, from a friend 6 = Yes, from a mobile app 7 = Yes, from an online source 8 = Yes, other (please specify: _____)
B16.8	Show the field ONLY if: [b16] = '8' Please specify:	[Text]

Section C: Information about second-hand tobacco smoke and exposure to the advertisements or promotions for tobacco

The following questions ask about your exposure to other people's smoking and tobacco advertisements.

SL	Question	Response options
C1	During the past 7 days, on how many days has anyone smoked inside your home, in your presence?	1 = 0 days 2 = 1 or 2 days 3 = 3 to 4 days 4 = 5 to 6 days 5 = 7 days
C2	During the past 7 days, on how many days has anyone smoked in your presence, inside any enclosed public place, other than your home (such as: school, shops, restaurants, shopping malls, movie theatres, any office, inside bus, inside train)?	1 = 0 days 2 = 1 or 2 days 3 = 3 to 4 days 4 = 5 to 6 days 5 = 7 days
C3	During the past 7 days, on how many days has anyone smoked in your presence, at any outdoor public place (such as: playgrounds, sidewalks, entrance to buildings, parks, beaches, bus terminal, railway station)?	1 = 0 days 2 = 1 or 2 days 3 = 3 to 4 days 4 = 5 to 6 days 5 = 7 days
C4	During the past 30 days, did you see anyone smoke inside the school building or outside on school property?	1 = Yes 2 = No
C5	During the past 30 days, did you see any people using tobacco on TV, in videos, or movies?	0 = No 1 = Yes 2 = I did not watch TV, videos, or movies in the past 30 days.
C6	During the past 30 days, did you see any advertisements or promotions for tobacco products in retailers (such as: stores, shops, street vendors)?	0 = No 1 = Yes 2 = I did not visit any retailers in the past 30 days.
C7	During the past 30 days, did you see any advertisements or promotions for tobacco products online (such as: Facebook, Instagram, YouTube, Twitter, etc.)?	0 = No 1 = Yes 2 = I did not use any social media in the past 30 days.

C8	Would you ever use or wear something that has a tobacco company or tobacco product name or picture on it such as a lighter, T-shirt, hat, or sunglasses?	0 = No 1 = Yes 2 = Maybe
C9	Do you have something (for example, T-shirt, pen, backpack) with a tobacco product band logo on it?	0 = No 1 = Yes
C10	Has a person working for a tobacco company ever offered you a free tobacco product?	0 = No 1 = Yes

Section D: Knowledge, attitudes and beliefs about using tobacco products

The following questions ask about your knowledge, attitudes and beliefs about using tobacco.

SL	Question	Response options
D1	If one of your friends offered you a tobacco product, would you use it?	0 = Definitely not 1 = Probably not 2 = Probably yes 3 = Definitely yes
D2	At any time during the next 12 months do you think you will use any form of tobacco?	0 = Definitely not 1 = Probably not 2 = Probably yes 3 = Definitely yes
D3	Do you think the smoke from other people's tobacco smoking is harmful to you?	0 = Definitely not 1 = Probably not 2 = Probably yes 3 = Definitely yes
D4	Once someone has started using tobacco, do you think it would be difficult for them to quit?	0 = Definitely not 1 = Probably not 2 = Probably yes 3 = Definitely yes
D5	Do you think using tobacco helps people feel more comfortable or less comfortable at celebrations, parties, or in other social gatherings?	0 = More comfortable 1 = Less comfortable 2 = No difference whether using tobacco or not
D6	Do you agree or disagree with the following: "I think I might enjoy using a tobacco product." [Shown to anyone who answered Q B1=0 AND Q B5=0 AND Q B8=0]	1 = Strongly agree 2 = Agree 3 = Disagree 4 = Strongly disagree
D7	Has anyone ever raised the topic of tobacco use with you?	0 = No; go to "D10" 1 = Yes; go to next question
D8	Who raised the topic of tobacco use with you? (Tick all that apply)	0 = Friends 1 = Family member 2 = School teacher 3 = Health Professional

		4 = Others (please specify.....)		
D9	Did anyone tell you about the dangers of tobacco use / provide anti-tobacco education? (Tick all that apply)	0 = Friends 1 = Family member 2 = School teacher 3 = Health Professional 4 = Others (please specify.....)		
D10	I have knowledge about the rules and regulations for smoking and tobacco products use (control) in Bangladesh.	1 = Strongly agree 2 = Agree 3 = Disagree 4 = Strongly disagree		
	Do the following statements agree with your knowledge about the rules and regulations for smoking and tobacco products use (control) in Bangladesh?	0 = No	1 = Yes	2 = Don't know
D11.1	No public places (e.g., educational institution, hospital, cinema hall), public areas (children park), and public transports shall be marked or identified as a smoking zone			
D11.2	If it is necessary to display any scene in movies containing the usage of tobacco products, the scene can be displayed without a written warning about the harmful effects of consuming tobacco products			
D11.3	All types of tobacco promotional advertisement are banned by the law			
D11.4	Selling tobacco products to the minors (less than 18 years old) is prohibited by law			
D11.5	Either pictorial or written warning notice must cover the surface on the packets, packages, cartons or cans of tobacco products			
D11.6	Violation of any provision of the tobacco control law in Bangladesh is protected with just a financial punishment			

Section E: Information about mental health

The following questions ask about your mental health conditions.

E1	How do you describe your general state of health now? Or, In general, would you say your health is:	1 = Very good 2 = Good 3 = Moderate (in between good and poor) 4 = Poor 5 = Very poor			
E2	Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all (0)	Several days (1)	More than half the days (2)	Nearly every day (3)
E2.1	Feeling nervous, anxious				
E2.2	Not being able to sleep or control worrying?				
E2.3	Worrying too much about different things?				
E2.4	Trouble relaxing?				
E2.5	Being so restless that it is hard to sit still?				
E2.6	Becoming easily annoyed or irritable?				
E2.7	Feeling afraid as if something awful might happen?				
E3.1	Little interest or pleasure in doing things?				
E3.2	Feeling down, depressed, or hopeless?				
E3.3	Trouble falling or staying asleep, or sleeping too much?				
E3.4	Feeling tired or having little energy?				
E3.5	Poor appetite or overeating?				
E3.6	Feeling bad about yourself - or that you are a failure or have let yourself or your family down?				
E3.7	Trouble concentrating on things, such as reading the newspaper or watching television?				
E3.8	Moving or speaking so slowly that other people could have noticed? Or, the opposite - being so fidgety or restless that you have been moving around a lot more than usual?				
E3.9	Thoughts that you would be better off dead, or of hurting yourself in some way?				

Section F: Qualitative part

The following questions will seek your opinion about what a possible tobacco use prevention programme should look like.

Consider a scenario where somebody is trying to develop **a training programme for tobacco use prevention** among adolescents like you and implement it in school settings. Please describe the answer to the following questions in your way.

F1. How many sessions would you prefer to receive on this, and how long should each session be?

.....
.....

F2. What information, tasks or activities, do you think, would most likely prevent you or other adolescents to start using tobacco?

.....
.....

F3. Which of the following components would you like to see in the training sessions and why? (Mention all that apply)

1. Graphical material (poster, information cards, and flyers); (_____ why)
2. Motivational videos; (_____ why)
3. Quiz activities; (_____ why)
4. Didactic material (e.g., crossword puzzles); (_____ why)
5. Group dividing activities; (_____ why)
6. Games; (_____ why)
7. Music and songs; (_____ why)
8. Religious story; (_____ why)
9. Others; (please specify with reasons: _____)

F4. Would you prefer to see a friend of yours, or a teacher of your school, or an outsider expert in the subject matter as the trainer of the training programme? (please mention the reasons for your preference)

.....
.....

F5. Do you think a tobacco use prevention programme is needed in your school? (Why/why not)

.....
.....

F6. Do you think such a tobacco use prevention programme should also address household tobacco use simultaneously? (Why/why not)

.....
.....

F7. What possible difficulties might you face in participating in the training programme?

.....
.....

End the questionnaire.
Thank you very much.
Submit option

Appendix 3.9: Suicide & self-harm risk protocol

LONDON'S GLOBAL UNIVERSITY



UCL

SUICIDE & SELF-HARM RISK PROTOCOL

UCL Research Ethics Committee Approval ID Number: 22645/001

Title of study: **School-based survey on tobacco and health in Dhaka, Bangladesh**

Name and Contact Details of the Research Team:

Sahadat Hossain, Email: [REDACTED]
(BD), [REDACTED]

Dr Emma Beard, Email: [REDACTED]

Professor Lion Shahab, Email: [REDACTED]

INTRODUCTION TO SUICIDE & SELF-HARM RISK

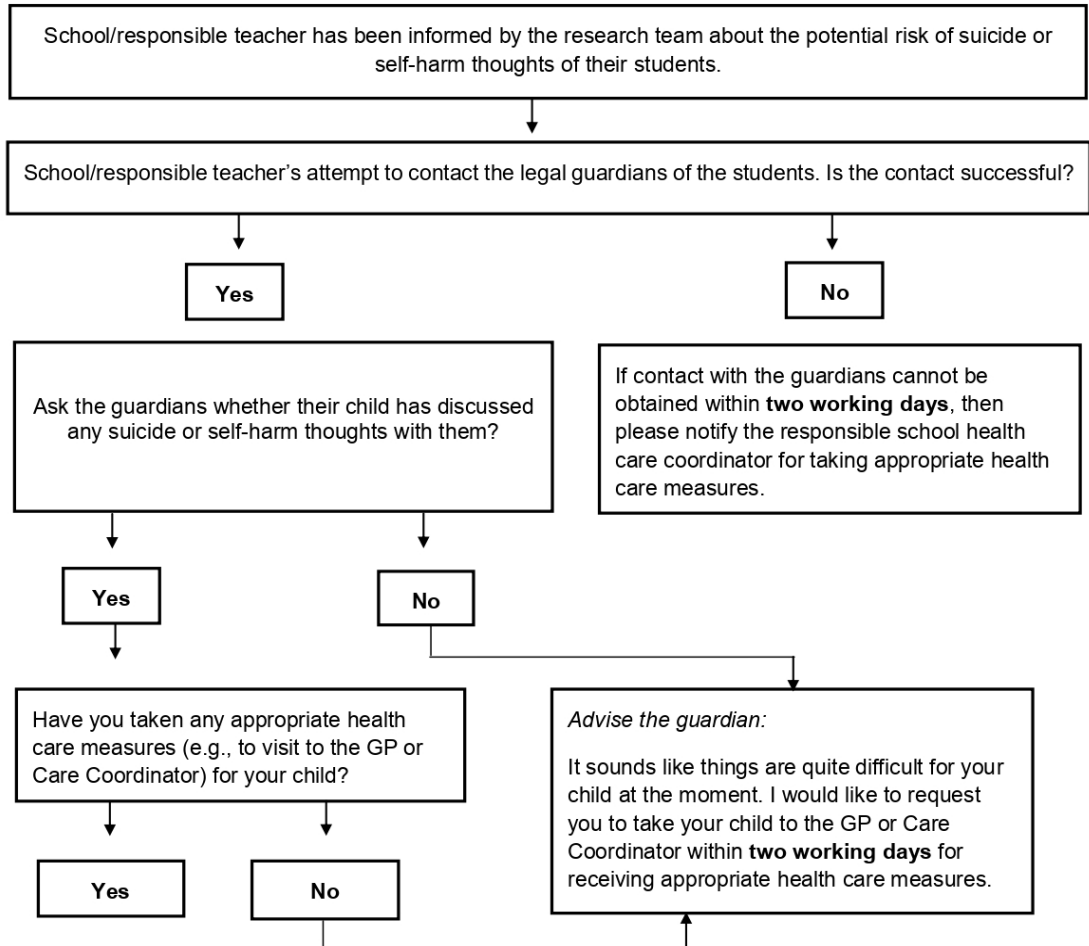
For the school-based survey on tobacco and health in Dhaka Bangladesh, participant risk will mainly be monitored through **Question 9 (E3.9)** of the **PHQ-9** questionnaire measure: *“Thoughts that you would be better off dead or hurting yourself in some way”*. The risk protocol is enacted if the participant indicates a **response of 3** for this item.

SUICIDE RISK IDENTIFIED DURING ONLINE DATA COLLECTION

In this instance, participant risk will only be identified through answering Question 9 (E3.9) of the PHQ-9 questionnaire in the data collection tool when it is completed and submitted electronically by the participant. An individual in the research team will receive an electronic notification if a participant indicates a **response of 3** to question 9 of the PHQ-9 **“Thoughts that you would be better off dead or hurting yourself in some way”**. In this instance, the research team will only be responsible to make contact with the relevant school/responsible teacher in which the participant is enrolled and make them aware of this. The school/ responsible teacher will attempt to make contact with the legal guardians (i.e., the parents) of the participants and take further necessary actions as per their policy. However, we will provide the school/teacher a risk flow chart to follow to manage the risk cases.

SUICIDE RISK MANAGEMENT BY SCHOOL/RESPONSIBLE TEACHER

RISK MANAGEMENT FLOW CHART



Appendix 3.10: Ethics approval letters for the survey

A. Local ethics approval letter for the survey from Jahangirnagar University

Chairman
Biosafety, Biosecurity & Ethical
Committee
Faculty of Biological Sciences



Jahangirnagar University
Savar, Dhaka-1342, Bangladesh
Tel: [REDACTED]
Fax: [REDACTED]
Email: [REDACTED]

Ref No: BBEC, JU/ M-2022 (4) 3

Date: 06-04-2022

Certificate of Ethical Clearance

This is to certify that the submitted a human survey proposal during the PhD study titled “**School based survey on tobacco and health in Dhaka, Bangladesh**” has been reviewed and approved by the Biosafety, Biosecurity and Ethical Committee of Jahangirnagar University.

Project Information

Name of the Project : School based survey on tobacco and health in Dhaka, Bangladesh

Name of the Applicant : Shahadat Hossain (JU)

Name of the Supervisor : Dr. Lion Shahab, Professor of UCL, UK

Contact Address of Applicant : Lecturer, Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka, Bangladesh

Telephone/ Mobile No. : [REDACTED]

Email No. : [REDACTED]

Research Information

Species/ Sample : Cross sectional study of human

Problem : None

Age : 13-17 yrs

Number : 3400

Category : NA

Number of days each sample will be examined : NA

[REDACTED]

Professor Dr. Abdul Jabber Howlader
Dean, Faculty of Biological sciences
& Chairman Biosafety, Biosecurity and Ethical Committee of
Jahangirnagar University
Savar, Dhaka-1342
BANGLADESH

Phone: [REDACTED]
Office: Faculty of Biological Sciences, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh

B. UCL ethics approval letter for the survey

UCL RESEARCH ETHICS COMMITTEE
OFFICE FOR THE VICE PROVOST RESEARCH



9th June 2022

Professor Lion Shahab Position
Department of Behavioural Science and Health
UCL

Cc: Sahadat Hossain & Dr Emma Beard

Dear Professor Shahab

Notification of Ethics Approval with Provisos
Project ID/Title: 22645/001: School-based survey on tobacco and health in Dhaka, Bangladesh

Further to your satisfactory responses to the Committee's comments, I am pleased to confirm in my capacity as Chair of the UCL Research Ethics Committee (REC) that your study has been ethically approved by the UCL REC until **9th June 2023**.

Ethical approval is subject to the following conditions:

Notification of Amendments to the Research

You must seek Chair's approval for proposed amendments (to include extensions to the duration of the project) to the research for which this approval has been given. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of continued ethical approval by completing an 'Amendment Approval Request Form' <https://www.ucl.ac.uk/research-ethics/responsibilities-after-approval>

Adverse Event Reporting – Serious and Non-Serious

It is your responsibility to report to the Committee any unanticipated problems or adverse events involving risks to participants or others. The Ethics Committee should be notified of all serious adverse events via the Ethics Committee Administrator (ethics@ucl.ac.uk) immediately the incident occurs. Where the adverse incident is unexpected and serious, the Joint Chairs will decide whether the study should be terminated pending the opinion of an independent expert. For non-serious adverse events the Joint Chairs of the Ethics Committee should again be notified via the Ethics Committee Administrator within ten days of the incident occurring and provide a full written report that should include any amendments to the participant information sheet and study protocol.

The Joint Chairs will confirm that the incident is non-serious and report to the Committee at the next meeting. The final view of the Committee will be communicated to you.

Office of the Vice Provost Research, 2 Tavistock Street
University College London
Tel: +44 (0)20 7679 8717
Email: ethics@ucl.ac.uk
<http://ethics.grad.ucl.ac.uk/>

Final Report

At the end of the data collection element of your research we ask that you submit a very brief report (1-2 paragraphs will suffice) which includes in particular issues relating to the ethical implications of the research i.e. issues obtaining consent, participants withdrawing from the research, confidentiality, protection of participants from physical and mental harm etc.

In addition, please:

- ensure that you follow all relevant guidance as laid out in UCL's Code of Conduct for Research;
- note that you are required to adhere to all research data/records management and storage procedures agreed as part of your application. This will be expected even after completion of the study.

With best wishes for the research.

Yours sincerely

A black rectangular box redacting the signature of Professor Lynn Ang.

Professor Lynn Ang
Joint Chair, UCL Research Ethics Committee

Appendix 3.11: Association of demographic characteristics and related key determinants with smoked tobacco use behaviour of school adolescents in Dhaka, Bangladesh

Variable	Ever smoked tobacco use ^a				Current smoked tobacco use ^b					
	Unadjusted model		Adjusted model ^c		Unadjusted model			Adjusted model ^d		
	OR (95% CI)	p- value	AOR (95% CI)	p- value	OR CI)	(95% CI)	p- value	AOR CI)	(95% CI)	p- value
Demographics										
Sex										
Male	4.67 (3.38–6.45)	<0.001	3.59 (2.46–5.23)	<0.001	12.21 (6.59– 22.64)		<0.001	7.19 (3.56– 14.53)		<0.001
Female	1.00		1.00		1.00			1.00		
Age (in years)										
17-18 years	5.43 (3.05–9.68)	<0.001	2.59 (1.40–4.80)	0.002	8.55 (3.46– 21.13)		<0.001	3.23 (1.24– 8.40)		0.016
14-16 years	1.85 (1.02–3.35)	0.042	1.22 (0.65–2.28)	0.537	2.19 (0.86– 5.57)		0.100	1.23 (0.46– 3.31)		0.677
11-13 years	1.00		1.00		1.00			1.00		
Living accommodation										
Hostel & other	2.54 (1.73– 3.74)	<0.001	1.38 (0.89– 2.17)	0.165	3.87 (2.42– 6.20)		<0.001	2.32 (1.31– 4.12)		0.004
Owned house with parents	1.67 (1.28– 2.18)	<0.001	1.43 (1.04– 1.95)	0.026	2.23 (1.57– 3.20)		<0.001	2.18 (1.40– 3.39)		<0.001
Rented house with parents	1.00		1.00		1.00			1.00		
Monthly pocket money expenditure										

Variable	Ever smoked tobacco use ^a				Current smoked tobacco use ^b					
	Unadjusted model		Adjusted model ^c		Unadjusted model			Adjusted model ^d		
	OR (95% CI)	p- value	AOR (95% CI)	p- value	OR (95% CI)	(95% CI)	p- value	AOR (95% CI)	(95% CI)	p- value
Middle and high	2.73 (2.13–3.50)	<0.001	1.71 (1.27–2.32)	<0.001	3.33 (2.41–4.59)		<0.001	1.79 (1.20–2.67)		0.004
Low and lower middle	1.00		1.00		1.00			1.00		
Father's educational level										
Bachelor's degree and above	0.91 (0.70–1.17)	0.450	1.11 (0.82–1.50)	0.498	0.93 (0.67–1.30)		0.680	1.17 (0.78–1.76)		0.442
Higher secondary and below	1.00		1.00		1.00			1.00		
Mother's educational level										
Bachelor's degree and above	1.18 (0.93–1.51)	0.181	1.36 (1.01–1.83)	0.040	1.36 (0.99–1.86)		0.061	1.67 (1.12–2.48)		0.011
Higher secondary and below	1.00		1.00		1.00			1.00		
Exposure to SHS, advertisement, or promotion										
Exposed to second-hand smoke										
Yes	2.66 (1.43–4.94)	0.002	1.67 (0.57–4.94)	0.354	2.65 (1.16–6.08)		0.021	1.59 (0.31–8.01)		0.577
No	1.00		1.00		1.00			1.00		
Exposed to tobacco smoke at home										
Yes	2.35 (1.80–3.08)	<0.001	1.72 (1.25–2.36)	<0.001	2.52 (1.79–3.55)		<0.001	1.61 (1.06–2.45)		0.027

Variable	Ever smoked tobacco use ^a				Current smoked tobacco use ^b					
	Unadjusted model		Adjusted model ^c		Unadjusted model			Adjusted model ^d		
	OR (95% CI)	p- value	AOR (95% CI)	p- value	OR CI)	(95% CI)	p- value	AOR CI)	(95% CI)	p- value
No	1.00		1.00		1.00			1.00		
Exposed to tobacco smoke in an enclosed public place										
Yes	2.20 (1.49– 3.27)	<0.001	1.65 (0.94– 2.89)	0.080	2.45 (1.42– 4.21)		0.001	1.93 (0.84– 4.44)		0.123
No	1.00		1.00		1.00			1.00		
Exposed to tobacco smoke in an outdoor public place										
Yes	2.08 (1.36– 3.19)	<0.001	1.00 (0.55– 1.83)	0.992	2.42 (1.33– 4.41)		0.004	1.04 (0.43– 2.52)		0.926
No	1.00		1.00		1.00			1.00		
Witnessed tobacco use in/outside of school premises										
Yes	2.36 (1.81– 3.08)	<0.001	1.53 (1.12– 2.09)	0.008	3.11 (2.16– 4.49)		<0.001	1.88 (1.21– 2.92)		0.005
No	1.00		1.00		1.00			1.00		
Observed tobacco use on TV, in videos, or in movies										
Yes	2.05 (1.48– 2.85)	<0.001	1.37 (0.93– 2.02)	0.107	2.37 (1.50– 3.72)		<0.001	1.55 (0.89– 2.71)		0.122
No	1.00		1.00		1.00			1.00		
Exposed to point-of-sale tobacco advertisement or promotion										
Yes	2.14 (1.64– 2.79)	<0.001	1.40 (1.01– 1.94)	0.044	2.29 (1.63– 3.21)		<0.001	1.75 (0.76– 1.81)		0.464
No	1.00		1.00		1.00			1.00		
Exposed to online (social media platforms) tobacco advertisement or promotion										

Variable	Ever smoked tobacco use ^a				Current smoked tobacco use ^b					
	Unadjusted model		Adjusted model ^c		Unadjusted model			Adjusted model ^d		
	OR (95% CI)	p- value	AOR (95% CI)	p- value	OR CI)	(95% CI)	p- value	AOR CI)	(95% CI)	p- value
Yes	1.54 (1.13– 2.09)	0.006	0.74 (0.50– 1.09)	0.122	1.76 (1.21– 2.58)	0.004		0.69 (0.42– 1.15)		0.158
No	1.00		1.00		1.00			1.00		
Ever used non-tobacco products with tobacco company or tobacco product name, brand logo or picture on it										
Yes	4.04 (2.72– 6.00)	<0.001	1.89 (1.05– 3.39)	0.034	5.16 (3.29– 8.09)	<0.001		2.08 (1.01– 4.27)		0.047
No	1.00		1.00		1.00			1.00		
Currently using non-tobacco products with tobacco company or tobacco product name, brand logo or picture on it										
Yes	3.77 (2.38– 5.98)	<0.001	1.14 (0.57– 2.27)	0.719	5.34 (3.21– 8.88)	<0.001		1.56 (0.68– 3.58)		0.291
No	1.00		1.00		1.00			1.00		
Got offer and/or received complimentary tobacco products										
Yes	3.79 (2.56– 5.60)	<0.001	1.45 (0.90– 2.33)	0.129	6.25 (4.06– 9.60)	<0.001		2.27 (1.31– 3.92)		0.003
No	1.00		1.00		1.00			1.00		
Tobacco education and regulatory knowledge										
Have received health education on the risks of tobacco use										
Yes	0.63 (0.45– 0.88)	0.007	0.61 (0.42– 0.90)	0.012	0.67 (0.43– 1.05)	0.079		0.66 (0.39– 1.11)		0.115
No	1.00		1.00		1.00			1.00		
Have knowledge about country's tobacco control rules and regulations										

Variable	Ever smoked tobacco use ^a				Current smoked tobacco use ^b					
	Unadjusted model		Adjusted model ^c		Unadjusted model			Adjusted model ^d		
	OR (95% CI)	p-value	AOR (95% CI)	p-value	OR (95% CI)	p-value		AOR (95% CI)	p-value	
Yes	0.50 (0.37–0.68)	<0.001	0.65 (0.47–0.91)	0.011	0.47 (0.32–0.69)	<0.001		0.62 (0.40–0.95)	0.028	
No	1.00		1.00		1.00			1.00		

Note. OR – odds ratio; AOR – adjusted odds ratio; CI – confidence interval; SHS – second hand smoke.

