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Preventing smoking among nine to ten year-old children using a novel school-based physical activity intervention: Overview of SmokeFree Sports

Physical activity (PA) is associated with many health benefits, including reduced risk of hypertension, coronary heart disease, stroke and heart disease (Chief Medical Officers, 2011). From an educational perspective, PA has been found to improve cognitive functioning, aiding children's learning through improved concentration (Norlander et al., 2005), attention (Maher, 2011) and memory (Kamijo et al., 2011). Children participate in PA in multiple ways; for example, active play, physical education (PE), and extra-curricular and community sport programmes. Moreover, children enjoy participating in PA and often want to increase their participation (Ridgers et al., 2006). Given that there is evidence that taking part in PA may be protective against smoking uptake (Audrain-McGovern et al., 2003; Rodriguez and Audrain-McGovern, 2005; Kaczynski et al., 2008), it is suggested that PA contexts such as PE and sport could be utilised as a vehicle for smoking prevention. The use of sport to deliver smoking education has previously been trialled in the US and Canada with initiatives such as Tobacco Free Sports (The US Centers for Disease Control and Prevention, 2007), Tobacco Free Athletes (www.tobaccofreemaine.org) and Play, Live, Be Tobacco Free (www.playlivebetobaccofree.ca).

Physical education and sport

PE and sport play a central role in children's lives. All primary school children are required to participate in PE, and over three-quarters of

five-to-ten-year-olds participate in sport outside of school, (Department for Culture, Media and Sport, 2013). PE and sport can contribute to children's physical, social, emotional and psychological development (Chief Medical Officers, 2011). There is a growing recognition of the importance of health-based PE in promoting the knowledge and skills required to lead healthy lifestyles (Alfrey et al., 2012). While health-related PE is predominantly considered in regards to lifelong PA, this lesson could provide a forum for other health promotion activity, such as smoking prevention. Moreover, National Governing Bodies of sport and community sport organisations regularly deliver sports programmes in primary schools. These efforts are primarily designed to promote participation and develop skills in their respective sports but could also be used to implement health promotion initiatives.

Provision of health-related PE and sport in primary schools

Despite the importance of PE in the curriculum, often primary school teachers are not PE specialists and lack confidence in their ability to deliver lessons (Morgan and Bourke, 2008). Consequently, primary schools increasingly employ qualified sports coaches to lead PE or to work alongside primary teachers when teaching PE, giving them the opportunity to observe delivery and participate in sessions (Whipp et al., 2011). These sports coaches have

the potential to be positive role models for children and can incorporate health promotion activity within their coaching practice, with the possibility to support young people's health through promotion, prevention and early intervention (Glang et al. 2010; Mazzer et al., 2012). Whether primary teachers and sport coaches can effectively deliver smoking prevention education through health-related PE within a primary school setting has yet to be investigated.

SmokeFree Sports

SmokeFree Sports (SFS), a novel multi-component intervention that aimed to deliver smoking prevention education through the medium of PA, was established in September 2010. It was originally funded by Liverpool Primary Care Trust through the Local Government Improvement and Development Agency, and later by Liverpool City Council (LCC). The project was managed by researchers at the Physical Activity Exchange at Liverpool John Moores University (LJMU) in partnership with multi-disciplinary organisations, including, the Centre for Public Health at LJMU, St George's University of London, Liverpool Community Health, LCC, Merseyside Sports, Healthy Stadia, Liverpool Healthy Schools team, Florence Melly Primary School, Everton in the Community, Liverpool FC Foundation and Alder Hey NHS Trust.

The objectives of SFS were to:

- a) strengthen children's intentions to be smoke free,
- b) give children the confidence to refuse a cigarette, and
- c) increase negative attitudes toward smoking.

This article describes the design of a school-based SFS intervention to prevent smoking among nine to ten year-old children (Year 5), within Liverpool primary schools. Further, a brief outline of related on-going programmes of research exploring the implementation and effectiveness of the intervention is offered.

Design and methods

SFS was delivered between October 2012 and May 2013. For this non-randomised controlled study, schools were clustered into two groups:

- Group 1 (intervention group): schools received their usual smoking-related education plus SFS
- Group 2 (comparison group): schools received only their usual smoking-related education.

Participants and procedures

The funding agreement required that the intervention be delivered within LCC local authority boundaries; therefore, Group 1 (intervention group) was restricted to Liverpool-based schools. Schools situated in Knowsley, another local authority within the Merseyside region of North West England that has similar characteristics to Liverpool in terms of smoking rates (Department of Health, 2012), as well as deprivation levels (Department for Communities and Local Government, 2011) and ethnic composition (Office for National Statistics, 2009), were utilised as the comparison group (Group 2).

Coaches employed to deliver SFS coaching sessions were recruited through partner organisations, including Liverpool FC Foundation, Everton in the Community and LCC. In addition, at least one PE deliverer (including class teachers, PE coordinators, teaching assistants and external sport coaches; referred to as 'teachers' in this article) and all Year 