^a Estimates are based on binary logistic regression with ever smoked tobacco use as dependent variable.

^b Estimates are based on binary logistic regression with current smoked tobacco use as dependent variable.

^c Adjusted for all significant variables in the unadjusted model of ever smoked tobacco use.

^d Adjusted for all significant variables in the unadjusted model of current smoked tobacco use.

Appendix 3.12: Association of demographic characteristics and related key determinants with smokeless tobacco use behaviour of school adolescents in Dhaka, Bangladesh

Variable	Ever smokeless tobacco use ^a				Current smokeless tobacco use ^b			
	Unadjusted model		Adjusted model ^c		Unadjusted model		Adjusted model ^d	
	OR (95% CI)	p-value	AOR (95% CI)	p-value	OR (95% CI)	p-value	AOR (95% CI)	p-value
Demographics								
Sex								
Male	1.22 (0.91–1.64)	0.186	0.78 (0.55–1.09)	0.147	2.18 (1.15–4.14)	0.017	1.25 (0.58–2.66)	0.569
Female	1.00		1.00		1.00		1.00	
Age (in years)								

Variable	Ever smokeless tobacco use ^a				Current smokeless tobacco use ^b			
	Unadjusted model		Adjusted model ^c		Unadjusted model		Adjusted model ^d	
	OR (95% CI)	p-value	AOR (95% CI)	p-value	OR (95% CI)	p-value	AOR (95% CI)	p-value
17-18 years	2.87 (1.51–5.43)	0.001	2.37 (1.14–4.92)	0.021	4.77 (1.13–20.14)	0.033	1.97 (0.43–9.10)	0.387
14-16 years	2.33 (1.57–3.09)	0.009	2.60 (1.28–5.30)	0.008	2.27 (0.52–9.82)	0.274	1.53 (0.33–7.01)	0.588
11-13 years	1.00		1.00		1.00		1.00	
Living accommodation								
Hostel & other	2.18 (1.41–3.38)	<0.001	1.94 (1.19–3.15)	0.007	4.33 (1.92–9.77)	<0.001	4.12 (1.57–10.79)	0.004
Owned house with parents	1.19 (0.87–1.64)	0.275	1.15 (0.81–1.62)	0.437	2.27 (1.18–4.37)	0.014	2.41 (1.14–5.11)	0.022
Rented house with parents	1.00		1.00		1.00		1.00	
Monthly pocket money expenditure								
Middle and high	1.68 (1.24–2.26)	<0.001	1.33 (0.94–1.87)	0.107	2.99 (1.68–5.31)	<0.001	1.65 (0.84–3.24)	0.150
Low and lower middle	1.00		1.00		1.00		1.00	
Father's educational level								
Bachelor's degree and above	0.97 (0.72–1.31)	0.843	1.08 (0.78–1.51)	0.634	0.88 (0.49–1.60)	0.682	0.89 (0.46–1.73)	0.728
Higher secondary and below	1.00		1.00		1.00		1.00	
Mother's educational level								

Variable	Ever smokeless tobacco use ^a				Current smokeless tobacco use ^b			
	Unadjusted model		Adjusted model ^c		Unadjusted model		Adjusted model ^d	
	OR (95% CI)	p-value	AOR (95% CI)	p-value	OR (95% CI)	p-value	AOR (95% CI)	p-value
Bachelor's degree and above	1.18 (0.88–1.57)	0.275	1.12 (0.81–1.54)	0.499	1.38 (0.78–2.45)	0.271	1.16 (0.60–2.23)	0.662
Higher secondary and below	1.00		1.00		1.00		1.00	
Exposure to SHS, advertisement, or promotion								
Exposed to second-hand smoke								
Yes	2.51 (1.22–5.17)	0.012	2.15 (0.85–5.48)	0.108	4.56 (0.63–33.27)	0.135	Not estimable	
No	1.00		1.00		1.00			
Exposed to tobacco smoke at home								
Yes	1.93 (1.40–2.66)	<0.001	1.35 (0.95–1.92)	0.093	4.27 (2.33–7.83)	<0.001	2.37 (1.21–4.65)	0.012
No	1.00		1.00		1.00		1.00	
Exposed to tobacco smoke in an enclosed public place								
Yes	1.68 (1.10–2.58)	0.017	0.97 (0.57–1.66)	0.912	2.02 (0.79–5.15)	0.142	0.61 (0.21–1.77)	0.360
No	1.00		1.00		1.00		1.00	
Exposed to tobacco smoke in an outdoor public place								
Yes	1.49 (0.95–2.34)	0.081	0.69 (0.39–1.23)	0.205	8.72 (1.20–63.54)	0.033	6.29 (0.83–47.78)	0.075
No	1.00		1.00		1.00		1.00	
Witnessed tobacco use in/outside of school premises								

Variable	Ever smokeless tobacco use ^a				Current smokeless tobacco use ^b			
	Unadjusted model		Adjusted model ^c		Unadjusted model		Adjusted model ^d	
	OR (95% CI)	p-value	AOR (95% CI)	p-value	OR (95% CI)	p-value	AOR (95% CI)	p-value
Yes	1.79 (1.32–2.42)	<0.001	1.12 (0.80–1.57)	0.504	1.95 (1.05–3.65)	0.035	0.77 (0.38–1.57)	0.472
No	1.00		1.00		1.00		1.00	
Observed tobacco use on TV, in videos, or in movies								
Yes	1.74 (1.20–2.52)	0.003	1.16 (0.77–1.75)	0.477	2.59 (1.09–6.16)	0.032	1.34 (0.52–3.48)	0.549
No	1.00		1.00		1.00		1.00	
Exposed to point-of-sale tobacco advertisement or promotion								
Yes	2.92 (2.16–3.96)	<0.001	2.28 (1.61–3.23)	<0.001	4.46 (2.42–8.23)	<0.001	2.85 (1.40–5.82)	0.004
No	1.00		1.00		1.00		1.00	
Exposed to online (social media platforms) tobacco advertisement or promotion								
Yes	1.73 (1.23–2.45)	0.002	0.96 (0.64–1.43)	0.825	3.21 (1.73–5.97)	<0.001	1.24 (0.58–2.62)	0.582
No	1.00		1.00		1.00		1.00	
Ever used non-tobacco products with tobacco company or tobacco product name, brand logo or picture on it								
Yes	3.29 (2.08–5.19)	<0.001	1.35 (0.70–2.61)	0.370	6.50 (3.20–13.21)	<0.001	1.47 (0.47–4.54)	0.506
No	1.00		1.00		1.00		1.00	
Currently using non-tobacco products with tobacco company or tobacco product name, brand logo or picture on it								

Variable	Ever smokeless tobacco use ^a				Current smokeless tobacco use ^b			
	Unadjusted model		Adjusted model ^c		Unadjusted model		Adjusted model ^d	
	OR (95% CI)	p-value	AOR (95% CI)	p-value	OR (95% CI)	p-value	AOR (95% CI)	p-value
Yes	3.78 (2.27–6.29)	<0.001	1.67 (0.80–3.46)	0.172	8.36 (3.99–17.51)	<0.001	3.15 (0.96–10.38)	0.059
No	1.00		1.00		1.00		1.00	
Got offer and/or received complimentary tobacco products								
Yes	2.62 (1.63–4.22)	<0.001	1.36 (0.78–2.35)	0.274	4.01 (1.82–8.82)	<0.001	0.95 (0.35–2.58)	0.917
No	1.00		1.00		1.00		1.00	
Tobacco education and regulatory knowledge								
Have received health education on the risks of tobacco use								
Yes	0.59 (0.41–0.86)	0.006	0.62 (0.41–0.93)	0.021	0.29 (0.15–0.55)	<0.001	0.27 (0.13–0.56)	<0.001
No	1.00		1.00		1.00		1.00	
Have knowledge about country's tobacco control rules and regulations								
Yes	0.42 (0.30–0.59)	<0.001	0.52 (0.36–0.73)	<0.001	0.36 (0.19–0.68)	0.002	0.56 (0.28–1.13)	0.106
No	1.00		1.00		1.00		1.00	

Note. OR – odds ratio; AOR – adjusted odds ratio; CI – confidence interval; SHS – second hand smoke.

^a Estimates are based on binary logistic regression with ever smokeless tobacco use as dependent variable.

^b Estimates are based on binary logistic regression with current smokeless tobacco use as dependent variable.

^c Adjusted for all significant variables in the unadjusted model of ever smokeless tobacco use.

^d Adjusted for all significant variables in the unadjusted model of current smokeless tobacco use.

Not estimable: Estimate could not be calculated due to insufficient observations or data imbalance.

Appendix 3.13: Thematic coding of the responses for potential components of a tobacco prevention intervention for adolescents

Codes as per categories							
	1	2	3	4	5	6	7
	Awareness-raising	Psychological skill development	Encouragement of healthy alternative activities	Supportive environment	Increased behavioural monitoring	Moral & religious guidance	Family involvement
1	Addiction	Anxiety resilience	Active in school	Adult support	Family monitoring	Ethics education	Concerned parenting
2	Awareness	Coping with peer pressure	Co-curricular activity	Cessation support	Monitoring	Family ethics	Family awareness
3	Bad effect	Counselling/ Therapy	Cultural activities	Environmental support	Parental monitoring	Improved personal morality	Family education
4	Bad habit	Depression resilience	Extra-curricular activity	Family support	Parental supervision	Islam	Family intervention
5	Brain effect	Empowerment for informed decisions	Healthy eating habits	Help in quitting tobacco	Supervision	Moral education	Family motivation
6	Deadly behaviour	Mental health promotion	Healthy lifestyle	Peer support	Teachers monitoring	Religious education	Family-based programme
7	Disease	Motivation	Physical activity	Positive peer support		Religious ethics	Parental education
8	Future consequences	Personality development	Playgrounds for sports	Social support		Religious principles	Parental support

9	Harmful effects	Problem identification	Recreational activities				Responsibility towards family
10	Health awareness	Problem-solving	Social activities				
11	Health hazard	Resistance skills	Sports				
12	Health risk	Self-control					
13	Mental harm	Self-efficacy					
14	Offline awareness	Self-esteem					
15	Online awareness	Stress resilience					
16	Peer awareness						
17	Physical harm						
18	Self-awareness						
19	Social awareness						
20	Social harm						
21	Teachers' awareness						

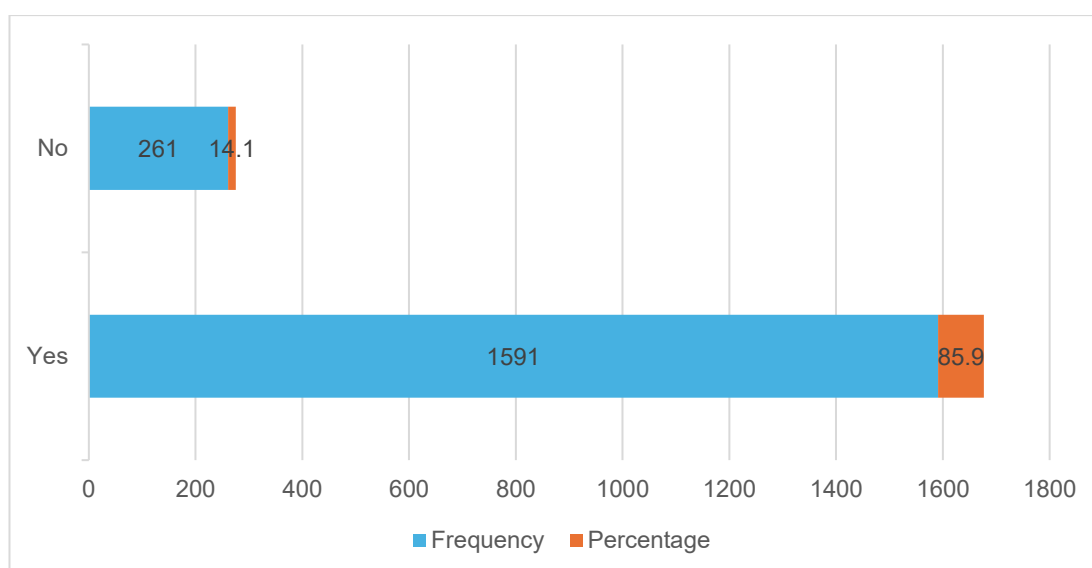
Appendix 3.14: Further details of the qualitative findings – participants’ opinions about what a possible tobacco use prevention programme should look like.

Qualitative Findings

Participants’ opinions about what a possible tobacco use prevention programme should look like.

(Participants were asked to consider a scenario where somebody is trying to develop a training programme for tobacco use prevention among adolescents like them and implement it in school settings).

Q.F5. Do you think a tobacco use prevention programme is needed in your school? (N = 1852)



Response to “Why the programme is needed in your school?” – Random 5 comments:

Study ID: 2260- “Our school surely needs this programme. Because many students in my school have a misconception about tobacco use but they are far away from the cold truth. They think smoking is cool somehow and they brag that they smoke and advise their friends to smoke or even to consume energy drinks which have a percentage of alcohol in them. Other than that I saw some students (mostly senior students) in the washroom who were smoking and sometimes even vaping. I also saw some students bringing energy drink which

has a percentage of alcohol and is inappropriate and harmful to a teenager's health and mind. I would also like to add that few students say that they smoke marijuana or weed they also ask their friends if they would like to smoke weed with him/her. So my school definitely needs this program."

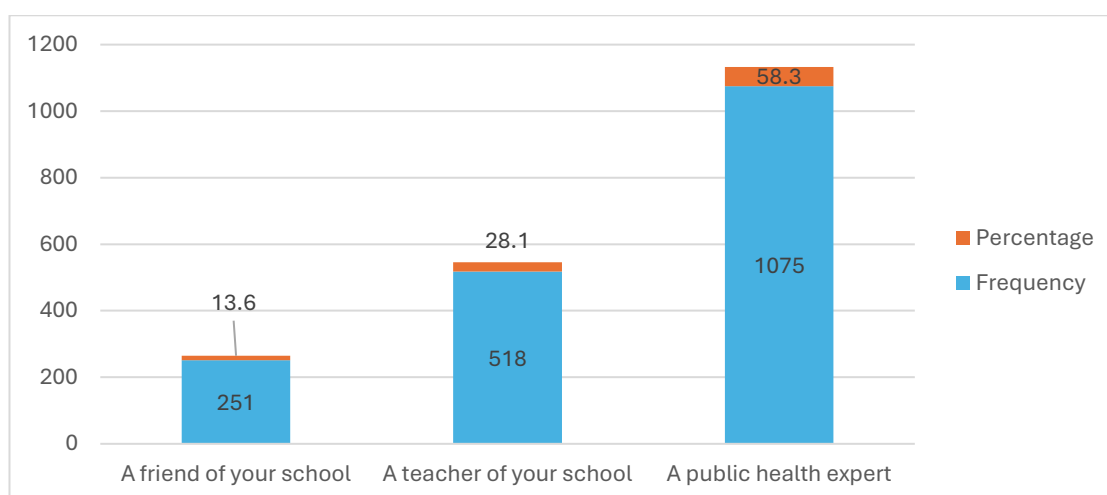
Study ID: 2811- "The base of a person's future lies in the family and the school-college university. If there is a tobacco prevention program in schools and colleges, the students will get encouragement from it and in the future through such programs, they will be able to eradicate tobacco from society forever."

Study ID: 3423- "Because school is a place from where I can learn many things along with education. If the programme gives knowledge about the bad effect of smoking held in school, then we will be able to attend that programme and we can learn many things from it. A school is an enjoyable place for both education and for gaining different knowledge about many things."

Study ID: 4727- "Because there are so many people who do these things around my school without thinking twice, and the school should take some steps for stopping this cause it's inspiring the young students."

Study ID: 5996- "Most smokers smoke from their juvenile age, mainly due to the various frustration they have due to improper growth environment. That's why proper awareness and counselling can prove effective."

Q. F4. To whom would you prefer to see as the trainer of the intervention programme? (N = 1844)



Response to "Why a public health expert?" – **Random 5 comments:**

Study ID: 632- "I prefer public health expert because he has more experience than other persons mentioned in the option."

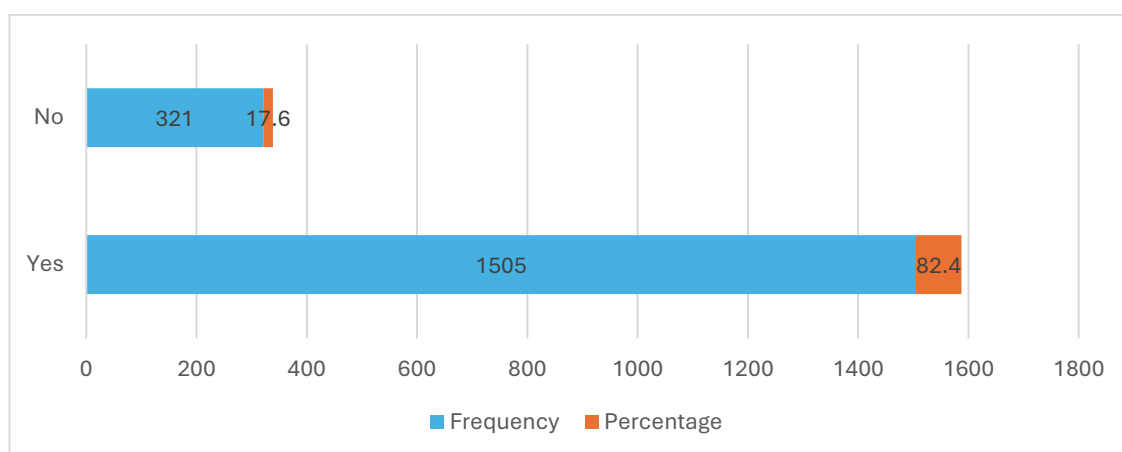
Study ID: 876- “I prefer experts because being instructed about tobacco is embarrassing if done by a friend or class teacher.”

Study ID: 2260- “The reason I chose this option is that he/she would be more experienced than a generic school teacher and a Teenager who still can't make his own decisions and is just starting to understand this world and how it works. I think a person who is experienced and knows what he is doing can put a lot of sense into the minds of the senseless teenager who doesn't know what is right and what is wrong.”

Study ID: 4950- “A public health expert will be able to present the issue better than others because he or she will naturally have a better idea than others.”

Study ID: 5996- “A professional who is aware of all the causes and impacts, can effectively deliver a proper awareness speech to initiate prevention.”

Q. F6. Do you think such a tobacco use prevention programme should also address household tobacco use simultaneously? (N = 1826)



Response to “Why the programme should also address household tobacco use simultaneously?” – **Random 5 comments:**

Study ID: 448 – “The family requires a tobacco-free atmosphere in addition to college.”

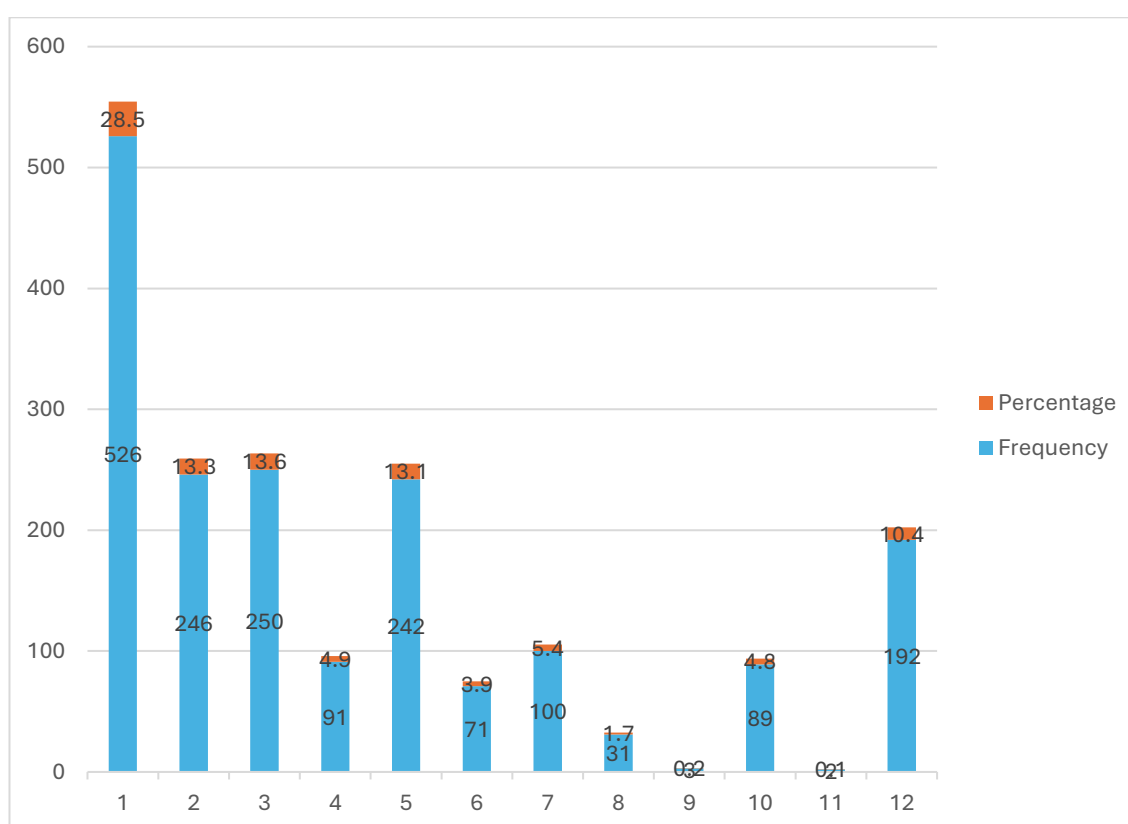
Study ID: 2468 – “Because it is seen that many times family members consume tobacco products, so I think this programme can help them.”

Study ID: 3274 – “If we discuss this with our family at home, they may change their thoughts. They may adopt a drawdown mentality in order to overcome their tobacco addiction.”

Study ID: 4371 – “Yes, because there are many families where at least one person uses drugs or cigarettes, their children may be attracted to it, both parents and children should be engaged in such awareness programs to know about the dangers of drugs and cigarettes.”

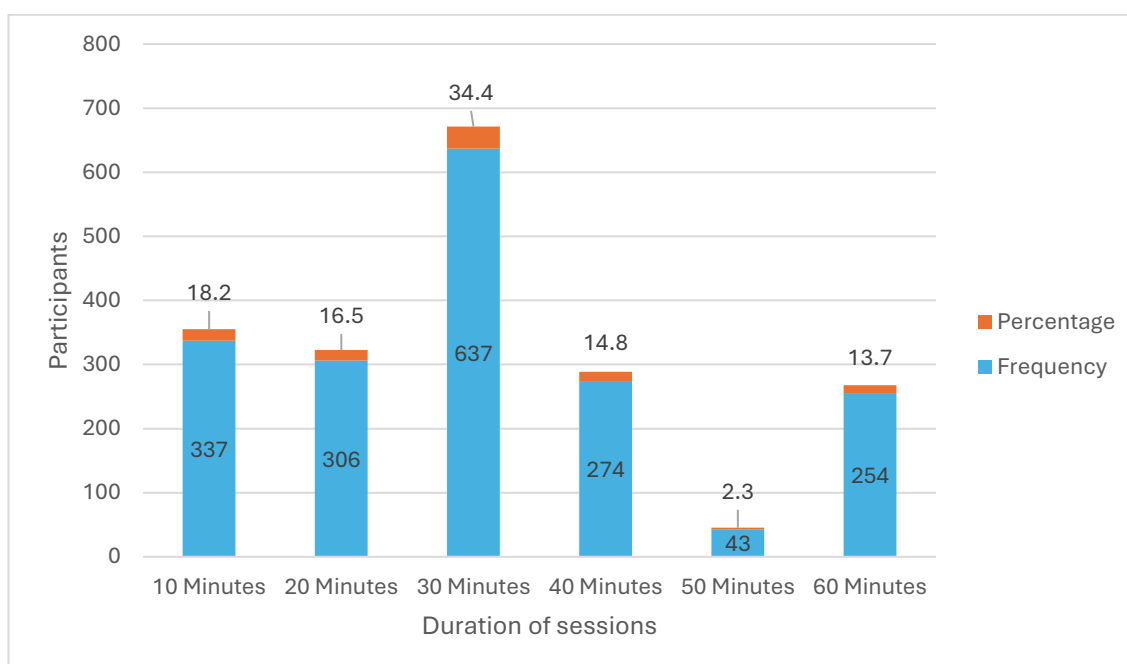
Study ID: 5939 – “This is how the family members will approach the issue and picture its consequences. As a result, he or she abstains from using tobacco products everywhere, including at home.”

Q. F1-1. How many sessions would you prefer to receive in a school-based tobacco use prevention intervention? (N = 1843)



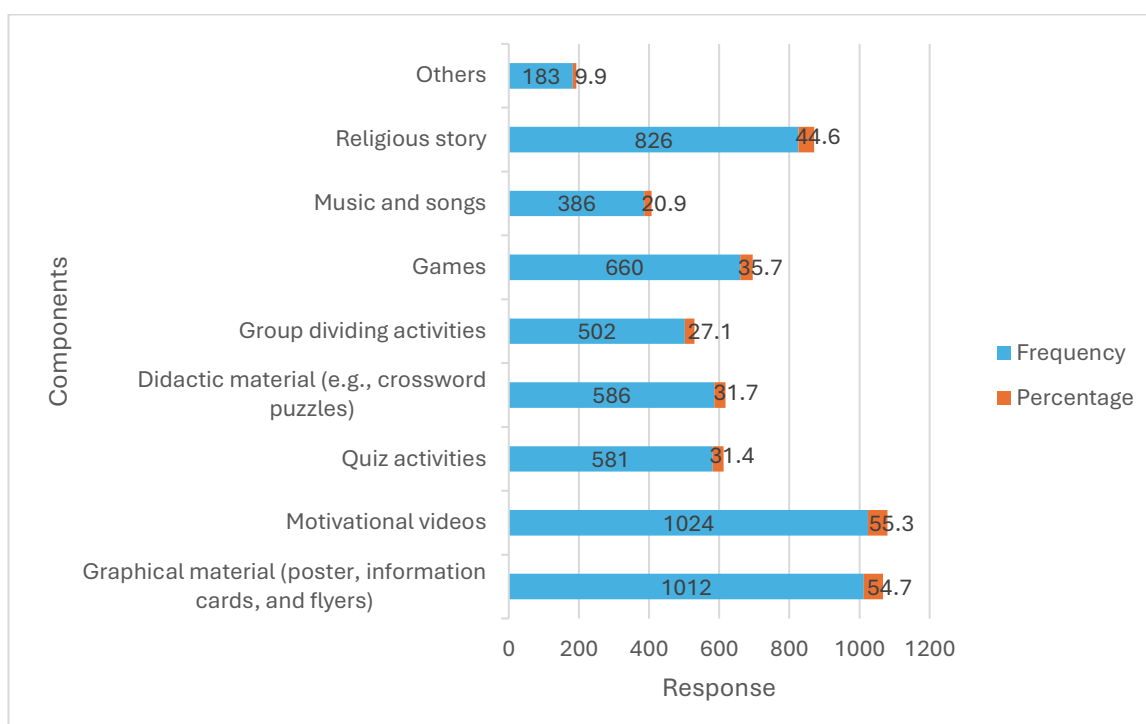
The mean of the session was 4.32 ($\pm$ 3.56)

Q. F1.2: How long should each session be in that intervention? (N = 1851)



The mean duration of the session was 30.77 minutes (± 15.38)

Q. F3. Which of the following components would you like to see in the training sessions and why? (Mention all that apply) (N = 1851)



Response to “Why graphical material (poster, information cards, and flyers)?” – **Random 5 comments:**

Study ID: 813 – “Posters, information cards, and leaflets attract people in various ways. After various information in the information sheet, students will learn more about the harmful effects of using tobacco products.”

Study ID: 2811 – “If we can see something with an example right in front of our eyes, it sticks in our head more than hearing or reading something. For example, tobacco use can cause deadly diseases including cancer. If this is explained in the form of graphics, it will be easy to understand how difficult the life of a tobacco smoker is. Moreover, if a tobacco user is not in normal life also if it is promoted with the help of graphics then awareness can be created in the public mind that for a good life, healthy normal life tobacco is totally prohibited.”

Study ID: 3980 – “Awareness can be increased through these materials. Besides, everyone can be informed about the evil effects of consuming tobacco, and how to prevent them.”

Study ID: 5660 – “Because these will help us along with others to know about the harmful effects of tobacco consumption.”

Study ID: 5885 – “Many people suffer from serious incurable diseases including cancer as a result of tobacco use. If the relevant pictures, posters etc. are displayed, considering the consequences of tobacco use, many of us will be discouraged from using tobacco.”

Response to “Why Motivational Videos” – **Random 5 comments:**

Study ID: 619 – “Because the audio-visual medium is a very powerful tool in today's world.”

Study ID: 1879 – “It will alert us. Since we use a phone to watch videos, it will not be a problem, we can watch the video through our mobile.”

Study ID: 2646 – “A short video which first portrays the common causes of using tobacco products and then shows how they suffer and how they can get out of this suffering or addiction it won't be boring and leave a big impression. The succession rate depends on whether they can relate to the video or not and how much they can feel it.”

Study ID: 4674 – “Because, through motivational videos, the related content can be easily understood by everyone and I think it will easily motivate everyone to stop smoking.”

Study ID: 4759 – “Yes, I think so. The motivational video will make children and teenagers understand how harmful these tobacco products are. And it is not only a risk to one's own life but also harmful to the surrounding people and family.”

Response to “Why quiz activities?” – **Random 5 comments:**

Study ID: 763 – “Well-targeted, tailor-made quizzes can boost self-esteem and confidence. When pupils can challenge themselves but can succeed, their confidence can grow. An individual quiz takes off the pressure that a 'test' can bring and enables children to make mistakes privately. Even if used in teams or pairs, the nature of a fun quiz can also help those children less confident to make mistakes, especially if the quiz allows them to try again.”

Study ID: 1469 – “Quizzes encourage pupils' self-awareness of progress and self-assessment.”

Study ID: 2700 – “It will motivate the students to participate in the session more attentively and get the questions right in the quiz, it will be even better if there is a prize.”

Study ID: 4573 – “It's fun, and something everybody would do, unlike sessions. They'll be waiting for it to end but if given a quiz and make sure that everybody is joining, it will be highly likely for everybody to read and answer.”

Study ID: 5247 – “If the mind is good through the quiz program, then the attention will not be paid to tobacco, as a result of which tobacco use will gradually decrease and tobacco use will stop at one time.”

Response to “Why religious story” – **Random 5 comments:**

Study ID: 464 – “It is necessary to know about the religious rules regarding tobacco use. Because religious rules never condone bad actions or thoughts. It will help to keep the teenagers away from tobacco and mentally healthy.”

Study ID: 1766 – “It will help our brothers to give up doing haram things and at the same time it will remind us of who we actually are and what we actually meant to do in this temporary earth... and what we were made for...”

Study ID: 2811 – “No religion ever tells us to despise life and turn to something heinous like tobacco use. So, if we can keep it within ourselves by following religious rules, no one will become addicted to tobacco. Furthermore, motivational stories will encourage people to learn about the benefits and risks of tobacco use, as well as to say no to tobacco.”

Study ID: 3314 – “Religious belief keeps people away from bad deeds. Religious motivational stories are true and enough to inspire...”

Study ID: 4371 – “In our country, most of the people are very religious - they always try their best to obey the rules of religion. So the programme will be so

much effective if religious contents associated with tobacco use prevention are added.”

Appendix 4

There is no supplementary material for Chapter 4.

Appendix 5

Appendix 5.1: Questionnaire and focus group topic guide for students

Title of study

Cultural adaptation of the contents, design, and implementation procedure of a brief school-based Intervention for Adolescent Tobacco Initiation Prevention

Questionnaire and FGD Guide for Students

Section A: Demographic Questionnaire

SL	Question	Response options
A1	Participant category	99 = Student
A2	Participant age	0 = 14 years 1 = 15 years 2 ≥ 16 years
A3	Participant gender	0 = Female 1 = Male
A4	Participant school year	0 = Eight 1 = Nine 2 = Ten 3 = Eleven
A5	Select the true statement for you from the following –	0 = I never used any tobacco product in my life. 1 = I used to use tobacco, but not now 2 = I use tobacco now (go to question A7)
A6	If the answer to “A6” is option “2”, What types of tobacco are you using?	0 = Cigarette 1 = Bidi/other smoking tobacco 2 = Smokeless tobacco

Focus Group Topic Guide for Students

Setting and instructions to participants (10 mins)

Introductions

- Facilitator and assistant facilitator introduce selves

Welcome and thank you for making time for this focus group. Your point of view is important, and we appreciate the time you have given to take part.

This focus group discussion is being held to **learn about your experiences, thoughts and feelings about adolescents' tobacco use behaviour and prevention programmes and your expectations on what you would like a programme to include.**

The discussion should take no more than 90 minutes. As we mentioned in the information sheet about this study, we would like to record this discussion so that we have a record of everything that has been discussed. We would like to assure you that this discussion is confidential, and all information will be pseudonymised. We will give you a number at the start of the focus group and refer to you by number throughout (e.g., Participant 2, Participant 4). The recordings will be kept safely on a password-protected computer in a locked room at the Department of Behavioural Science and Health, University College London until they are transcribed, after which they will be destroyed. The transcribed notes of the focus group will not contain any information that could be used to identify you or link you to any particular statements. All subsequent data (from the transcript, questionnaire, notes) used for analysis and publication will be anonymised.

Can I just confirm that everyone is happy for the discussion to be recorded?

We'd like to encourage you to answer and comment as accurately and truthfully as possible. To protect everyone's confidentiality, we would also like to ask you to refrain from discussing the comments of other group members outside of the focus group. Whilst we would like you to be as involved as possible, if there are any questions or discussions you do not want to answer or participate in, you do not have to do so. Your participation in this study is voluntary and that you are free to withdraw from the study without giving a reason. Even, after completing the FGD, you can withdraw your data at any time within 30 days by contacting the researchers via email.

Cover ground rules:

- Please treat this focus group as a relaxed discussion - it is not a question-and-answer session.
- All responses are valid – there are no right or wrong answers.
- Speak as openly as you feel comfortable.
- It's all right to abstain from discussing specific topics if you are not comfortable.

• Try to stay on topic; we may need to interrupt so that we can cover all the material. • Avoid revealing very detailed information about any sensitive health issues. • Please respect the opinions of others even if you don't agree. • Help protect others' privacy by not discussing details outside the group. • Any questions before we begin? ...	
Introductions (5 minutes) Ask all group members to introduce themselves by role. Ask participants to speak clearly to facilitate the identification of individuals during transcription.	

Main discussion (90 minutes)		
B	General part	
	Questions	Prompts
B1	Are there any activities in your school or at home to promote your healthy lifestyle?	If so, • What types of activities are these? • Could you tell me more about the health activities you participated in school or at home? • When do you usually perform these? For how long in a day/week/month? • What is your role in the activities?
*** Delivery of Tobacco Prevention Intervention [Describe the proposed intervention – gain any feedback on materials] “We are developing a short school-based tobacco-use prevention intervention for school adolescents. The intervention will be structured based on the contents. I would like to know your specific views on the contents and advice for further modification.” Participants were provided with the materials to explore and comment on different content.		

	Questions
C1	• What are your initial thoughts about our proposed contents of the intervention in general / the layout/looks/information included? • What do you like/dislike about it? • What features do you think are most/least useful? • Is there anything that should be changed/explained better / presented better? • Do you think the contents of the intervention programme are sufficient to develop the students' skills in order to prevent them from tobacco use? • Is there anything that you expecting to see in the intervention, but we missed?
C2	• What do you think - Who would be best to deliver the intervention? What is the reason behind your opinion? • If you get training, do you feel your could deliver the tobacco prevention intervention to your peers?
Debrief and End	
C3	Is there anything else you would like to say? (Provide them pen and paper if the want to add anything anonymously)

Appendix 5.2: Questionnaire and focus group topic guide for teachers

Title of study

Cultural adaptation of the contents, design, and implementation procedure of a brief school-based Intervention for Adolescent Tobacco Initiation Prevention

Questionnaire and FGD Guide for Teachers

Section A: Demographic Questionnaire

SL	Question	Response options
A1	Participant category	77 = Teacher
A2	Participant age	0 ≤ 30 years 1 = 31 – 40 years 2 = 41 – 50 years 3 ≥ 51 years
A3	Participant gender	0 = Female 1 = Male
A4	Teacher of the student year (Tick all that apply)	0 = Eight 1 = Nine 2 = Ten 3 = Eleven
A5	Participant's highest level of education	0 = No formal education 1 = Primary (1-5) 2 = Secondary (6-10) 3 = Higher Secondary (11-12) 4 = Undergraduate 5 = Graduate 6 = Doctoral
A6	Select the true statement for you from the following –	0 = I never used any tobacco product in my life. 1 = I used to use tobacco, but not now

		2 = I use tobacco now (go to question A7)
A7	If the answer to “A6” is option “2”, What types of tobacco are you using?	0 = Cigarette 1 = Bidi/other smoking tobacco 2 = Smokeless tobacco

Focus Group Topic Guide for Teachers

Setting and instructions to participants (10 mins)
Introductions • Facilitator and assistant facilitator introduce selves Welcome and thank you for making time for this focus group. Your point of view is important, and we appreciate the time you have given to take part. This focus group discussion is being held to learn about your experiences, thoughts and feelings about youth tobacco use behaviour and prevention programmes and your expectations on what you would like a programme to include. The discussion should take no more than 90 minutes. As we mentioned in the information sheet about this study, we would like to record this discussion so that we have a record of everything that has been discussed. We would like to assure you that this discussion is confidential, and all information will be pseudonymised. We will give you a number at the start of the focus group and refer to you by number throughout (e.g., Participant 2, Participant 4). The recordings will be kept safely on a password-protected computer in a locked room at the Department of Behavioural Science and Health, University College London until they are transcribed, after which they will be destroyed. The transcribed notes of the focus group will not contain any information that could be used to identify you or link you to any particular statements. All subsequent data (from the transcript, questionnaire, notes) used for analysis and publication will be anonymised. Can I just confirm that everyone is happy for the discussion to be recorded? We’d like to encourage you to answer and comment as accurately and truthfully as possible. To protect everyone’s confidentiality, we would also like to ask you to refrain from discussing the comments of other group members outside of the focus group. Whilst we would like you to be as involved as possible, if there are any questions or discussions you do not want to answer or participate in, you do not have to do so. Your participation in this study is voluntary and that you are free to withdraw from the study without giving a

reason. Even, after completing the FGD, you can withdraw your data at any time within 30 days by contacting the researchers via email.

Cover ground rules:

- Please treat this focus group as a relaxed discussion - it is not a question-and-answer session.
- All responses are valid – there are no right or wrong answers.
- Speak as openly as you feel comfortable.
- It's all right to abstain from discussing specific topics if you are not comfortable.
- Try to stay on topic; we may need to interrupt so that we can cover all the material.
- Avoid revealing very detailed information about any sensitive health issues.
- Please respect the opinions of others even if you don't agree.
- Help protect others' privacy by not discussing details outside the group.
- Any questions before we begin? ...

Introductions (5 minutes)

Ask all group members to introduce themselves by role. Ask participants to speak clearly to facilitate the identification of individuals during transcription.

Main discussion (90 minutes)		
B	General part	
	Questions	Prompts
B1	Are there any activities you undertake to encourage a healthy lifestyle for pupils in your school?	If so, • Could you tell me more about the health activities you/your school provide to students in your school? • When do the students usually perform these? For how long in a day/week/month? • What is your role in delivering these activities?
C	Students and Tobacco	
C1	Do you think kids in your school are using tobacco?	If so,

		• Why do you think kids might use tobacco? • Have you noticed any differences in tobacco use between different groups (e.g., gender).
C2	Have you addressed tobacco use in school?	Have you ever talked about tobacco use prevention? Is there any ongoing tobacco use prevention programme in your school? If not, was it previously? Is/was it a part of your curriculum? What you do if you see students using tobacco?
*** Delivery of Tobacco Prevention Intervention [Describe the proposed intervention – gain any feedback on materials] “We are developing a short school-based tobacco-use prevention intervention for school adolescents. The intervention will be structured based on the contents. I would like to know your specific views on the contents and advice for further modification.” Participants were provided with the materials to explore and comment on different content.		
	Questions	
D1	• What are your initial thoughts about our proposed contents of the intervention in general / the layout/looks/information included? • What do you like/dislike about it? • What features do you think are most/least useful?	

	• Is there anything that should be changed/explained better / presented better? • Do you think the contents of the intervention programme are sufficient to develop the students' skills in order to prevent them from tobacco use? • Is there anything that you expecting to see in the intervention, but we missed?
D2	What factors need to be considered in regard to delivering the intervention to students? • How feasible would it be to deliver the intervention in a classroom setting? • Who would be best to deliver the intervention? What is the reason behind your opinion? • If you get training, do you feel your current workload would allow you to offer tobacco prevention intervention to your students? • Overall, what kind of difficulties might be encountered?
D3	Is there anything else you would like to say about how the tobacco prevention intervention should be delivered in schools like yours? • How important do you think it would be to add tobacco prevention intervention to routine school activities/curricula in Bangladesh?
Debrief and End	
D4	Is there anything else you would like to say? (Provide them pen and paper if the want to add anything anonymously)

Appendix 5.3: Questionnaire and focus group topic guide for parents

Title of study

Cultural adaptation of the contents, design, and implementation procedure of a brief school-based Intervention for Adolescent Tobacco Initiation Prevention

Questionnaire and FGD Guide for Parents

Section A: Demographic Questionnaire

SL	Question	Response options
A1	Participant category	55 = Parent
A2	Participant age	0 ≤ 30 years 1 = 31 – 40 years 2 = 41 – 50 years 3 ≥ 51 years
A3	Participant gender	0 = Female 1 = Male
A4	What is the school year of your child?	0 = Eight 1 = Nine 2 = Ten 3 = Eleven
A5	Participant's highest level of education	0 = No formal education 1 = Primary (1-5) 2 = Secondary (6-10) 3 = Higher Secondary (11-12) 4 = Undergraduate 5 = Graduate 6 = Doctoral
A6	Select the true statement for you from the following –	0 = I never used any tobacco product in my life. 1 = I used to use tobacco, but not now 2 = I use tobacco now (go to question A7)
A7	If the answer to “A6” is option “2”, What types of tobacco are you using?	0 = Cigarette 1 = Bidi/other smoking tobacco 2 = Smokeless tobacco

Focus Group Topic Guide for Parents

Setting and instructions to participants (10 mins)

Introductions

- Facilitator and assistant facilitator introduce selves

Welcome and thank you for making time for this focus group. Your point of view is important, and we appreciate the time you have given to take part.

This focus group discussion is being held to **learn about your experiences, thoughts and feelings about youth tobacco use behaviour and prevention programmes and your expectations on what you would like a programme to include.**

The discussion should take no more than 90 minutes. As we mentioned in the information sheet about this study, we would like to record this discussion so that we have a record of everything that has been discussed. We would like to assure you that this discussion is confidential, and all information will be pseudonymised. We will give you a number at the start of the focus group and refer to you by number throughout (e.g., Participant 2, Participant 4). The recordings will be kept safely on a password-protected computer in a locked room at the Department of Behavioural Science and Health, University College London until they are transcribed, after which they will be destroyed. The transcribed notes of the focus group will not contain any information that could be used to identify you or link you to any particular statements. All subsequent data (from the transcript, questionnaire, notes) used for analysis and publication will be anonymised.

Can I just confirm that everyone is happy for the discussion to be recorded?

We'd like to encourage you to answer and comment as accurately and truthfully as possible. To protect everyone's confidentiality, we would also like to ask you to refrain from discussing the comments of other group members outside of the focus group. Whilst we would like you to be as involved as possible, if there are any questions or discussions you do not want to answer or participate in, you do not have to do so. Your participation in this study is voluntary and that you are free to withdraw from the study without giving a reason. Even, after completing the FGD, you can withdraw your data at any time within 30 days by contacting the researchers via email.

Cover ground rules:

- Please treat this focus group as a relaxed discussion - it is not a question-and-answer session.
- All responses are valid—there are no right or wrong answers.
- Speak as openly as you feel comfortable.
- It's all right to abstain from discussing specific topics if you are not comfortable.

• Try to stay on topic; we may need to interrupt so that we can cover all the material. • Avoid revealing very detailed information about any sensitive health issues. • Please respect the opinions of others even if you don't agree. • Help protect others' privacy by not discussing details outside the group. • Any questions before we begin? ...	
Introductions (5 minutes) Ask all group members to introduce themselves by role. Ask participants to speak clearly to facilitate the identification of individuals during transcription.	

Main discussion (90 minutes)		
B	General part	
	Questions	Prompts
B1	Is healthy living important in your family?/ Do you address healthy lifestyle in your home?	If so, • How/Why/why NOT important? • (That's really good...can you expand on this... anyone want's to add anything)
C	Students and Tobacco	
C1	Do you think kids in your kids' school are using tobacco?	If so, • Why do you think kids might use tobacco? • Are there any gender differences?
C2	Do you ever ask your child about his/her tobacco use?	If so, • How easily does s/he find it to talk to you about using tobacco? • How easy do you find engaging with this? • How would you respond if your child used tobacco?
*** Delivery of Tobacco Prevention Intervention [Describe the proposed intervention – gain any feedback on materials]		

“We are developing a short school-based tobacco-use prevention intervention for school adolescents. The intervention will be structured based on the contents. I would like to know your specific views on the contents and advice for further modification.” Participants were provided with the materials to explore and comment on different content.			
D1	• What are your initial thoughts about our proposed contents of the intervention in general / the layout/looks/information included? • What do you like/dislike about it? • What features do you think are most/least useful? • Is there anything that should be changed/explained better / presented better? • Do you think the contents of the intervention programme are sufficient to develop the adolescents' skills in order to prevent them from tobacco use? • Is there anything that you expecting to see in the intervention, but we missed? • What would help you at home address tobacco use that could be part of this intervention?		
Debrief and End			
D2	Is there anything else you would like to say? (Provide them pen and paper if they want to add anything anonymously)		

Appendix 5.4: Ethics clearance certificates

5.4.1: UCL ethics clearance certificate

RESEARCH AND INNOVATION SERVICES



Professor Lion Shahab
Department of Behavioural Science and Health
UCL

Cc: Sahadat Hossein

26 June 2023

Dear Professor Shahab

Notification of Ethical Approval

Project ID/Title: 22645/003 Cultural adaptation of the contents, design and implementation procedure of a brief school based intervention for Adolescent Tobacco Initiation Prevention

I am pleased to confirm that your study has been ethically approved by the UCL Research Ethics Committee (UCL REC) until 31 July 2023.

Ethical approval is subject to the following conditions:

Notification of Amendments to the Research

Please seek Chair's approval for proposed amendments (to include extensions to duration) to the research for which this approval has been given. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of continued ethical approval by completing an 'Amendment Approval Request Form' <https://www.ucl.ac.uk/research-ethics/responsibilities-after-approval>

Adverse Event Reporting – Serious and Non-Serious

It is your responsibility to report to the REC any unanticipated problems or adverse events involving risks to participants or others. The REC should be notified of all serious adverse events via the Research Ethics Service (ethics@ucl.ac.uk) immediately after the incident occurs. Where the adverse incident is unexpected and serious, the Joint Chairs will decide whether the study should be terminated pending the opinion of an independent expert.

For non-serious adverse events, the Joint Chairs should again be notified via the Research Ethics Service within ten days of the incident occurring and provide a full written report that should include any amendments to the participant information sheet and study protocol. The Joint Chairs will confirm that the incident is non-serious and report to the REC at the next meeting. The final view of the REC will be communicated to you.

Research Ethics Service
Research and Innovation Services
University College London
ethics@ucl.ac.uk
www.ucl.ac.uk/research-ethics/

Final Report

At the end of the data collection element of your research we ask that you submit a very brief report (1–2 paragraphs will suffice) which includes issues relating to the ethical implications of the research (i.e. any issues obtaining consent, participants withdrawing from the research, confidentiality, protection of participants from physical and mental harm etc).

In addition, please:

- ensure that you follow all relevant guidance as laid out in [UCL's Code of Conduct for Research](#);
- note that you are required to adhere to all research data/records management and storage procedures agreed as part of your application. This will be expected even after completion of the study.

With best wishes for the research.

Yours sincerely

A large black rectangular redaction box covering the signature area of the letter.

Professor Lynn Ang and Professor Michael Heinrich
Co-Chairs, UCL Research Ethics Committee

Research Ethics Service
Research and Innovation Services
University College London
ethics@ucl.ac.uk
www.ucl.ac.uk/research-ethics/

5.4.2: JU ethics clearance certificate

Chairman Biosafety, Biosecurity & Ethical Committee Faculty of Biological Sciences		Jahangirnagar University Savar, Dhaka-1342, Bangladesh Tel: [REDACTED] Fax: [REDACTED] Email: [REDACTED]
Ref No: BBEC, JU/M 2023/ 05 (29)		Date: 23-05-2023
<u>Certificate of Ethical Clearance</u>		
This is to certify that the project titled “Cultural adaptation of the contents, design, and implementation procedure of a brief school-based Intervention for Adolescent Tobacco Initiation Prevention” has been reviewed and approved by the Biosafety, Biosecurity and Ethical Committee of Jahangirnagar University.		
<u>Project Information</u>		
Name of the Project	:	Cultural adaptation of the contents, design, and implementation procedure of a brief school-based Intervention for Adolescent Tobacco Initiation Prevention
Name of the Applicant	:	Sahadat Hossain
Name of the Supervisor	:	Professor Lion Shahab at UCL, UK
Contact Address of the Principal Investigator	:	Assistant Professor, Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka, Bangladesh
Telephone/ Mobile No.	:	[REDACTED]
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<u>Research Information</u>		
Species/ Sample	:	Human
Age	:	17 to adult
Number	:	24
Problems	:	None
Category	:	N/A
Number of days each sample will be examined	:	N/A
23/05/23 Chairman Biosafety, Biosecurity & Ethical Committee & Dean, Faculty of Biological Sciences Jahangirnagar University Savar, Dhaka-1342 BANGLADESH		
Office: Faculty of Biological Sciences, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh		

Appendix 5.5: Themes, sub-themes, and representative quotes from students, teachers, and parents on the IATIP Intervention

SL	Theme	Subtheme	Quotes			
			Student	Teacher		Parent
1	Initial Impressions	General thoughts on content	1. "[...] the topics are very important. I think the general understanding of tobacco is very necessary. I think in this case, it is important to understand the addiction to tobacco and set goals for tobacco prevention." [ID-S3, Student participant]; 2. "Many of us who struggle to give up tobacco can be inspired if they join the sessions of this programme. This [the contents] can be used as a source of motivation." [ID-S8, Student participant]	"Your work is noble, your objective is noble, and the content is also great. It seems everything is in good shape." [ID-T1, Teacher participant]		"I found all the topics relevant and very good. If you can implement it successfully, it'll be really beneficial." [ID-P2, Parent]

2	Initial Impressions	Perceptions of layout/design	"I think it would be more effective if it's shown through experiments. Reading alone wouldn't be that effective." [ID-S7, Student participant]	"In terms of visualisation, it does sound effective. A video could be shown, maybe a small documentary-style video. But unless we show them how tobacco is slowly leading them towards death, I feel like that's not as impactful. Some other ways of awareness raising are fine, but if you show them the direct fear of death, that would work better. Because the fear itself is the key." [ID-T3, Teacher participant]	"Your program ideas are all really good. Every aspect you've mentioned needs attention because addressing these issues could lead to effective outcomes." [ID-P1, Parent]
3	Initial Impressions	Clarity of information provided	"No, I don't understand what you mean by ETS. It would be easier for us if you could explain it clearly. Also, I think you shouldn't use any language that is too complex for us." [ID-S6, Student participant]	"Everything seems right to me. That's right, because if we listen to them, we can correct misconceptions by presenting things in their language. If they feel that older people are just lecturing them, they might reject it. So, a mix of lectures and group work will make the programme	"Yes, these are all correct. But I think the children might not understand everything just by reading. Someone should guide them." [ID-P7, Parent]

				enjoyable.” [ID-T7, Teacher participant]	
4	Likes/Dislikes	Most appreciated features	“If mental health can be normalised in our society, then many of these addictions, like tobacco addiction, will highly decrease. I think this is very important topic to be discussed.” [ID-S8, Student participant]	“it could be more like a real-life example, maybe bringing in someone who became addicted to smoking and got cancer as a result of smoking. Having them share their story directly as a living example would be more effective, not through a video.” [ID-T2, Teacher participant]	“You're saying that breathing exercises can be done in the session. It's a great activity. I love it. It will help them keep their brains cool. I think they can practice this during assemblies or in physical education classes as well.” [ID-P6, Parent] 2. “Yes, it's essential to address these emotional challenges. I really liked that this program includes attention to such matters because, honestly, it's something we should talk about.” [ID-P3, Parent]

5	Likes/Dislikes	Content-related concerns	“Regarding the health risks mentioned here, since we can now use 3D animation (amm) for various things, like if we show them how cancer happens due to tobacco use, (amm) and how the operation process works and what damages occur, if they see that through 3D animation, they might avoid it. They might be scared that if they don’t stay away, they could face the same fate.” [ID-S3, Student participant]	“Our children today are dealing with stuff we never even thought about. Back in the day, we grew up in joint families, so no matter what trouble we got into, we could always run to our grandfather for protection, and our dad wouldn’t scold us. But now, children face all sorts of stress and often have nowhere to turn. Plus, our generation is all about wanting more and more – always chasing something better, and it never seems to end. It’s good that you’ve added mental wellbeing components, but you should also include how to get emotional and social support.” [ID-T4, Teacher participant]	“It’s essential to teach children the difference between right and wrong. (ahh) They need to understand that good actions lead to good outcomes, and bad actions have consequences. Once they realise this, they’ll think twice about making poor decisions. If a child knows their parents have explained both sides to them, they’re less likely to stray onto the wrong path. Even if they’re tempted, they’ll remember what their parents said and reconsider. [...] So, I believe the most important thing is for parents to become aware first.” [ID-P4, Parent]

6	Suggestions for Addition to IATIP	Content changes	“There is an opportunity for some activities to be included in the programme like sports. [...] If there are any open activities available for everyone, I think it would be better.” [ID-S3, Student participant]	“In an open economy, tobacco represents a significant percentage, as Sir said, it’s a huge percentage. Even after raising the tax rate year after year, you still can’t control it. No matter how expensive the cigarette gets, whether it’s 15 or 16 takas, a student will still buy them. And not only that, various new brands have emerged. They are being marketed as ‘less harmful’. This is the new trend – marketing tobacco as less harmful, but it’s not really less harmful. At the same time, business policies are being added. So, you must address these issues in your programme and motivate the students not to use tobacco.” [ID-T3, Teacher participant]	“Another thing you can add (hmm) is that you could start annual health checkups for students, (hmm) let’s say for class eight to twelve. You can test for tobacco use and issue certificates. Anyone who will be found using tobacco would be expelled from the school.” [ID-P7, Parent]

7	Suggestions for Addition to IATIP	Delivery modifications	“It’s a fact that in our society, it’s said that boys have no emotions. Or why would a boy show emotions? (...) Families always pressure boys to be perfect. Yes, from a young age, they’re pressured to grow up, get a job, and take on family responsibilities. They’re constantly thinking, ‘If I can’t get a job and support my family, then what will happen?’ – I’ll have no hope. This pressure is leading them to cigarette addiction.” [ID-S7, Student participant]	“You could add a bit more specificity by showing an interview with someone who smoked all their life and developed cancer. It would be impactful to show how their family members were affected – how many people in their family were destroyed by it.” [ID-T2, Teacher participant]	“The contents of your programme, tobacco prevention programme, should be included in school textbooks, and lots of seminars can be conducted on this. They [children] don’t know. They don’t know about the health risks of tobacco use at all. I think the health risks can be added to the science books, the social and environmental risks to the social studies books, and the religious perspective to the religion books. If we include a bit in each subject, then they’ll be aware.” [ID-P7, Parent]

8	Cultural Relevance	Alignment with socio-cultural norms	“And also, in our country, it’s really common to see people smoking while walking on the footpath. No one ever says anything or tries to stop them, even though others who don’t like cigarette smoke have to deal with it too. It’s just seen as normal. But I think we should change this cultural practice. Maybe you could highlight this issue in the programme.” [ID-S2, Student participant]	“We are only focusing on smoking, but there’s also a sector for Jarda, yes. My mother, my grandmother, madam, yes, are big fans of Jarda. And within our cultural context, this Jarda is viewed in two different ways. If mothers and grandmothers consume it, it’s seen as positive. But if it’s smoked, it’s seen as negative. I don’t know why this double standard exists – why does fire make it problematic, but not otherwise? I don’t understand why this happens. (...) And in our wedding ceremonies, you’ll see that betel leaf is displayed in various ways, and if it’s not there, people fight. Yes, sweet, betel leaf and Jarda – if those aren’t there, there will be trouble.” [ID-T2, Teacher participant]	“As a mother, I always try to teach my child to follow the successful people in my family, usually follow those who are gentle and don’t get involved in any wrongdoing. So, you can also focus on this in your programme. Teaching them about following the good people around us and the importance of staying healthy to take care of their family and I think it can discourage them from using tobacco.” [ID-P3, Parent]

9	Cultural Relevance	Integration of religious values	1. "(hm) Generally, we do follow religious principles. For those who believe in religion, these principles act like a force. I believe that if this is implemented, it could be impactful. If we tell them that doing this is wrong, it would be sinful." [ID-S3, Student participant] 2. "[...] However, for those who aren't serious about religion or who don't believe in it, it might not be effective." [ID-S7, Student participant]	"If I think from a religious perspective, whether it's Hindu, Muslim, Christian, or Buddhist, no religion says that you should engage in addiction. No religion says that you should do forbidden things. It's not stated anywhere. (...) For this reason, to prevent tobacco use, or many other prohibited activities, you can motivate students through religion as well." [ID-T3, Teacher participant]	"And you can make the children aware of tobacco from a religious perspective – it's haram (forbidden). Islam prohibits it because it's a waste. It harms not only oneself but also others, including pregnant women, and even the environment." [ID-P4, Parent]
10	Implementation Challenges	Practicality of implementation	"In a seminar, many may not attend, or they may talk among themselves, and the maintenance won't be good. If it's done in a classroom, we can make sure that everyone listens." [ID-S4, Student participant]	"We could also hold seminars every month or every three months or every six months. (...) Regular seminars where we show videos or engage in discussions would be very beneficial." [ID-T8, Teacher participant];	"There's a law [tobacco control] in Bangladesh, but it's not being implemented. You should mention that the proper implementation of these laws needs to be ensured. You can connect this to your lecture, for example, there's a fine for smoking in public, but it's not enforced, but we should

					follow this.” [ID-P8, Parent]
11	Implementation Challenges	Perceived barriers	“Our generation believes more in scientific explanations. I think if it’s shown scientifically from religion, it would be better.” [ID-S6, Student participant)	“This time is difficult for us because it’s our students’ year finals. Right now, every class is very important, this kind of activity will disrupt that.” [ID-T3, Teacher]	“We don’t think there’ll be any barriers from parents. We’re really happy about it because we don’t want our children to be destroyed by using tobacco or something like this.” [ID-P2, Parent]
12	Preferred Delivery Methods	Peer-led, teacher-led, or expert-led approaches	“We won’t take friends as seriously as we would take experts, (hmm) this is because they (experts) will have more knowledge. That’s why we would take them more seriously. I think it would be better if they (experts) conducted it.” [ID-S7, Student]	“... it would be great to bring in a new face, like a public health expert. But we can still be there to make sure everything runs smoothly. We can handle class management, just standing by without speaking.” [ID-T5, Teacher]	

13	Preferred Delivery Methods	Mode of engagement (in-person or online)	“(Ah) It would be better if the program is held in the classroom. People [students] don’t pay much attention or take things seriously online. We’ve seen this even in online classes.” [ID-S1, Student]	“In my opinion, the classroom approach is better. Fewer students will be present, they will be able to grasp the concepts better, and they will also be able to participate and give their opinions.” [ID-T1, Teacher]	

Appendix 5.6: IATIP programme manual

Intervention for Adolescent Tobacco Initiation Prevention (IATIP) to Promote Health and Well-being

Programme manual

Document version 1.8



Contents

Contents	Page number
Introduction	
Overview of IATIP components, learning outcomes and learning types	
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1.2 Tobacco toxicity and addiction	
1.3 Health effects of tobacco use	
1.4 Religious views on tobacco use	
Session 2: Kick the habit: Smart decision and strong skills for a healthy lifestyle	
2.1 Why do people use tobacco?	
2.2 Decision making and problem-solving skills to resist tobacco: assertiveness and refusal skills	
2.3 Discover positive and healthy alternatives to using tobacco	
Session 3: Mind matters: Navigating emotions and setting goals for a tobacco-free future	
3.1 Links between tobacco and mental wellbeing	
3.2 Coping with emotions: expression of negative feelings, dealing with stress, depression and anxiety.	
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Classroom sessions

Session 1: Tobacco talk: Understanding the basics, health effects, and perspectives

Learning outcomes

The learning outcomes of this session are as follows:

1. General understanding: Students will acquire a basic understanding of the nature of tobacco, its composition, and the various forms of tobacco products.
2. Understanding tobacco addiction: Students will gain insight into the addictive nature of tobacco and the physiological and psychological mechanisms that lead to addiction.
3. Awareness of health consequences: Students will explore about the detrimental health effects of tobacco use, including both short-term and long-term consequences.
4. Exploration of religious perspectives: Students will learn how different religion's view tobacco use and its implications on personal beliefs and values.
5. Motivation for change: Students may experience an increased motivation to not to initiate tobacco consumption or reduce or quit tobacco use, guided by the knowledge of addiction, health risks, and personal values.

These learning outcomes aim to provide Students with a comprehensive understanding of tobacco, including its addictive nature, health consequences, legal aspects, and its intersection with religion. This knowledge can empower them to make informed decisions and potentially motivate them to address their tobacco use or advocate for public health measures.

1.1 Tobacco and Tobacco products

Mode of delivery: Open discussion

Learning type: Discussion & Acquisition

In this sub-session, students will be engaged in an open discussion format that fosters active dialogue and knowledge acquisition. The focus is on exploring the general introduction to tobacco, and its types. The facilitator will encourage Students to share their thoughts, questions, and insights, creating an interactive learning environment. Through this discussion, Students acquire foundational knowledge about tobacco, setting the stage for deeper exploration in subsequent sessions.

Example (Prompts for facilitator):

Tobacco is a plant that have high levels of the addictive and toxic chemicals, containing nicotine, tar, carbon monoxide, benzene, arsenic, formaldehyde, etc.

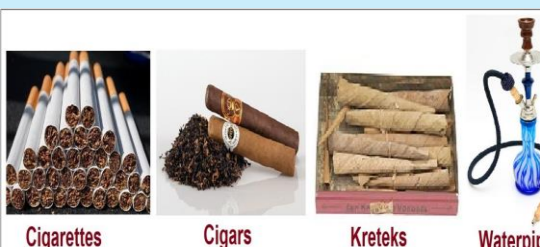
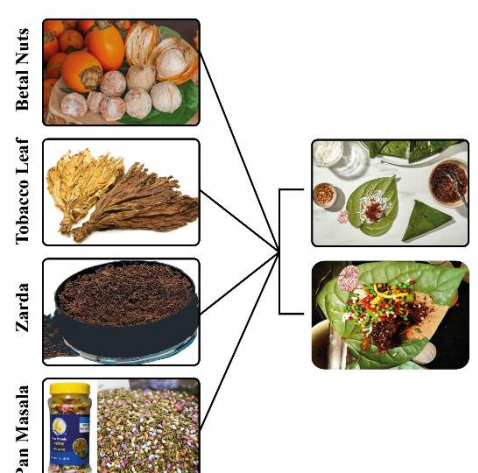
After harvesting, tobacco leaves are cured, aged, and processed in various ways and the resulting products are smoked, or inhaled, or applied to the gums.



(Photos: Children & women engaged in the cultivation & production of tobacco in Bangladesh)

In terms of tobacco products, we can categorise these into two types – smoking tobacco products and smokeless tobacco products.

Smoking tobacco	Smokeless tobacco
A tobacco product which is burnt or heated and then inhaled.	A tobacco product which is used orally (chewed, sucked, dipped, held in the mouth, etc.) or nasally.
Ex. • cigarettes • cigars • bidis • kreteks • hookah/ waterpipe/ shisha	Ex. • chewing tobacco (plug/twist/loose leaf) • snuff • snus • gutka • betel quid with tobacco (paan) • zarda

Cigarette smoking is the most common form of tobacco use worldwide. The picture below shows different smoking tobacco products.	The picture below shows different smokeless tobacco products.
Figure: A  Cigarettes Cigars Kreteks Waterpipe	Figure: B  Smokeless Tobacco Products in Bangladesh

1.2 Tobacco toxicity and Addiction

Tobacco toxicity

Mode of delivery: Word cloud game (Group activity)

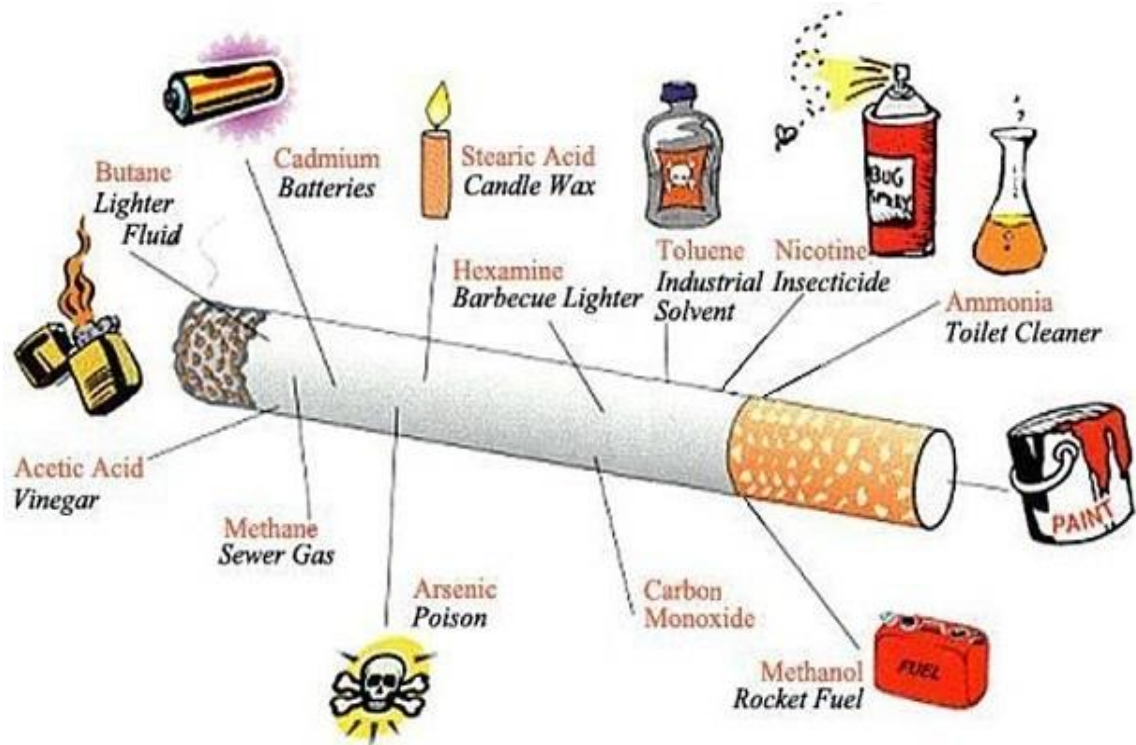
Learning type: Investigation & Collaboration

In this engaging sub-session, students will come together for an interactive group activity that encourages investigation and collaboration. They will explore the topic of the toxic components of tobacco.

Word cloud game: Groups will create a word cloud that visually represents the toxic elements of tobacco. Each group contributes keywords, and together they will form a comprehensive depiction of the topic. This collaborative activity will promote shared knowledge and exploration.

- **Tobacco** is a very toxic product.
- It is estimated that cigarettes contain at least **600 chemicals**, and once lit, produce a further **3000 to 4000 chemical compounds**.
- Of which, at least **250 are known to be harmful**, including ammonia, carbon monoxide, and hydrogen cyanide.
- Among the 250 known harmful chemicals in tobacco smoke, at least 69 can cause cancer. These cancer-causing chemicals include the following:

Acetaldehyde, Aromatic amines, 1,3-Butadiene (a hazardous gas), Arsenic, Benzene, Cadmium (a toxic metal), Chromium, Nickel, Formaldehyde, Polonium-210 (a radioactive chemical element), etc.



More than **30**   
in  **smokeless tobacco** are linked to **cancer**.

Source: NCI/CDC, *Smokeless Tobacco and Public Health: A Global Perspective*, 2014.

CENTER FOR TOBACCO PRODUCTS



Interactive component: Word cloud game (group activity) on tobacco toxicity

Instructions to follow:

Pre-lecture word cloud game:

- Before the facilitator's lecture on tobacco toxicity begins, divide the students into groups and provide each group with a tablet and access to Mentimeter.
- Explain to the students that they will be using Mentimeter on their tablets to create a word cloud representing the toxic components of tobacco.
- Instruct each group to log in to Mentimeter and access the word cloud feature on their tablets.
- Allocate a specified time frame (e.g., 2 minutes) for the groups to brainstorm and list down as many toxic components of tobacco as they can think of on their tablets.
- Once they have their list, each group enters their toxic components into Mentimeter to create a word cloud.

Post-lecture word cloud game:

- After the lecture, repeat the same process with the groups using Mentimeter on their tablets.
- This time, instruct the groups to create a new word cloud on Mentimeter based on the same question, incorporating any additions or revisions from the information learned during the lecture.
- Allocate time for the groups to complete their word clouds on Mentimeter accordingly.

Comparison:

- Facilitate a class discussion after both rounds of the Word Cloud Game.
- Encourage students to compare their pre-lecture and post-lecture word clouds displayed on Mentimeter.
- Discuss any differences or similarities observed between the two sets of word clouds.
- Highlight key concepts or toxic components that were added or emphasized after the lecture, indicating improved understanding or knowledge retention.

Tobacco addiction: nicotine and nicotine dependence

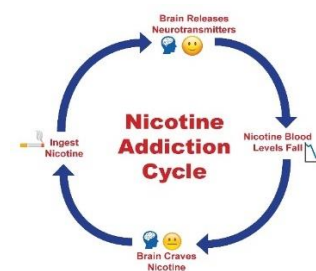
Mode of delivery: Lecture presentation.

Learning type: Acquisition

This part is dedicated to providing a comprehensive understanding of tobacco addiction, with a specific focus on nicotine and nicotine dependence. During the structured lecture, students will receive in-depth information about the role of nicotine in tobacco addiction, the physiological and psychological aspects of dependence, and the mechanisms through which nicotine affects the brain and behaviour. Visual aids, and relevant diagrams are included to enhance understanding.

The lecture aims to ensure students acquire a solid foundational knowledge of tobacco addiction, laying the groundwork for informed discussions and subsequent sessions. The facilitator will address the following questions here:

(i) Is tobacco really addictive? (ii) Who is most likely to become addicted? (iii) How does a tobacco user become an addict? (iv) Can the addict get rid of his addiction if he wants?



1.3 Health effects of tobacco use

Mode of delivery: Word cloud game, Video presentation, and Visual Displays

Learning type: Investigation, Collaboration, Discussion, Acquisition

This sub-session is designed to provide students with a holistic understanding of the health effects of tobacco use. To begin, the students will engage in a word cloud game where they contribute keywords and phrases related to the consequences of tobacco use. This interactive activity fosters investigation and collaboration as students collectively build a visual representation of the topic. Then, the facilitator will present a couple of informative videos illustrating the health consequences of tobacco consumption. Following this, the facilitator will dig into the specific ways tobacco can impact adolescents. The sub-session will feature personal testimonials and stories, presented through four short video case studies.

Interactive component: Word cloud game (group activity) on diseases related to tobacco use

Question: What diseases are related to tobacco use?

Pre-lecture word cloud game (Group activity)

Post-lecture word cloud game (Group activity)



Health effects of tobacco use

Tobacco can damage every part of the body

Cancers

Head or Neck

Lung

Leukemia

Stomach

Kidney

Pancreas

Colon

Bladder

Cervix

Chronic Diseases

Stroke

Blindness

Gum infection

Aortic rupture

Heart disease

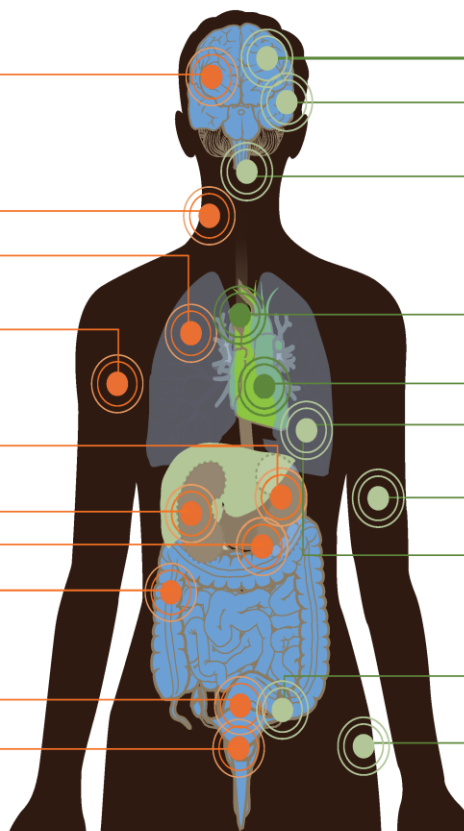
Pneumonia

Hardening of the arteries

Chronic lung disease
& asthma

Reduced fertility

Hip fracture



Interactive component: Video presentation on health effects of tobacco use

Video - 1: What damage will this cigarette do? This video highlights the fact that every cigarette consumed does damage to the smoker.



Link: <https://www.vitalstrategies.org/resources/bangladesh-tobacco-control-what-damage-will-this-cigarette-do/>

Case study – 1: A Bangladeshi lung cancer patient



Video: Health consequences of tobacco use – Lung Cancer.

Link: <https://www.vitalstrategies.org/resources/bangladesh-people-behind-the-packs-lung-cancer/>

Case study – 2: A Bangladeshi oral cancer patient



Video: Health consequences of smokeless tobacco use – Oral Cancer.

Link: <https://www.vitalstrategies.org/resources/bangladesh-people-behind-the-packs-oral-cancer/>

Case study – 3:



Video: Health consequences of tobacco use – Brain damage. This video is originally created in Australia. It was tailored to run the anti-tobacco campaign in Bangladesh, highlighting new graphic health warnings on tobacco products.

Link: <https://www.vitalstrategies.org/resources/bangladesh-brain-2015/>

1.5 Tobacco use & Religion

Mode of delivery: Lecture

Learning type: Acquisition

This sub-session will dive into the relationship between tobacco use and religious beliefs. Students will engage in a group discussion to explore and understand the varying perspectives and teachings of different religions (Islam and Hinduism) regarding tobacco consumption. The facilitator will guide the discussion, encouraging Students to share their insights, ask questions, and express their understanding of how their faith or religious beliefs intersect with the use of tobacco. By actively participating in this discussion, Students acquire a deeper comprehension of the religious dimensions of tobacco use.

Question: Is tobacco consumption “Haram” (forbidden) in Islam?

- A = Yes
- B = No

There are two types of food for Muslims. Halal and Haram. There is nothing outside of it.

Do you think cigarettes, bidis, tobacco are these holy and good things?

Of course, tobacco is bad, impure, harmful, smelly and dirty.

In the eyes of Islam, consuming **any kind of bad and harmful substance** is **forbidden (Haram)**.

Allah says in the Holy Qur'an –

“They ask you, ‘O Prophet’, what is permissible for them ‘to eat’. Say, “All good (holy) things have been made lawful for you.” (5/Surah Al Mayidah: 4)

Another verse says, “... He (Allah) makes lawful for you what is good (and pure) and prohibits what is bad (impure) and harmful, ...”

(7/Surah Al Araf: 157)

Allah has prohibited evil things with the above verses.

From the Hadith

The Prophet (peace be upon him) said,

1. “Whoever **commits suicide by consuming poison**, he will lick the **fire of hell** for eternity. There he will remain forever.” (Sahih Muslim)

Everybody agrees that tobacco is poisonous and harmful, and it is also written on the tobacco packets.

2. “Your body has rights over you; Do not harm yourself, and do not harm others.” (Musnad Ahmad, Ibn Majah).

3. “He who believes in Allah and the Hereafter should not cause trouble to his neighbour.” (Sahih Bukhari)

A smoker causes trouble to his family, friends and people around him by his smoking.

Session 2: Kick the habit: Smart decision and strong skills for a healthy lifestyle

Learning outcomes

The learning outcomes of this session are as follows:

1. Analysing factors influencing tobacco use behaviour: Students will gain the ability to identify and critically analyse factors influencing tobacco use behaviour.
2. Informed decision-making: Students will be better equipped to make informed decisions regarding tobacco use, taking into account addiction, health consequences, legal considerations, and personal beliefs.
3. Developing resistance skills: Students will develop a range of essential life skills, including assertiveness, refusal skills, self-awareness, empathy, effective communication (verbal and non-verbal), expression of feelings and ideas, group work and team building.
4. Exploring healthy alternatives: Students will explore and identify positive and healthy alternatives to tobacco use.

These learning outcomes are designed to empower Students with the knowledge, skills, and strategies necessary to resist tobacco use, set and achieve goals related to tobacco cessation, and navigate social situations where tobacco pressure may exist. Additionally, they promote a holistic approach to preventing and managing tobacco use behaviour, considering individual, interpersonal, and environmental factors.

2.1 Reasons why people use tobacco (direct tobacco use & indirect tobacco use)

Mode of delivery: Opinion and Group discussion.

Learning type: Discussion & Acquisition

In this sub-session, Students will explore the various reasons why people use tobacco, both through direct use and exposure to Environmental Tobacco Smoke (ETS). It will begin with an opinion-sharing segment, where Students are encouraged to express their initial thoughts and opinions on this topic.

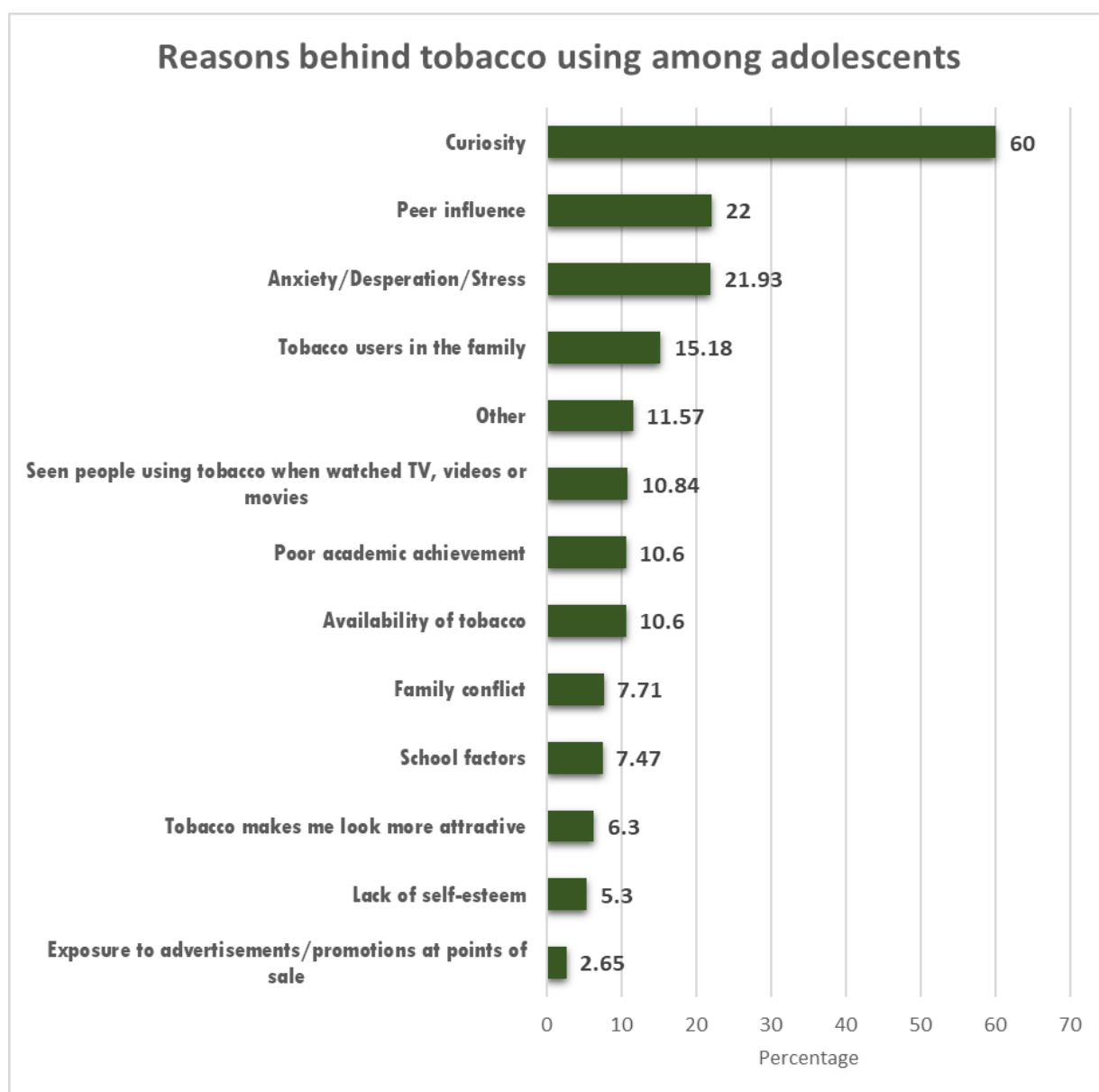
Following the opinion-sharing phase, the sub-session will transition into a group discussion format. Students will be divided into groups, and each group is tasked with discussing specific aspects related to tobacco use. They will collaboratively explore the reasons behind direct and indirect tobacco use,

sharing their insights and observations. At the end, the facilitator will bust some common myths related to adolescents' tobacco use.

During these discussions, Students not only acquire knowledge about the factors that lead to tobacco use but also engage in meaningful dialogue that encourages critical thinking and acquisition of a deeper understanding of the topic.

Example:

The 2022 school-based survey on tobacco and health in Dhaka, Bangladesh identified the following reasons behind adolescents' tobacco use:



Common myths surrounding tobacco initiation



Question 1: Is tobacco use considered Cool?

Tobacco is not cool

Tobacco use or smoking doesn't make you look cool and attractive. If you think it's cool — it's a shame about the terrible health consequences



Question 2: Is tobacco use a sign of confidence?

No.

Tobacco use is not a sign of confidence.

Confident people who are sure of themselves have no trouble saying no to tobacco.

Saying no shows greater confidence.



Question 3: Does tobacco use make you popular?

No.

If people are your friends because you use tobacco, then ask yourself

“Are they real friends?”

Real friends are not friends because you use tobacco.

Tobacco use can ruin your health and appearance. Real friends wouldn't want that for you.

Question 4: Can tobacco use manage depression, anxiety, and stress?

No.

People with mental health problems who smoke / use tobacco experience increased psychiatric symptoms.

It increases levels of depression, anxiety and stress, and decrease the mood quality.



2.2 Decision making & problem-solving skills to resist tobacco: assertiveness and refusal skills

Mode of delivery: Discussion, Role playing (Individual & Group)

Learning type: Acquisition & Practice

This comprehensive sub-session will address various aspects, including understanding the different types of pressure to use tobacco, developing the skills to resist such pressures, and enhancing decision-making and problem-solving abilities.

It will begin with a discussion where students can share their experiences, thoughts, and concerns regarding peer pressure and decision-making. Then the students engage in both individual and group role-playing scenarios to simulate situations involving peer pressure, the application of resistance skills, and decision-making and problem-solving.

Decision making skill

Decision-making skill is essential for making informed and effective choices. This skill involves evaluating situations, considering various options, and selecting the best course of action. By improving decision-making abilities, students can navigate complex situations with confidence and clarity. In this regard, they will learn 3C's of decision-making.

“3Cs” of decision making

The “3Cs” of Decision Making is a structured approach designed to enhance the decision-making skills of school adolescents. This method encourages students to:

1. **Think Clearly:** Evaluate the situation and consider all available choices. This step involves gathering relevant information, analysing the context, and understanding the potential outcomes of each option.
2. **Choose Wisely:** Select the best possible option based on the analysis. This involves weighing the pros and cons, considering the long-term implications, and making a choice that aligns with your values and goals.
3. **Convey Confidently:** Communicate the decision with confidence. This step emphasises the importance of articulating the decision clearly and assertively, ensuring that the rationale behind the choice is understood and respected by others.

By following these steps, students can develop a systematic approach to making informed and confident decisions, which is important for their personal and academic growth.

Problem-solving skills

Problem-solving skills are essential for navigating challenges and making effective decisions. These skills involve identifying issues, generating potential solutions, and implementing the best course of action. By developing strong problem-solving abilities, students can approach obstacles with confidence and creativity. In this regard, students will learn about the assertiveness and refusal skills.

Assertiveness

Assertiveness is the ability to express one's thoughts, feelings, and beliefs in a clear, honest, and respectful manner, while considering the rights and feelings of others. It is an important skill for effective communication and problem-solving.

Key components of assertiveness

1. **Clear Communication:** Expressing thoughts and feelings clearly and directly.
2. **Confidence:** Believing in the validity of one's opinions and rights.
3. **Respect:** Valuing the rights and opinions of others.
4. **Active Listening:** Paying full attention and understanding the perspective of others.

By developing assertiveness, students can navigate social interactions more effectively, ensuring their voices are heard while maintaining respectful relationships.

Refusal skill

Refusal skills involve the ability to say 'NO' in a firm and respectful way when faced with pressure or temptation to engage in undesirable behaviours, such as tobacco use. This skill is essential for maintaining personal integrity and making healthy choices.

Key components of refusal skill

1. **Saying "NO":** Directly stating the refusal without ambiguity.
2. **Reasoning:** Providing a brief, logical reason for the refusal.

3. **Alternatives:** Offering an alternative or suggesting a different activity.
4. **Positive Tone:** Maintaining a respectful and positive tone during refusal.
5. **Body Language:** Non-verbal cues, such as maintaining eye contact and using confident body language, can reinforce the refusal message.

By acquiring refusal skill, students can confidently resist peer pressure and make decisions that align with their values and well-being.

Interactive component

Situational role playing to demonstrate skills (individual and group)

Problem scenario: A friend offers a cigarette / a tobacco product.

How will you utilise your Assertive and Refusal skills to solve this problem?

Assertive response:

1. "Thank you for the offer, but I have made a commitment to myself to stay tobacco-free. I hope you understand."
2. "I choose not to use tobacco because it's harmful to my health."
3. "I feel uncomfortable when people smoke around me."

Refusal skill response:

1. "No, I don't smoke / I don't use tobacco."
2. "No, I don't smoke, thanks."
3. "No, I don't smoke. I prefer to focus on my health and well-being. Let's do something else. How about we go for a walk instead?"

2.3 Discover positive and healthy alternatives to using tobacco.

Mode of delivery: Group discussion & Word cloud game (Group activity)

Learning type: Investigation, Collaboration, Production

This sub-session will encourage the students to explore positive and healthy alternatives to using tobacco.

At first, students will engage in group work where they investigate and discuss various positive alternatives to tobacco use. They collaboratively explore and share ideas, fostering an environment of creative thinking and brainstorming. This approach encourages investigation, collaboration, and discussion.

Interactive component

Word cloud game (group activity) on alternatives to tobacco use

Example (Prompts for facilitator):

Possible healthier alternatives to tobacco: 1. Promote sports and physical activity; 2. Hobbies and creative outlets; 3. Stress management techniques; 4. Supportive social activities; 5. Academic or career goals; 6. Healthy eating; 7. Peer support; 8. Professional support; 9. Engage in community initiatives; 10. Positive role models

Session 3: Mind matters: Navigating emotions and setting goals for a tobacco-free future

Learning outcomes

The learning outcomes of this session are as follows:

1. Understanding mental well-being: Students will gain an understanding of what mental well-being is, its significance, and how it relates to tobacco use prevention.
2. Emotional resilience: Students will develop skills to build emotional resilience, cope with stress, and manage emotions without turning to tobacco use.
3. Goal setting and behaviour change: Students will be able to set clear and achievable goals related to tobacco use behaviour, whether it is becoming a tobacco non-user or achieving tobacco cessation.
4. Commitment to tobacco-free living: Students will reinforce their commitment to a tobacco-free lifestyle and how it will contribute to their well-being.

These learning outcomes will empower students to not only maintain their own tobacco-free lifestyle but also become advocates for tobacco use prevention and mental well-being in their communities.

3.1 Links between tobacco and mental health

Mode of delivery: Lecture / Educational videos and documentaries

Learning type: Acquisition

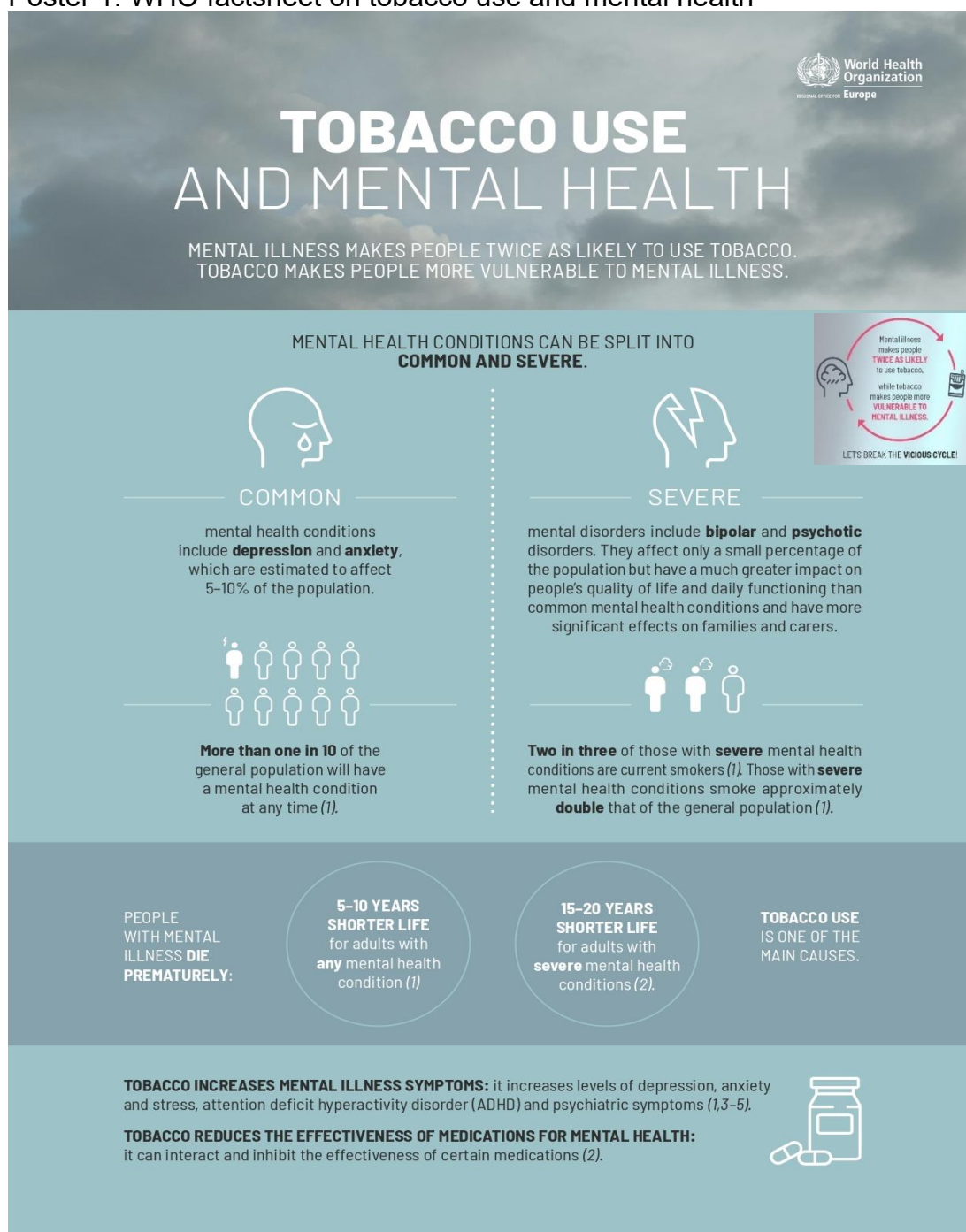
This sub-session is focused on providing students with essential knowledge about the connections between tobacco use and mental health. A brief lecture will be delivered to provide students with structured information about the links between tobacco use and mental health. Furthermore, to enhance understanding and engagement, educational posters related to the links

between tobacco use and mental health will be shown. These visual aids will provide real-life examples and insights, complementing the lecture content.

Links between tobacco and mental health

The relationship between tobacco use and mental health is complex and multifaceted. Research has shown that individuals with mental health conditions are more likely to use tobacco, and tobacco use can, in turn, exacerbate mental health issues.

Poster 1: WHO factsheet on tobacco use and mental health



Key points

1. Increased prevalence: People with mental health conditions, such as depression, anxiety, and schizophrenia, are more likely to smoke compared to the general population. This higher prevalence is often due to the temporary relief from stress and anxiety that nicotine provides.

2. Negative impact on mental health: While nicotine may offer short-term relief, long-term tobacco use can worsen mental health symptoms. Smoking is associated with increased levels of depression, anxiety, and stress.

3. Cycle of dependence: There is a feedback loop between tobacco use and mental health. Mental health conditions can lead to increased tobacco use, and tobacco use can make individuals more vulnerable to developing or worsening mental health issues.

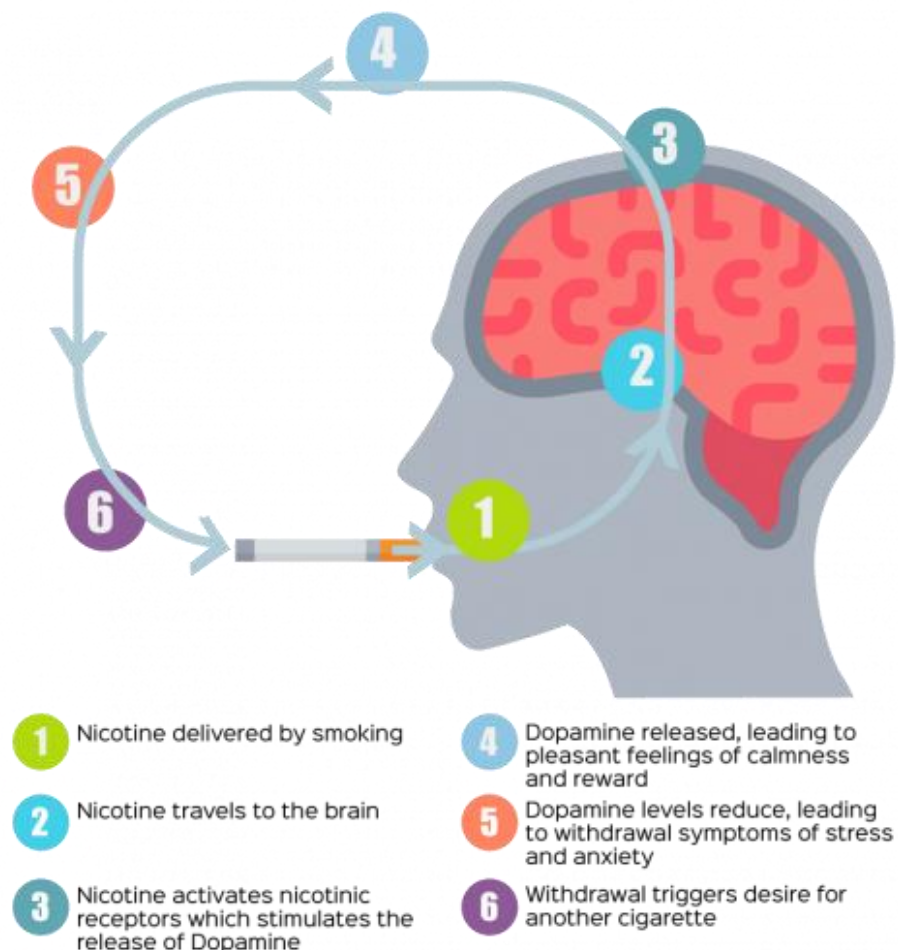


Figure: Vicious cycle of tobacco use and mental health issues.

3.2 Coping with emotions: expression of negative feelings, dealing with stress, depression and anxiety

Mode of delivery: Group discussion, Art and creative expression & Practice exercises

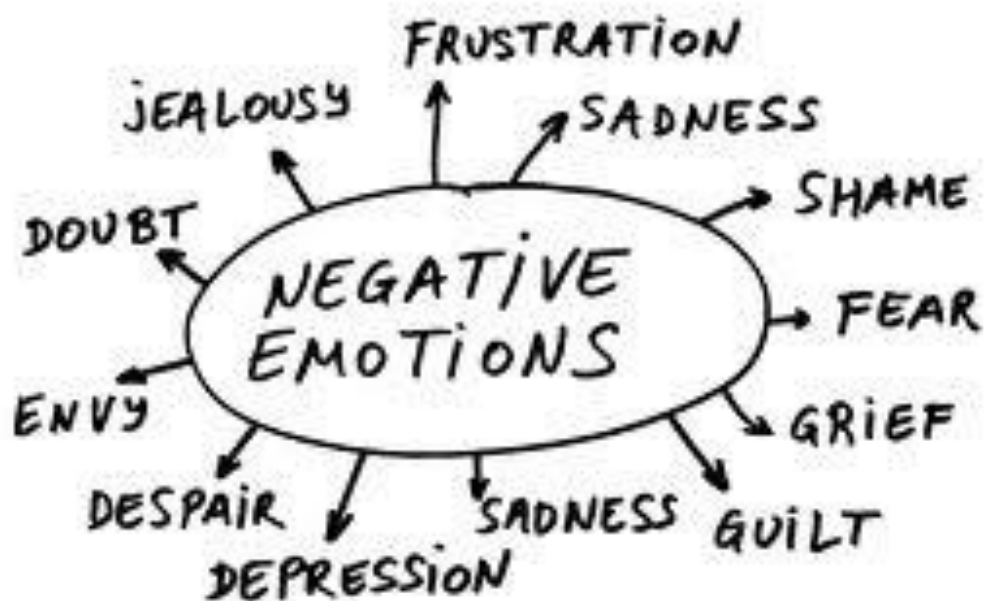
Learning type: Acquisition & Practice

This sub-section will address the critical topic of coping with emotions and mental illness, specifically focusing on the expression of negative feelings and dealing with challenges. It will begin with a group discussion where students will have the opportunity to openly discuss their emotions, experiences with stress, depression and anxiety, as well as the situations that may lead to these conditions, and strategies for coping with mental health challenges. Students will be encouraged for creative expression through art, music, or writing. Expressing emotions through creative outlets can be therapeutic and provide an alternative way to communicate feelings. At the end of this session, relaxation deep breathing exercises will be performed in the classroom to help students manage their everyday life stressors, negative emotions, stress, depression and anxiety.

Coping with emotions

Coping with emotions is a vital skill for maintaining mental health and well-being. This involves recognising and expressing negative feelings in a healthy way, as well as effectively managing stress, depression, and anxiety.

Expressing negative feelings is important for emotional health. Suppressing emotions can lead to increased stress and mental health issues.



Dealing with negative emotions, stress, depression and anxiety

1. Understand and **identify what upsets you** and makes you not want to express your feelings.
2. Make practicing **Mindfulness through Meditation, Yoga, or Breathing exercises** a habit.
3. Avoid unhealthy **behaviours (Say NO to Tobacco)** and **lifestyles**.
4. Don't worry about saying things perfectly the first time – **practice makes perfect**.
5. Let your **body language** help you convey your emotions.
6. **Try a new hobby** to help yourself be more expressive, especially something **creative**.
7. **Express your happy feelings too**, not just the hard ones.
8. Involve in regular **Sports and Physical Activity**.
9. **Limit distractions** like cell phones or music when you're sharing your feelings.
10. **Be patient, Forgiving and Respectful** with others as they learn to respond to your feelings.

Positive Emotions Beyond Happiness



Interactive component: Deep breathing exercise

Deep breathing exercise

Deep breathing exercise is an effective technique for managing negative emotions, stress, depression and anxiety promoting relaxation, enhancing focus and improving overall well-being. Before starting the deep breathing exercise, instruct students to maintain the following procedures:

Procedures of deep breathing exercise

1. Relaxation environment: Begin by creating a calm and quiet environment. Dim the lights, if possible, and ensure that you are sitting comfortably.
2. Comfortable posture: Upright posture with feet flat on the floor and hands resting on your laps.
3. Diaphragmatic breathing: Known as belly breathing. This technique involves deep, slow breaths that engage the diaphragm.
4. Mindful focus: Focus your attention on your breath as you inhale and exhale. It's normal for the mind to wander, but gently guide it back to the breath.
5. Repeat as needed: Deep breathing can be practiced as often as needed, especially during moments of stress or when you feel overwhelmed.
6. Steps for deep breathing
 - a. Inhale slowly through the nose for a count of 5 seconds.
 - b. Hold the breath for a count of 5 seconds.
 - c. Exhale slowly and completely through the mouth for a count of 6-8 seconds.
 - d. Pause briefly at the end of the exhale.

By following these steps, students will be ready to fully participate in the deep breathing exercise.

3.3 Goal setting and personal commitment (pledge) not to use tobacco

Mode of delivery: Open discussion, Written pledges, & Creative artwork

Learning type: Discussion, Investigation, & Production

This sub-session is dedicated to the practical aspect of setting and achieving goals related to:

- A. For never tobacco users: Being tobacco non-user for ever.
(This goal is suitable for individuals who have never initiated tobacco use. It emphasizes the importance of maintaining a tobacco-free lifestyle.)
- B. For ever tobacco users: Keep tobacco non-user status and never start tobacco use again in future.
(This goal addresses individuals who have quit tobacco and focuses on maintaining their non-user status to prevent relapse.)
- C. For current tobacco users: Stop tobacco now / Tobacco cessation, keep abstain from tobacco use and never start tobacco again in future.
(This goal targets current tobacco users and is comprehensive in its approach, covering cessation and relapse prevention.)

Goal setting

Effective goal setting involves creating specific, measurable, attainable, relevant, and time-based (SMART) goals. This structured approach helps students stay focused and motivated.

1. **Specific:** Clearly define the goal. For example, “I will not use tobacco products.”
2. **Measurable:** Establish criteria to track progress. For instance, “I will track my tobacco-free days on a calendar.”
3. **Attainable:** Ensure the goal is realistic. “I will seek support from friends and family to help me stay tobacco-free.”
4. **Relevant:** Align the goal with personal values and long-term health benefits. “Staying tobacco-free will improve my overall health and well-being.”
5. **Time-based:** Set a timeline for achieving the goal. “I will remain tobacco-free for the next six months and beyond.”

Personal commitment (pledge) not to use tobacco

Making a personal commitment or pledge reinforces the decision to avoid tobacco use. This pledge serves as a constant reminder of the student's dedication to their health.

Steps for making a personal commitment

1. Write it down: Encourage students to write down their pledge to stay tobacco-free. This can be a powerful affirmation of their commitment.
2. Share with others: Sharing the pledge with friends, family, or a support group can provide additional motivation and accountability.
3. Visual reminders: Suggest creating visual reminders, such as posters or notes, to keep the pledge visible and top of mind.
4. Celebrate milestones: Recognise and celebrate milestones along the way, such as one week, one month, or six months tobacco-free.

By setting clear goals and making a personal commitment, students can take proactive steps towards a healthier, tobacco-free future.

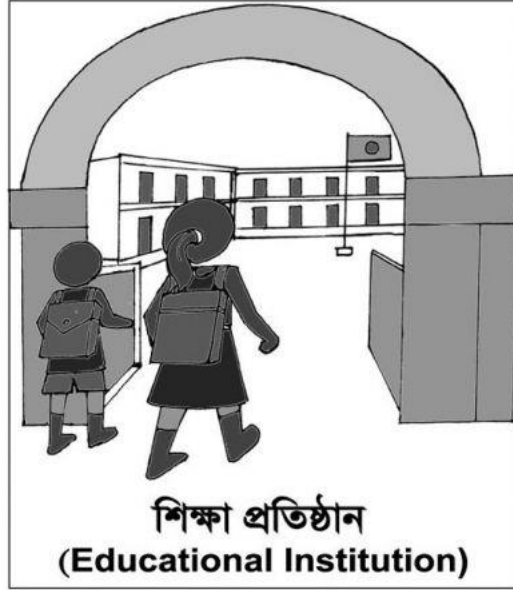
Interactive component: Creative artwork

Show your creativity and win the prize!

Theme title: “UCL – IATIP: Prevent Tobacco, Promote Health and Well-being”



ধূমপানমুক্ত বাংলাদেশ



ধূমপান হইতে বিরত থাকুন
ইহা শাস্তিযোগ্য অপরাধ

Abstain from Smoking, it is a Punishable Offence

জাতীয় তামাক নিয়ন্ত্রণ সেল
স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়

শিক্ষা প্রতিষ্ঠান ১০০% ধূমপানমুক্ত

Poster: Tobacco free educational institution

Appendix 6

Appendix 6.1: IATIP questionnaire

Title of study

Intervention for Adolescent Tobacco Initiation Prevention to Promote Health and Well-being

UCL Research Ethics Committee Approval ID Number: 22645/004
JU Biosafety, Biosecurity & Ethical Committee Approval ID Number:
BBEC, JU/M 2024/ 02 (82)

Baseline Questionnaire – v1.5

Instructions

- Please read each question carefully before answering it.
- Choose the answer that best describes what you believe and feel to be correct.
- Some of the questions will ask about your knowledge, attitudes, and beliefs about using tobacco products.
- Other questions may ask about smoking tobacco in general that includes cigarettes and other types of smoked tobacco products (e.g., Pipes, Cigars, Waterpipes/hookah/shisha, Bidis).
- Other questions may ask about using smokeless tobacco (e.g., Snuff, Chewing tobacco–zarda with pan, tobacco leaf, gul, panmasala–Betel quid with tobacco, Gutka), which is tobacco that is not smoked, but is sniffed through the nose, held in the mouth, or chewed.
- Some of the questions will test your skills for a healthy lifestyle.
- Finally, other questions may ask about your mental health and well-being.

Identification

SL	Question	Response options
ID1	School code	
ID2	Student year	
ID3	Student section	
ID4	Student class roll number	
ID5	Initials of the student's name	

Section A: Demographic information[#]

The following questions ask for some background information about yourself.

SL	Question	Response options
A1	How old are you now?	in years
A2	What is your sex?	0 = Female 1 = Male
A3	What is your religion?	0 = No religious belief 1 = Islam 2 = Hinduism 3 = Buddhism 4 = Christianity
A4	How many siblings do you have?	 (in number)
A5	What is the highest level of education of your mother?	0 = No formal education 1 = School level 2 = University level
A6	What is the highest level of education of your Father?	0 = No formal education 1 = School level 2 = University level
A7	During an average week, how much money do you have that you can spend on yourself, however you want? (in Taka)	Taka
A8	What is the current status of your housing tenure/ living accommodation?	1 = Hostel 2 = Rented house with parents 3 = Owned property with parents 0 = Other (Please specify.....)
A9	Do any of the people you are connected with smoke cigarettes? (Tick all that apply)	0 = None/Don't know 1 = Family in your household 2 = Family not in household 3 = Friends 4 = School teachers
A10	Do any of the people you are connected with use smokeless tobacco products? (Tick all that apply)	0 = None/Don't know 1 = Family in your household 2 = Family not in household 3 = Friends 4 = School teachers

[#]This section was excluded from the follow-up questionnaire.

Section B: Information about exposure to second-hand tobacco smoke, intention-to use tobacco and tobacco use behaviour.

The following questions ask about your exposure to other people's smoking, susceptibility to tobacco and your own tobacco use behaviour.

SL	Question	Response options
Exposure to second-hand tobacco smoke		
B1	During the past 7 days, on how many days has anyone smoked inside your home, in your presence?	0 = 0 days 1 = 1 or 2 days 2 = 3 to 4 days 3 = 5 to 6 days 4 = 7 days
B2	During the past 7 days, on how many days has anyone smoked in your presence, inside any enclosed public place, other than your home (such as: school, shops, restaurants, shopping malls, movie theatres, any office, inside bus, inside train)?	0 = 0 days 1 = 1 or 2 days 2 = 3 to 4 days 3 = 5 to 6 days 4 = 7 days
B3	During the past 7 days, on how many days has anyone smoked in your presence, at any outdoor public place (such as: playgrounds, sidewalks, entrance to buildings, parks, beaches, bus terminal, railway station)?	0 = 0 days 1 = 1 or 2 days 2 = 3 to 4 days 3 = 5 to 6 days 4 = 7 days
Intention to use tobacco		
B4	If someone (cousin/friend/close relative) offers you a tobacco product, would you use it?	0 = Definitely not 1 = Probably not 2 = Probably yes 3 = Definitely yes
B5	At any time during the next 12 months, do you think you will use any form of tobacco?	0 = Definitely not 1 = Probably not 2 = Probably yes 3 = Definitely yes
Tobacco use behaviour		
B6	Have you ever tried or experimented with cigarette smoking?	0 = No 1 = Yes
B7	During the past 30 days, on how many days did you smoke cigarettes?	0 = 0 days 1 = 1 or 2 days 2 = 3 to 5 days 3 = 6 to 9 days 4 = 10 to 19 days 5 = 20 to 29 days 6 = All 30 days
B8	Have you ever tried or experimented with any form of smoked tobacco products other	0 = No 1 = Yes

	than cigarettes (pipes, cigars, waterpipes, hookah, shisha, bidis)?	
B9	During the past 30 days, on how many days did you use any form of smoked tobacco products other than cigarettes (e.g., pipes, cigars, waterpipes, hookah, shisha, bidis)?	0 = 0 days 1 = 1 or 2 days 2 = 3 to 5 days 3 = 6 to 9 days 4 = 10 to 19 days 5 = 20 to 29 days 6 = All 30 days
B10	Have you ever tried or experimented with any form of smokeless tobacco products (zorda with pan, tobacco leaf, gul, khaini, panmasala)?	0 = No 1 = Yes
B11	During the past 30 days, on how many days did you use smokeless tobacco?	0 = 0 days 1 = 1 or 2 days 2 = 3 to 5 days 3 = 6 to 9 days 4 = 10 to 19 days 5 = 20 to 29 days 6 = All 30 days
B12	Would you please let us know about your motivation toward stopping tobacco use? (Please select the best option for you from the list)	0 = Not applicable 1 = I don't want to stop tobacco use 2 = I think I should stop tobacco use but don't really want to 3 = I want to stop tobacco use but haven't thought about when 4 = I REALLY want to stop tobacco use but I don't know when I will 5 = I want to stop tobacco use and hope soon 6 = I REALLY want to stop tobacco use and intend to in the next 3 months 7 = I REALLY want to stop tobacco use and intend to in the next month
B13 [†]	During the past 12 months, have you ever try to stop tobacco use?	0 = No 1 = Yes 2 = Not applicable

[†]This question was modified for the follow-up assessment as follows: During the past month, have you tried to stop tobacco use?

Section C: Knowledge, attitudes and beliefs about tobacco and health.

The following questions ask about your knowledge, attitudes and beliefs about using tobacco.

SL	Question	Response options
Items of Knowledge		
Harm related		
C1	How much do you think people harm themselves when they use tobacco? (Absolute harm perception)	0 = Don't know 1 = No harm 2 = Very little harm 3 = Some harm 4 = A lot of harm
C2	In your opinion, do you think that smokeless tobacco products are less harmful, about the same, or more harmful to a person's health than smoking tobacco products? (Relative harm perception)	0 = Don't know 1 = Less harmful 2 = Same harmful 3 = More harmful
C3	Which of the following are harmful components of tobacco products? (Tick all that apply)	0 = None/Don't know 1 = Nicotine 2 = Tar 3 = Carbon monoxide 4 = Hydrogen cyanide 5 = Cadmium
C4	Is 'Nicotine' the main substance in tobacco that makes people want to use tobacco products?	0 = Don't know 1 = Definitely yes 2 = Probably yes 3 = Probably not 4 = Definitely not
C5	Is 'Nicotine' the chemical that causes most of the cancer caused by tobacco use?	0 = Don't know 1 = Definitely yes 2 = Probably yes 3 = Probably not 4 = Definitely not
C6	Is a pregnant woman's tobacco use harmful to her baby?	0 = Don't know 1 = Definitely yes 2 = Probably yes 3 = Probably not 4 = Definitely not
Disease related		
C7	Which of the following diseases are caused by tobacco use? (Tick all that apply)	0 = None/Don't know 1 = Cold 2 = Chronic obstructive pulmonary disease 3 = Lung cancer 4 = Diabetes 5 = Heart disease 6 = Hypertension 7 = Stroke 8 = Bladder cancer 9 = Tuberculosis 10 = Skin problems

C8. Attitudes Toward Tobacco and Health

What do you think about the following statements:

		1 = Extremely disagree	2 = Disagree	3 = Unclear	4 = Agree	5 = Extremely agree
Effects of tobacco						
a	Tobacco can relieve fatigue, stress and improve study efficiency					
b	The feeling of tobacco use after meals is just like being a happy spirit					
c	All types of tobacco are very harmful to health					
d	We should try to increase job positions by developing tobacco industry					
Smoking image						
e	A man without smoking is not a real man					
f	It is a fashion for young boys and girls to smoke					
g	A brave youth should try the feeling of smoking					
h	Smoking is a symbol of maturation and independence					
Tobacco's role in social contact						
i	It is impolite to refuse the tobacco passed by others					
j	It is easy to get close relationship by passing tobacco each other					
k	Parents should not use tobacco in front of children					
l	It is uncivil to use tobacco (e.g., cigarette smoking) in public places					
Tobacco control measures						
m	Smoking should be banned in public places					
n	All the tobacco advertisements should be prohibited					
o	Tobacco sales to minors should be banned					
p	No one should be allowed to use tobacco in school area					

Beliefs about Tobacco and Health

C9. How likely is that each of the following will happen to you if you use tobacco in the next month? (Mark the answer that is closest to your opinion).					
		1=Very Likely	2=Likely	3=Unlikely	4=Very Unlikely
a	Get into trouble with parents				
b	Have problems with my friends				
c	Become an addict				
d	Have money problems				
e	Feel more relaxed				
f	Have more fun				
g	Be more popular				
h	Be more confident and outgoing				

C10. Once someone has started using tobacco, do you think it would be difficult for them to quit?

0 = Definitely not

1 = Probably not

2 = Probably yes

3 = Definitely yes

Section D: Skills for a Tobacco Free Healthy Lifestyle

D1. Decision making skills

There are several possible ways to take decisions. How well do the following apply to you? Mark the answer that is closest to your opinion.

		1=Strongly Agree	2=Agree	3=Disagree	4=Strongly Disagree
a	When I have decided to do something, I always carry it through				
b	I often make up my mind without thinking of the consequences				
c	I weigh up all the choices before I decide on something				
d	I often regret something that I had decided				
e	When I decide on something it doesn't				

	matter what my friends think				

D2. Refusal skills

Imagine yourself in each of the following situations. Some of them may be very familiar to you, some others less, so that you may feel less secure in answering. It is enough you do your best. Mark the answer that is closest to your opinion.

		1=Very Likely	2=Likely	3=Unlikely	4=Very Unlikely
a	You and your best friend are at a party where you meet new people, and you feel you really want to get to know them. Someone offers you to use tobacco (e.g., cigarette smoking) together. Your friend accepts. Do you?				
b	You and the same friend are studying hard for an important test at school the day after. Both of you feel stressed and need to calm down. Your friend suggests a cigarette would help and offers one. Do you accept?				
c	The day after, you both pass the test, and feel now it is time to celebrate. Have still some pocket-money lefts, and the liquor store is nearby. Would you buy some tobacco (e.g., cigarette) to celebrate?				

D3. Self-esteem

How much do you agree with the following descriptions of yourself? Mark the answer that is closest to your opinion.

		1=Strongly Agree	2=Agree	3=Disagree	4=Strongly Disagree
a	I feel that I have a number of good qualities				
b	I am able to do things as well as most other people				
c	At times I think I am no good at all				

d	Most boys and girls of my age are smarter than I am				
e	I am quite good at sports				
f	I feel very embarrassed when I have to say something in class				
g	My being happy is important to my parents				
h	I worry a lot about silly things				
i	I often feel nervous over nothing at all				
j	I have plenty of interests and hobbies				

D4. Problem solving skills

Here are some statements about dealing with other people. Mark the answer that is closest to your opinion.

		1=Strongly Agree	2=Agree	3=Disagree	4=Strongly Disagree
a	When someone tries to make you feel small, you should do the same to them				
b	There is point in letting people know you're angry with them				
c	The only way to deal with bullies is to let them know who is in charge				
d	There are always ways of dealing with problems without having to fight				
e	It is much better to 'fly off the handle' than to explain things calmly				

D5. Assertiveness

Imagine you would like to do the following things. How easy or difficult would you find it? Mark one box for each line.

		1=Very Easy	2=Easy	3=Difficult	4=Very Difficult
a	Say something nice to a friend				
b	Ask for a favour				
c	Show someone that I like him/her				
d	Say "no" when someone asks me to do something I do not want to				
e	Call for help when I have got problems				
f	Help someone who needs help				

Section E: Information about mental health and wellbeing

The following questions ask about your mental health and wellbeing.

E1. How do you describe your general state of health now? Or, In general, would you say your physical health is:

- 1 = Very good
- 2 = Good
- 3 = Moderate (in between good and poor)
- 4 = Poor
- 5 = Very poor

E2. Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS)

	Below are some statements about your feelings and thoughts over the last 2 weeks	None of the time (1)	Rarely (2)	Some of the time (3)	Often (4)	All of the time (5)
E2.1	I've been feeling optimistic about the future					
E.2	I've been feeling useful					
E2.3	I've been feeling relaxed					
E2.4	I've been dealing with problems well					
E2.5	I've been thinking clearly					
E2.6	I've been feeling close to other people					
E2.7	I've been able to make up my own mind about things					

E3. Perceived stress scale (PSS10). The questions in this scale ask you about your feelings and thoughts during the last month.

	In the last month. how often...	Never (0)	Almost never (1)	Sometimes (2)	Fairly often (3)	Very often (4)
E3.1	have you been upset because of something that happened unexpectedly?					
E3.2	have you felt that you were unable to control the important things in your life?					
E3.3	have you felt nervous and “stressed”?					
E3.4	have you felt confident about your ability to handle your personal problems?					
E3.5	have you felt that things were going your way?					
E3.6	have you found that you could not cope with all the things that you had to do?					
E3.7	have you been able to control irritations in your life?					
E3.8	have you felt that you were on top of things?					
E3.9	have you been angered because of things that were outside of your control?					
E3.10	have you felt difficulties were piling up so high that you could not overcome them?					

E4. Anxiety & E5. Depression assessment

E4	Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all (0)	Several days (1)	More than half the days (2)	Nearly every day (3)
E4.1	Feeling nervous, anxious				
E4.2	Not being able to sleep or control worrying?				
E4.3	Worrying too much about different things?				
E4.4	Trouble relaxing?				
E4.5	Being so restless that it is hard to sit still?				
E4.6	Becoming easily annoyed or irritable?				
E4.7	Feeling afraid as if something awful might happen?				
E5.1	Little interest or pleasure in doing things?				
E5.2	Feeling down, depressed, or hopeless?				
E5.3	Trouble falling or staying asleep, or sleeping too much?				
E5.4	Feeling tired or having little energy?				
E5.5	Poor appetite or overeating?				
E5.6	Feeling bad about yourself - or that you are a failure or have let yourself or your family down?				
E5.7	Trouble concentrating on things, such as reading the newspaper or watching television?				
E5.8	Moving or speaking so slowly that other people could have noticed? Or, the opposite - being so fidgety or restless that you have been moving around a lot more than usual?				
E5.9	Thoughts that you would be better off dead, or of hurting yourself in some way?				

End the questionnaire
Thank you very much

Appendix 6.2: Ethics approval letters for the IATIP trial

A. Local ethics approval letter for the IATIP trial from Jahangirnagar University

**Chairman
Biosafety, Biosecurity & Ethical
Committee
Faculty of Biological Sciences**



**Jahangirnagar University
Savar, Dhaka-1342, Bangladesh
Tel: [REDACTED]
Fax: [REDACTED]
Email: [REDACTED]**

Ref No: BBEC, JU/M 2024/ 02 (82)

Date: 08-02-2024

Certificate of Ethical Clearance

This is to certify that the project titled “**Intervention for adolescent tobacco initiation prevention and promotion of mental health (IATIP-PMH): a pilot cluster randomized controlled trial in Dhaka, Bangladesh**” has been reviewed and approved by the Biosafety, Biosecurity and Ethical Committee of Jahangirnagar University.

Project Information

Name of Project : **Intervention for adolescent tobacco initiation prevention and promotion of mental health (IATIP-PMH): a pilot cluster randomized controlled trial in Dhaka, Bangladesh**

Name of the Applicant : Sahadat Hossain, Assistant Professor

Designation of Supervisor : Professor Lion Shahab at UCL, UK

Contact address of Applicant : Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh

Telephone/Mobile No : [REDACTED]

Email : [REDACTED]

Research Information

Sample/Subject : Human

Subject description : NA

Age : 13-17 Years

Gender : All gender

Number : 1300

Problems : NA

Number of days each sample will be examined : NA

[REDACTED]
08/02/2024
Chairman
Biosafety, Biosecurity & Ethical Committee
&
Dean, Faculty of Biological Sciences
Jahangirnagar University
Savar, Dhaka-1342
BAHGLADESH

Office: Faculty of Biological Sciences, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh

B. UCL ethics approval letter for the IATIP trial

RESEARCH AND INNOVATION SERVICES



18th March 2024

Professor Lion Shahab
UCL Department of Behavioural Science and Health

Cc:
Sahadat Hossain
Dr Emma Beard

Dear Professor Shahab

Notification of Ethical Approval

Project ID/Title: 22645/004: Intervention for Adolescent Tobacco Initiation Prevention and Promotion of Mental Health (IATIP-PMH): A Pilot Cluster Randomised Controlled Trial in Dhaka, Bangladesh

Thank you for submitting the above high-risk research ethics application for review by the UCL Research Ethics Committee (UCL REC).

I am pleased to confirm in my capacity as Chair of the UCL REC that further to your satisfactory responses to reviewer comments your study has been ethically approved until **18th March 2025**.

Ethical approval is subject to the following conditions:

Notification of Amendments to the Research

Please seek Chair's approval for proposed amendments (to include extensions to the duration of the project) to the research for which this approval has been given. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of continued ethical approval by completing an 'Amendment Approval Request Form'

<https://www.ucl.ac.uk/research-ethics/responsibilities-after-approval>

Adverse Event Reporting – Serious and Non-Serious

It is your responsibility to report to the REC any unanticipated problems or adverse events involving risks to participants or others. The REC should be notified of all serious adverse events via the Research Ethics Service (ethics@ucl.ac.uk) immediately after the incident occurs. Where the adverse incident is unexpected and serious, the Chair will decide whether the study should be terminated pending the opinion of an independent expert.

For non-serious adverse events, the Chair should again be notified via the Research Ethics Service within ten days of the incident occurring and provide a full written report that should include any amendments to the participant information sheet and study protocol. The Chair will confirm that the incident is non-serious and report to the REC at the next meeting. The final view of the REC will be communicated to you.

Research Ethics Service
Research and Innovation Services
University College London
ethics@ucl.ac.uk
www.ucl.ac.uk/research-ethics/

Final Report

At the end of the data collection element of your research we ask that you submit a very brief report (1-2 paragraphs will suffice) which includes issues relating to the ethical implications of the research i.e., any issues obtaining consent, participants withdrawing from the research, confidentiality, protection of participants from physical and mental harm etc.

In addition, please:

- ensure that you follow all relevant guidance as laid out in [UCL's Code of Conduct for Research](#);
- note that you are required to adhere to all research data/records management and storage procedures agreed as part of your application. This will be expected even after completion of the study.

With best wishes for the research.

Yours sincerely



Professor Sarah Edwards
Chair, UCL Research Ethics Committee

Research Ethics Service
Research and Innovation Services
University College London
ethics@ucl.ac.uk
www.ucl.ac.uk/research-ethics/

Appendix 6.3: Parental information sheet

LONDON'S GLOBAL UNIVERSITY



UCL

Parental Information Sheet for Parents/Guardians

UCL Research Ethics Committee Approval ID Number: 22645/004

(An ethics committee is a group of individuals responsible for reviewing and overseeing the ethical conduct of research involving human participants. The primary purpose of an ethics committee is to ensure that research studies adhere to ethical principles and guidelines designed to protect the rights, safety, and well-being of participants.)

Title of Study: Intervention for Adolescent Tobacco Initiation Prevention and to Promote Health and Well-being

Department: Department of Behavioural Science and Health

Name and Contact Details of the Principal Researcher:

Professor Lion Shahab
Professor of Health Psychology
Programme Lead, MSc Health Psychology
Co-Director, UCL Tobacco and Alcohol Research Group
Department of Behavioural Science and Health
University College London
1-19 Torrington Place, LONDON, WC1E 7HB

1. Introduction

The purpose of this form is to provide you (as the parent/guardian of a prospective research study participant) with information that may affect your decision as to whether or not to let your child participate in this research study. Read the information below and ask any questions, using the contact information at the end of this form, you might have before deciding whether or not to give your permission for your child to take part. If you choose to enrol your child in this study, please complete the consent form attached to this information sheet.

2. What is the project's purpose?

The purpose of this school-based study is to assess the feasibility and potential efficacy of the study designed to prevent tobacco initiation and promote mental health and well-being of Bangladeshi school students.

3. Why has my child been chosen?

Your child has been approached because the study requires information from your child as s/he meets the following inclusion criteria:

- Your child is a Bangladeshi school student.
- Your child is a student of Year 8/9.
- Furthermore, your child has been chosen because the authority of your child's school and/or college agreed to participate in this study. Like your child, we are approaching all students who met the inclusion criteria in the school as well as other schools in Dhaka city.

4. Does my child have to participate?

It is entirely up to you and your child to decide. Your child's participation in this study is voluntary. Your child may decline to participate or to withdraw from participation after having agreed to participate within 30 days from the date of providing consent (until the end of data collection). Additionally, your child can also withdraw his/her data at any point up until submission of results for publication. Withdrawal or refusing to participate will not affect in any way. You can agree to allow your child to be in the study now and change your mind later without any penalty.

5. What is my child going to be asked to do?

If you are happy to allow your child to participate in this study after reading this information sheet, please submit your consent form in your child's school. Following this, we will allocate your child at random to one of two groups:

1. Regular school activity group.
2. New curriculum group.

Our researcher will inform your child which group s/he has been allocated to: there is a 50/50 chance of being included to either the regular school activity group or new curriculum group. If your child is allocated to the regular school activity group, s/he will continue with routine school activity, and take part in research assessments outlined in this information sheet.

If your child is allocated to the new curriculum group, s/he will be offered to join three successive class-room based sessions, each lasting approximately 45 minutes over three consecutive days. These sessions will include knowledge and skill-based lectures, graphical material demonstrations, individual and group interactive activities, and more. The sessions will be conducted during regular classroom hours and will be led by Mr Sahadat Hossain, a PhD student from UCL.

Your child and all other students participated in this study will be asked to complete questionnaires on three separate occasions (at the initial consent visit, at the end of new sessions delivery, and then 1 month later) in order for us to see whether taking part impacts on your child's knowledge, attitude, behaviour and well-being. Each of these assessments will take around 30 minutes to complete. The questionnaire includes demographic data (age, sex, place of living, etc.), intention to use tobacco (e.g., "If someone offers you a tobacco product, would you use it?" and "At any time during the next 12 months, do you think you will use any form of tobacco?"), knowledge, attitudes and beliefs about tobacco and health, second-hand tobacco use, tobacco use status, motivation to quit, and mental health and wellbeing information for assessing the overall mental wellbeing, stress, anxiety, and depression. Students in the new curriculum group will also be asked to complete a satisfaction questionnaire at the end of the sessions. This will ask your child about how satisfied s/he is with the new activities, the extent to which the sessions met expectations and specific components perceived as helpful or less helpful. Feedback and suggestions for improvement will be sought to inform future refinements of the study.

In this study, the data collected from participants will be pseudo-anonymized. Pseudo-anonymization involves replacing identifiable information with a unique code or identifier, thus separating the data from direct identifiers such as names, or IDs. This is to reduce the risk of identification of individuals.

6. Will my child's privacy and confidentiality be protected if s/he participates in this research study?

Yes, all the information that we will collect in this study will be kept strictly confidential. No data will be transferred to any third parties (e.g., commercial organisations). Only the

research team (Research Supervisors, Administrator and the Researcher) will have access to the data. We are committed to maintaining the confidentiality of your child's data to the fullest extent possible. However, in certain circumstances where there is a risk to your child safety or well-being, we may need to breach confidentiality to ensure appropriate support and intervention. We will take all necessary measures to safeguard your child privacy and confidentiality while prioritizing his/her safety and well-being.

7. What are the possible disadvantages and risks involved in this study?

There are no anticipated disadvantages, side effects, and risks of taking part in this survey. Since the questionnaire contains questions about the mental well-being of your child, this may cause some discomfort in completing the questionnaire.

Furthermore, sensitive information related to your child's self-harm/suicidal risk will be identified through answering a question: "Thoughts that you would be better off dead or hurting yourself in some way" in the data collection tool when it is completed and submitted. An individual in the research team will be responsible for checking questionnaire submissions on a daily basis to identify affirmative responses to this question. If someone indicates thoughts of self-harm, the research team will contact the participant's school/responsible teacher/wellbeing lead and make them aware of this. It is the responsibility of the school/teacher/wellbeing lead to attempt to make contact with the legal guardian (i.e., the parents) of the participant and take further necessary actions as per their policy. To support this, we will provide the school/teacher/ wellbeing lead with a risk flow chart to follow to manage the risk cases.

8. What are the possible benefits of taking part?

Your child may benefit from taking part in this study because s/he may receive new curriculum within the school setting, offering valuable insights and resources for tobacco prevention and mental health promotion. The study not only seeks to equip the students with knowledge and skills to resist tobacco initiation but also aims to enhance their overall mental well-being. Through active participation, students may experience improved awareness, strengthened coping mechanisms, and a supportive school environment, fostering positive behavioural and mental health outcomes.

9. What will happen to the results of the research project?

The results of the study will be published in a PhD thesis; peer-reviewed articles and conference proceedings may also be prepared for publication in academic journals. Your child will not be able to be identified in any ensuing reports or publications. However, the pseudonymised data will be stored securely at least for 10 years in a password protected computer of the principal researcher. If the data collected from this study are needed by either the current or a future researcher to answer a new research question, data will be de-identified prior to using them, and no researcher will have access to information that could identify your child.

10. Local Data Protection Privacy Notice

Notice:

The controller for this project will be University College London (UCL). The UCL Data Protection Officer provides oversight of UCL activities involving the processing of personal data, and can be contacted at data-protection@ucl.ac.uk

This 'local' privacy notice sets out the information that applies to this particular study. Further information on how UCL uses participant information can be found in our 'general' privacy notice:

For participants in health and care research studies, click [here](#)

The information that is required to be provided to participants under data protection legislation (GDPR and DPA 2018) is provided across both the 'local' and 'general' privacy notices.

The categories of your child's personal data used will be as follows:

- The initials of your child name
- The school name of your child
- Your child's class roll number

Special category personal data

This type of data is about your child's sex, religious belief, health data (how do your child describe his or her general state of health now; Over the last 2 weeks, how often have your child been bothered by any of the following problems, e.g., feeling nervous, anxious).

The lawful basis that would be used to process your *personal data* will be performance of a task in the public interest. The lawful basis used to process *special category personal data* will be for scientific and historical research or statistical purposes.

If you are concerned about how the personal data of your child is being processed, or if you would like to contact us about your child's rights, please contact UCL in the first instance at data-protection@ucl.ac.uk.

11. Who is organising and funding the research?

This survey is a part of Sahadat Hossain's PhD project. The Commonwealth Scholarship Commission in the UK (CSC) provides SH a Commonwealth Scholarship (CSC Reference Number: BDCS-2021-607) to financially support for the degree of PhD at University College London.

12. Contact for further information

If you have any questions about any aspect of this research project, or your child's participation in the survey, not answered by this Information Sheet, you may contact the research team, using the following email and/or contact number.

Name and Contact Details of the Researcher(s):

Sahadat Hossain, Email: [REDACTED]

Dr Emma Beard, Email: [REDACTED]

Professor Lion Shahab, Email: [REDACTED]

Note: The "BD mobile contact number" will be active and available between April and June 2024. After this period, please contact us by email if you have any queries.

Please complete the consent form, and let us know your decision about your child's participation.

Thank you for reading this information sheet and considering your child participating in this study. Additionally, we need your child's consent in another form after your consent, as we will not seek to collect data from your child against his/her will. Our research team will facilitate this process during the meeting with your child at school.

Appendix 6.4: Parental consent form

LONDON'S GLOBAL UNIVERSITY



UCL

Parental Consent Form

Title of Study: Intervention for Adolescent Tobacco Initiation Prevention and to Promote Health and Well-being

UCL Research Ethics Committee Approval ID Number: 22645/004

Thank you for reading our information sheet. If your child agreed and you're happy to allow your child to participate in this study, we'll need you to give your consent. To do this, please **read the statements below and tick the appropriate boxes.**

Receiving information about the study

I confirm that:

- I have read and understood the Information Sheet for the above study.
- I have had an opportunity to consider the information and what will be expected of if my child take part in the study.
- I have had the opportunity to ask questions about my child's participation in the study, and any questions asked have been answered to my satisfaction.

☐ **Tick here to confirm**

Data collection

I understand that:

- This research involves collection of data via questionnaires on three separate occasions (at the initial consent visit, at the end of intervention delivery and 1 month later).
- My child's data will be kept strictly confidential. (However, it is important to note that data confidentiality is subject to a safeguarding caveat. This means that while the research team will take all necessary measures to protect the confidentiality of your child's data, there may be circumstances where confidentiality needs to be breached to ensure your child's safety and well-being. The research team assure you that any such breach of confidentiality will be done with the utmost care and consideration for your child's best interests.)

☐ **Tick here to confirm your understanding**

Understanding the right to withdraw from the study

I understand that:

- My child's participation in this study is voluntary and that s/he is free to withdraw from the study without giving a reason.
- My child can withdraw from the study after having agreed to participate within 30 days from the date of providing consent (until the end of data collection).
- Additionally, my child can also withdraw his/her data at any point up until submission of results for publication.
- If we decide to withdraw, any personal data my child has provided up to that point will be deleted unless we agree otherwise.

☐ **Tick here to confirm your understanding**

Understanding potential risks of study participation

- I understand the potential risks of participating and the support that will be available to my child should s/he experience any adverse physical or mental effects during the course of the research.

☐ [Tick here to confirm your understanding](#)

Understanding the potential benefits of study participation

I understand that:

- My child's participation in this study could be beneficial as it provides an opportunity to receive intervention programs within the school setting.

☐ [Tick here to confirm your understanding](#)

Understanding who will have access to the data

I understand that:

- The data will not be made available to any third parties (e.g., commercial organisations) and is solely the responsibility of the researchers undertaking this study.

☐ [Tick here to confirm your understanding](#)

Publication and future use of data

I understand that:

- My child's data may be included in published reports or applications for research funding, or may be presented to other researchers at scientific meetings.
- My child will not be able to be identified in any ensuing reports or publications.
- I agree that the anonymised research data of my child may be used again in future studies by the researchers carrying out this study, and by others collaborating with these researchers.
- I would be happy for the data my child provides to be archived anonymously in a data repository as "Open Data" (e.g. Open Science Framework, Academic Peer-reviewed Journals).

☐ [Tick here to confirm your understanding](#)

Agreement to participate

- I am making a decision about allowing my child to participate in this study based on his/her consent.

☐ [Tick here to confirm](#)

ID1: School code	ID2: Class	ID3: Student Class Roll Number	Parent's/guardian's name	Signature & Date

Appendix 6.5: Participant information sheet

LONDON'S GLOBAL UNIVERSITY



Participant Information Sheet

UCL Research Ethics Committee Approval ID Number: 22645/004

(An ethics committee is a group of individuals responsible for reviewing and overseeing the ethical conduct of research involving human participants. The primary purpose of an ethics committee is to ensure that research studies adhere to ethical principles and guidelines designed to protect the rights, safety, and well-being of participants.)

Title of Study: Intervention for Adolescent Tobacco Initiation Prevention to Promote Health and Well-being

Department: Department of Behavioural Science and Health

Name and Contact Details of the Principal Researcher:

Professor Lion Shahab
Professor of Health Psychology
Programme Lead, MSc Health Psychology
Co-Director, UCL Tobacco and Alcohol Research Group
Department of Behavioural Science and Health
University College London (UCL)
1-19 Torrington Place, LONDON WC1E 6BT

1. Invitation Paragraph

You are being invited to participate in this study which is a part of a PhD research project at University College London. Before you decide whether to take part, you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully and feel free to ask us if there is anything that is not clear or if you would like more information.

2. What is the project's purpose?

The purpose of this school-based study is to assess the feasibility and potential efficacy of the study designed to prevent tobacco initiation and promote mental health and well-being of Bangladeshi school students.

3. Why have I been chosen?

You have been approached because you meet the following inclusion criteria:

- You are a Bangladeshi school student.
- You are a student of Year 8/9

- Furthermore, you have been chosen because the authority of your school and/or college agreed to participate in this study. Like you, we are approaching all students, who met the inclusion criteria in your school as well as other schools in Dhaka city.

4. Do I have to take part?

No, taking part in the research is entirely voluntary. To participate in the study, we need both your and your parent's consent. You and your parent have the right to refuse to participate and to skip any activity you do not wish to attend or any question you do not wish to answer. You can withdraw from the study after having agreed to participate within 30 days from the date of providing consent (until the end of data collection). Additionally, you can also withdraw your data at any point up until submission of results for publication. This decision will not affect you and your parent in any way.

5. What will happen to me if I take part?

If you are happy to take part after reading this information sheet (for the parent, there is a separate parental information sheet), please submit both you and your parent's consent forms in your school. Following this, we will allocate you at random to one of two groups:

1. Regular school activity group.
2. New curriculum group.

Our researcher will inform you which group you have been allocated to: there is a 50/50 chance of being included to either the regular school activity group or new curriculum group. If you are allocated to the regular school activity group, you will continue with routine school activity and take part in research assessments outlined in this information sheet.

If you are allocated to the new curriculum group, you will be offered to join three successive class-room based sessions, each lasting approximately 45 minutes over three consecutive days. These sessions will include knowledge and skill-based lectures, graphical material demonstrations, individual and group interactive activities, and more. The sessions will be conducted during regular classroom hours and will be led by Mr Sahadat Hossain, a PhD student from UCL.

All students will be asked to complete questionnaires on three separate occasions (at the initial consent visit, at the end of new sessions delivery, and then 1 month later) in order for us to see whether taking part impacts on your knowledge, attitude, behaviour and well-being. Each of these assessments will take around 30 minutes to complete. The questionnaire includes demographic data (age, sex, place of living, etc.), intention to use tobacco (e.g., "If someone offers you a tobacco product, would you use it?" and "At any time during the next 12 months, do you think you will use any form of tobacco?"), knowledge, attitudes and beliefs about tobacco and health, second-hand tobacco use, tobacco use status, motivation to quit, and mental health and wellbeing information for assessing the overall mental wellbeing, stress, anxiety, and depression. Students in the new curriculum group will also be asked to complete a satisfaction questionnaire at the end of the sessions. This will ask you about how satisfied you are with the new activities, the

extent to which the sessions met expectations and specific components perceived as helpful or less helpful. Feedback and suggestions for improvement will be sought to inform future refinements of the study.

In this study, the data collected from participants will be pseudo-anonymized. Pseudo-anonymization involves replacing identifiable information with a unique code or identifier, thus separating the data from direct identifiers such as names, or IDs. This is to reduce the risk of identification of individuals.

6. What are the possible disadvantages and risks of taking part?

There are no anticipated disadvantages, side effects, and risks of taking part in this research. Since the questionnaire contains questions about your mental well-being, this may cause some discomfort in completing the questionnaire.

Furthermore, sensitive information related to your self-harm/suicidal risk will be identified through answering a question: "Thoughts that you would be better off dead or hurting yourself in some way" in the data collection tool when it is completed and submitted. An individual in the research team will be responsible for checking questionnaire submissions on a daily basis to identify affirmative responses to this question. If someone indicates thoughts of self-harm, the research team will contact the participant's school/responsible teacher/wellbeing lead and make them aware of this. It is the responsibility of the school/teacher/wellbeing lead to attempt to make contact with the legal guardian (i.e., the parents) of the participant and take further necessary actions as per their policy. To support this, we will provide the school/teacher/ wellbeing lead with a risk flow chart to follow to manage the risk cases.

7. What are the possible benefits of taking part?

You may benefit from taking part in this trial because you may receive new curriculum within the school setting, offering valuable insights and resources for tobacco prevention and mental health promotion. The study not only seeks to equip the students with knowledge and skills to resist tobacco initiation but also aims to enhance their overall mental well-being. Through active participation, students may experience improved awareness, strengthened coping mechanisms, and a supportive school environment, fostering positive behavioural and mental health outcomes.

8. Will my taking part in this project be kept confidential?

All the information that we collect about you in this study will be kept strictly confidential. No data will be transferred to any third parties (e.g., commercial organisations). Only the research team (Research Supervisors, Administrator, and the Researcher) will have access to the data. We are committed to maintaining the confidentiality of your data to the fullest extent possible. However, in certain circumstances where there is a risk to your safety or well-being, we may need to breach confidentiality to ensure appropriate support and intervention. We will take all necessary measures to safeguard your privacy and confidentiality while prioritizing your safety and well-being.

9. What will happen to the results of the research project?

The results of this research will be published in a PhD thesis; peer-reviewed articles and conference proceedings may also be prepared for publication in academic journals. You will not be able to be identified in any ensuing reports or publications. However, the pseudonymised data (data that doesn't contain identifiable information of participants) will be stored securely at least for 10 years in a password protected computer of the principal researcher. If the data collected from this study are needed by either the current or a future researcher to answer a new research question, data will be de-identified prior to using them, and no researcher will have access to information that could identify you.

10. Local Data Protection Privacy Notice

Notice:

The controller for this project will be University College London (UCL). The UCL Data Protection Officer provides oversight of UCL activities involving the processing of personal data, and can be contacted at data-protection@ucl.ac.uk

This 'local' privacy notice sets out the information that applies to this particular study. Further information on how UCL uses participant information can be found in our 'general' privacy notice:

For participants in health and care research studies, click [here](#)

The information that is required to be provided to participants under data protection legislation (GDPR and DPA 2018) is provided across both the 'local' and 'general' privacy notices.

The categories of personal data used will be as follows:

- Initials of your name
- Your Class Roll Number
- School name

Special category personal data

This type of data is about your sex, religious belief, health data (How do you describe your general state of health now?; Over the last 2 weeks, how often have you been bothered by any of the following problems? e.g., Feeling nervous, anxious).

The lawful basis that would be used to process your *personal data* will be performance of a task in the public interest. The lawful basis used to process *special category personal data* will be for scientific and historical research or statistical purposes.

Your personal data will be processed so long as it is required for the research project. If we are able to anonymise or pseudonymise the personal data you provide we will undertake this and will endeavour to minimise the processing of personal data wherever possible.

If you are concerned about how your personal data is being processed, or if you would like to contact us about your rights, please contact UCL in the first instance at data-protection@ucl.ac.uk.

11. Who is organising and funding the research?

This survey is a part of Sahadat Hossain's PhD project. The Commonwealth Scholarship Commission in the UK (CSC) provides SH a Commonwealth Scholarship (CSC Reference Number: BDCS-2021-607) to financially support for the degree of PhD at UCL.

12. Contact for further information

If you have any questions about any aspect of this research project, or your child's participation in the survey, not answered by this Information Sheet, you may contact the research team, using the following email and/or contact number.

Name and Contact Details of the Researcher(s):

Sahadat Hossain, Email: [REDACTED]

Dr Emma Beard, Email: [REDACTED]

Professor Lion Shahab, Email: [REDACTED]

Note: The "BD mobile contact number" will be active and available between April and June 2024. After this period, please contact us by email if you have any queries.

Thank you for reading this information sheet and for considering to take part in this research study.

Appendix 6.6: Participant consent form



Participant Consent Form

Title of Study: Intervention for Adolescent Tobacco Initiation Prevention to Promote Health and Well-being

UCL Research Ethics Committee Approval ID Number: 22645/004

Thank you for reading our information sheet. If you're happy to take part, we'll need you to give your consent. To do this, please **read the statements below** and **tick the appropriate boxes**.

Receiving information about the study

I confirm that:

- I have read and understood the Information Sheet for the above study.
- I have had an opportunity to consider the information and what will be expected of me if I take part in the study.
- I have had the opportunity to ask questions about participating in the study, and any questions asked have been answered to my satisfaction.

☐ **Tick here to confirm**

Data collection

I understand that:

- This research involves collection of data via questionnaires on three separate occasions (at the initial consent visit, at the end of intervention delivery and 1 months later).
- My data will be kept strictly confidential.

☐ **Tick here to confirm your understanding**

Understanding the right to withdraw participation and data

I understand that:

- My participation in this study is voluntary and that I am free to withdraw from the study without giving a reason.
- I can withdraw from the study after having agreed to participate within 30 days from the date of providing consent (until the end of data collection).
- Additionally, I can also withdraw my data at any point up until submission of results for publication.
- If I decide to withdraw, any personal data I have provided up to that point will be deleted unless I agree otherwise.

☐ **Tick here to confirm your understanding**

Understanding potential risks of study participation

- I understand the potential risks of participating and the support that will be available to me should I experience any adverse physical or mental effects during the course of the research.

☐ [Tick here to confirm your understanding](#)

Understanding the potential benefits of study participation

I understand that:

- My participation in this study could be beneficial as it provides an opportunity to receive intervention programs within the school setting.

☐ [Tick here to confirm your understanding](#)

Understanding who will have access to the data

I understand that:

- The data will not be made available to any third parties (e.g., commercial organisations) and is solely the responsibility of the researchers undertaking this study.

☐ [Tick here to confirm your understanding](#)

Publication and Future use of the data

I understand that:

- My data may be included in published reports or applications for research funding, or may be presented to other researchers at scientific meetings.
- I agree that my anonymised research data may be used again in future studies by the researchers carrying out this study, and by others collaborating with these researchers.
- I would be happy for the data I provide to be archived anonymously in a data repository as "Open Data" (e.g. Open Science Framework, Academic Peer-reviewed Journals).

☐ [Tick here to confirm your understanding](#)

Agreement to participate

- I voluntarily agree to take part in this study.

☐ [Tick here to confirm](#)

ID1: School code	ID2: Class	ID3: Student Class Roll Number	Student's name	Signature & Date

Appendix 6.7: Data on fidelity to IATIP components

IATIP components	Implementation status reported by observer (N = 14)			Implementation status reported by students (N=430)		
	Fully implemented, % (n)	Partially implemented, % (n)	Not implemented, % (n)	Fully implemented, % (n)	Partially implemented, % (n)	Not implemented, % (n)
Session 1						
Tobacco and product information	100.0 (14)	0	0	96.51 (415)	3.49 (15)	0
Tobacco toxicity and addiction information	100.0 (14)	0	0	95.81 (412)	4.19 (18)	0
Interactive activity on tobacco toxicity and addition	100.0 (14)	0	0	81.63 (351)	17.91 (77)	0.47 (2)
Discuss nicotine and nicotine dependence	100.0 (14)	0	0	94.65 (407)	5.35 (23)	0
Discuss health effects of tobacco use	100.0 (14)	0	0	80.47 (346)	19.30 (83)	0.23 (1)
Religious views on tobacco use	71.43 (10)	28.57 (4)	0	92.56 (398)	7.44 (32)	0
Session 2						
Explain why people use tobacco	85.71 (12)	14.29 (2)	0	90.47 (389)	9.53 (41)	0
Myths	78.57 (11)	21.43 (3)	0	82.56 (355)	16.74 (72)	0.70 (3)
3C's of decision making	100.0 (14)	0	0	85.58 (368)	13.49 (58)	0.93 (4)
Problem-solving: assertiveness skill	100.0 (14)	0	0	93.49 (402)	6.51 (28)	0

Problem-solving: refusal skills	100.0 (14)	0	0	91.16 (392)	8.37 (36)	0.47 (2)
Discovering positive and healthy alternatives	85.71 (12)	14.29 (2)	0	86.51 (372)	12.79 (55)	0.70 (3)
Session 3						
Links between tobacco and mental wellbeing	78.57 (11)	21.43 (3)	0	91.86 (395)	8.14 (35)	0
Expression of negative feelings	100.0 (14)	0	0	90.23 (388)	9.53 (41)	0.23 (1)
Identify everyday life stressors	71.43 (10)	7.14 (1)	21.43 (3)	87.91 (378)	12.09 (52)	0
Dealing with stress	100.0 (14)	0	0	91.16 (392)	8.60 (37)	0.23 (1)
Dealing with depression	100.0 (14)	0	0	89.07 (383)	10.47 (45)	0.47 (2)
Dealing with anxiety	100.0 (14)	0	0	95.58 (411)	4.42 (19)	0
Deep breathing exercise	100.0 (14)	0	0	88.60 (381)	10.93 (47)	0.47 (2)
Goal setting	100.0 (14)	0	0	91.86 (395)	7.44 (32)	0.70 (3)
Personal commitment (pledge)	100.0 (14)	0	0	85.12 (366)	13.49 (58)	1.40 (6)

Appendix 6.8: Total cost (in GBP) of the IATIP pilot feasibility trial in Dhaka, Bangladesh

Cost categories	Unit name	Unit number	Unit price	Total costs	Intervention group	Control group
Capacity building						
Baseline data collectors training (n=4)	Hour	4	8	128	64	64
Data collector trainer (n=1)	Hour	4	16	64	32	32
Field research assistants training (n=3)	Hour	6	8	144	72	72
Follow-up data collectors training (n=4)	Hour	2	8	64	32	32
Follow-up trainer (n=1)	Hour	2	16	32	16	16
Data entry operators training (3)	Hour	3	8	72	36	36
Data entry trainer (n=1)	Hour	3	16	48	24	24
Total capacity building cost				552	276	276
Personnel						
Lead facilitator of intervention (n=1)	Month	3	800	2400	2400	
Air ticket cost	Item	1	2018.38	2018.38	1009.19	1009.19
Assistant facilitator of intervention (n=2)	Month	2	450	1800	1800	
Data collectors (n=4)	Month	2	270	2160	1080	1080
Data entry operators (n=3)	Month	1	270	810	405	405
Bilingual transcriber (n=2)	Hour	8	15	240	240	
Total personal cost				9428.38	6934.19	2494.19
Materials and resources						
Laptop	Item	1	979	979	489.5	489.5
Projector	Item	1	291.97	291.97	291.97	
Portable Wireless PA Microphone	Item	1	35.04	35.04	35.04	

Cost categories	Unit name	Unit number	Unit price	Total costs	Intervention group	Control group
Multi plug + HDMI Cable + Mouse + Tripod	Items			26.9	26.9	
Field instruments carrying luggage	Item	1	45	45	22.5	22.5
Participant information sheet	Item	1600	0.45	720	360	360
Participant consent form	Item	1600	0.3	480	240	240
Parental consent form	Item	1600	0.3	480	240	240
Data collection form						
Baseline	Item	1400	1.8	2520	1260	1260
Follow-up	Item	1380	1.5	2070	1035	1035
Intervention manual	Item	700	9.15	6405	6405	
Stationeries (pencils, pens, paper, etc.)	Items			95	47.5	47.5
Transportation costs of Team						
Baseline	Month	1	200	200	100	100
Follow-up	Month	1	200	200	100	100
Car rent for Intervention	Month	1	300	300	300	
Refreshments	Item	28	20	560	400	160
Mobile bill	Month	3	8	24	12	12
Internet bill	Month	3	20	60	30	30
Total material and resources cost				15,491.91	11,395.41	4,096.5
Total cost				25,472.29	18,606	6,867
Number of participants					689	685
Cost per participant					27.0	10.0

Appendix 7

Appendix 7.1: Process evaluation FGD guides for students

Title of study

Intervention for Adolescent Tobacco Initiation Prevention (IATIP) to Promote Health and Well-being

UCL Research Ethics Committee Approval ID Number: 22645/004
JU Biosafety, Biosecurity & Ethical Committee Approval ID Number:
BBEC, JU/M 2024/ 02 (82)

Process Evaluation Questionnaire – v1.2 (For Students)

Dear Participant,

Thank you for participating in study, and for taking the time to provide feedback on your experience. Your insights are valuable for understanding how the study is being implemented and its impact on participants. Please provide honest and thoughtful responses to the following questions. Your feedback will contribute to the future improvement and refinement of the program.

ID1: School code	ID2: Class	ID3: Student Class Roll Number	ID4: Initials of the student's name

Section 1: Session attendance

1.1. Were there any challenges in attending the sessions and assessments of this study?

0 = No

1 = Yes

If 'Yes', what were the challenges? please describe:

.....
.....

Section 2: Intervention implementation acceptability

2.1. Which specific components did you find most helpful or least helpful?

Most helpful components:

.....
.....

Least helpful components:

.....
.....

2.2. Were there any irrelevant components in the manual that don't necessary in preventing tobacco initiation and promoting health and well-being?

0 = No

1 = Yes

If 'Yes', please specify the irrelevant contents and explain your reasons why irrelevant?

.....
.....

2.3. Were there any factors that positively or negatively influenced your engagement?

[Prompts: Were there any external factors (e.g., school environment, family situations) that influenced your experience with the intervention? How did the overall school environment contribute to or hinder your engagement with the IATIP-PMH intervention?]

.....
.....

Section 3: Program perceived efficacy

3.1 In your opinion, how has the study influenced your knowledge, attitudes, and behaviours related to tobacco use? Please explain:

.....
.....

3.2. In your opinion, how has the study influenced your knowledge, attitudes, and behaviours related to health and well-being? Please explain:

.....
.....

3.3. To what extent do you think the study helped to improve your life skills such as, decision making & problem-solving skills?

- 1 = Not at all
- 2 = To a small extent
- 3 = Moderately
- 4 = Quite a bit
- 5 = A great deal

3.4. To what extent do you believe that the study will help prevent tobacco initiation among school adolescents?

- 1 = Not at all
- 2 = To a small extent
- 3 = Moderately
- 4 = Quite a bit
- 5 = A great deal

3.5. Do you believe that the study contributed to the promotion of health and well-being among adolescents?

- 1 = Not at all
- 2 = To a small extent
- 3 = Moderately
- 4 = Quite a bit
- 5 = A great deal

Section 4: Suggestions for future improvement

4.1. Do you have any suggestions for improving the contents and the design, delivery approach, and session length of the intervention?

Suggestions for taught contents:

.....
.....

Suggestions for interactive contents:

.....
.....

Suggestions for layout and structure:

.....
.....

Suggestions for delivery approach:

.....
.....

Suggestions for session length and follow-up sessions:

.....
.....

4.2. Is there any additional feedback or comments you would like to share about your experience with the study?

.....
.....

End the questionnaire!

Thank you for your valuable input.

Appendix 7.2: Process evaluation IDI guideline for teacher

Title of study

Intervention for Adolescent Tobacco Initiation Prevention (IATIP) to Promote Health and Well-being

UCL Research Ethics Committee Approval ID Number: 22645/004
JU Biosafety, Biosecurity & Ethical Committee Approval ID Number:
BBEC, JU/M 2024/ 02 (82)

Process Evaluation Questionnaire – v1.2 (For Teachers)

ID1: School code	
ID2: Designation of the teacher	1 = Principal/ Headteacher 2 = Class teacher

Sir/Madam,

First of all, I would like to express my gratitude to you for allowing me to implement my intervention programme in your school to prevent students' tobacco initiation and to promote physical and mental well-being. Additionally, I would like to thank you for taking the time to be interviewed today.

The question I would like to ask you at the beginning is:

1. In your opinion, how important does the school administration/teacher consider promoting health and well-being among students?

- 1 = Not important at all
- 2 = Slightly important
- 3 = Moderately important
- 4 = Very important
- 5 = Extremely important

2. How important does the school administration consider the prevention of tobacco use among adolescents?

- 1 = Not important at all
- 2 = Slightly important
- 3 = Moderately important
- 4 = Very important
- 5 = Extremely important

3. Do you think any training programs outside of the school classroom activities to improve the physical and mental health of students can disrupt their schooling?

- 0 = No
- 1 = Yes

If 'Yes', please describe HOW?

.....
.....

4. What factors do you think we should consider in implementing this training program among students separately from classroom teaching? (time/ when is it being conducted? / who is doing it/ for what purpose, ... etc.)

.....
.....

5. How willing is your school to support the implementation of similar interventions in the future?

- 1 = Not willing at all
- 2 = Slightly willing
- 3 = Moderately willing
- 4 = Very willing
- 5 = Extremely willing

6. What type of support (e.g., logistical, financial, administrative) would be necessary for future implementations of such interventions?

.....
.....

7. If a teacher at your school is trained to implement a tobacco prevention and physical and mental health-promotion program for your students, can they implement it among students as an extra job outside of their current workload?

- 0 = No
- 1 = Yes

If 'No', please explain?

.....
.....

8. Please let me know your assessment of my research and training program to improve student tobacco prevention and physical and mental health.

.....
.....

9. Do you have any suggestions for improving the contents and the design, delivery approach, and session length of the intervention for future implementation?

Suggestions for taught contents:

.....
.....

Suggestions for interactive contents:

.....
.....

Suggestions for layout and structure:

.....
.....

Suggestions for delivery approach:

.....
.....

Suggestions for session length and follow-up sessions:

.....
.....

End the questionnaire!

Thank you for your valuable input

Appendix 8

Appendix 8.1: Visual documentation of the IATIP field implementation

This appendix contains a 7-minute video documentary and 20 photographs illustrating the IATIP's field implementation, including intervention delivery, participant interactions, and the creative outputs generated during the program.

The video documentary provides a vibrant snapshot of the IATIP's implementation, capturing the dedication and commitment of facilitator, participants, and the research team. It highlights key moments, such as workshop delivery, group discussions, role-playing activities, and the creation of artworks, offering a vivid portrayal of the program's real-world application and its transformative potential.

Link and QR code to access the video documentary of the IATIP intervention:

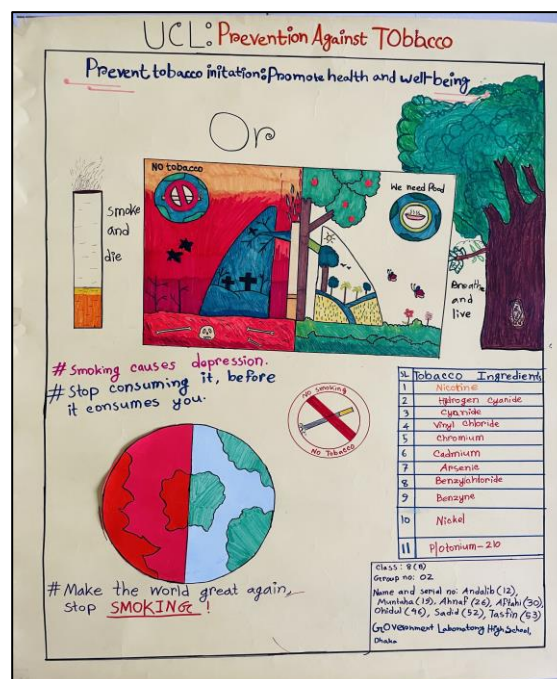
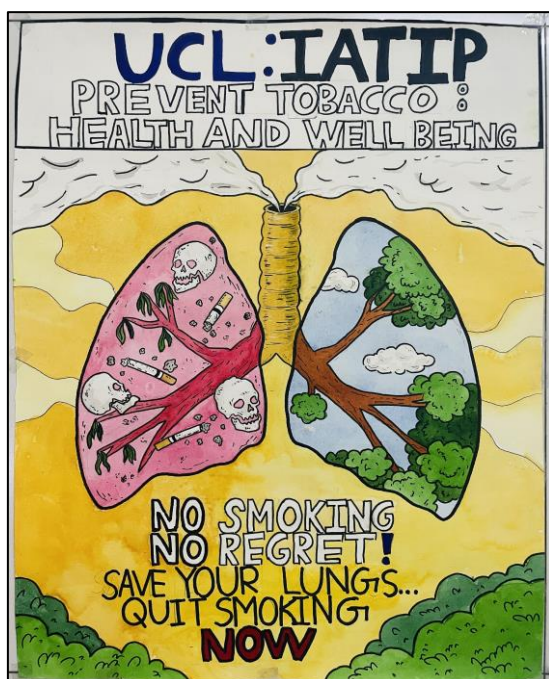
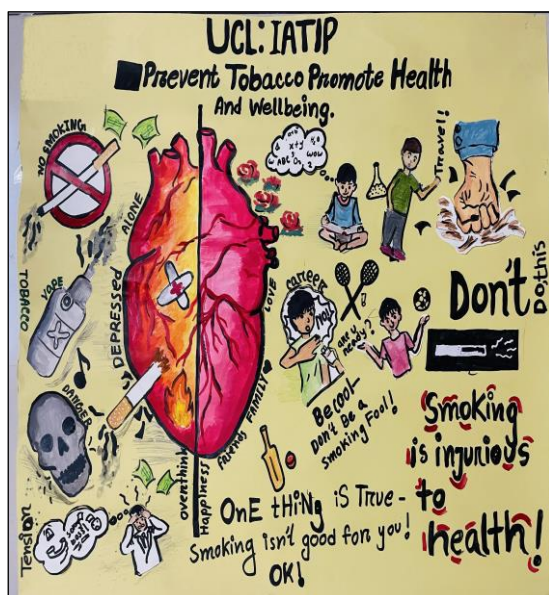
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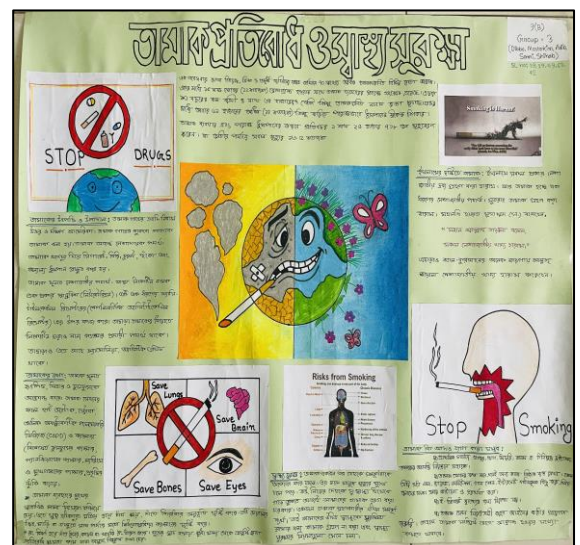
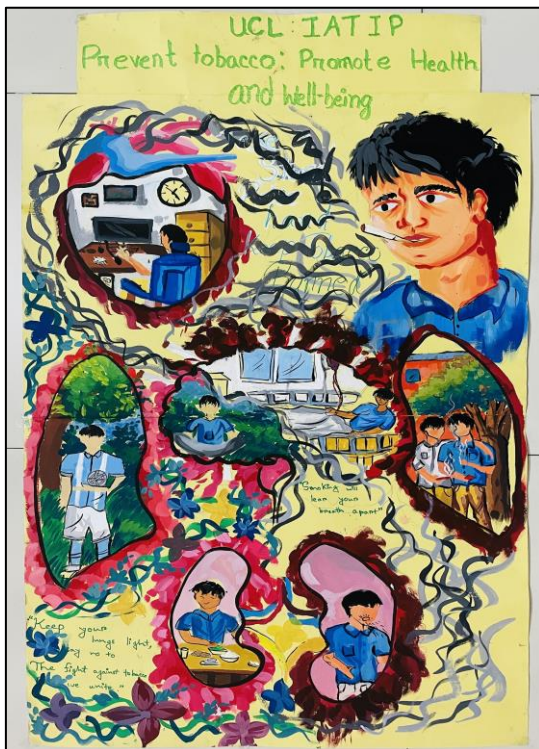


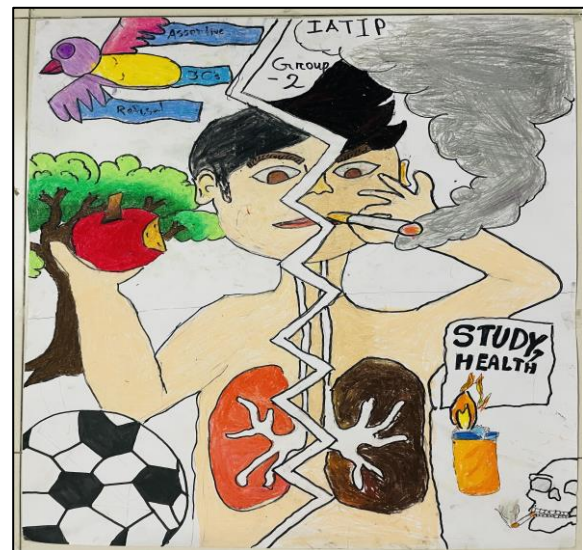
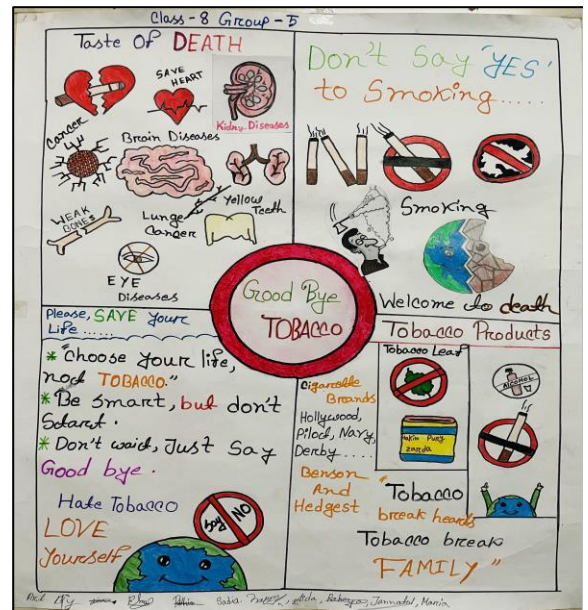
The photographs showcase the creative artworks produced by the experimental group participants as part of the IATIP program. Titled “UCL – IATIP: Prevent Tobacco, Promote Health and Well-being,” these artworks are authentic representations of the participants’ engagement and the intervention’s impact. They serve as tangible evidence of how the IATIP inspired participants to reflect

on tobacco prevention and health promotion through artistic expression. Together, these visuals not only document the intervention's process but also celebrate the collaborative spirit and creativity that defined the IATIP experience.

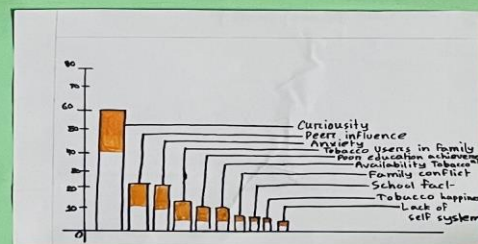
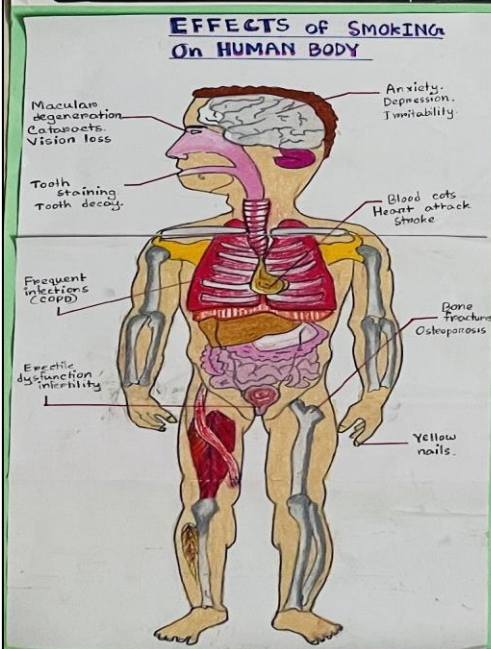
Student's group poster artworks







UCL:IATIP Prevent Tobacco: Promote Health and Well-being



Nicotine Addiction Cycle

- i) Brain Releases Neurotransmitter
- ii) Brain craves Nicotine
- iii) Ingest Nicotine
- iv) Nicotine Blood level fall



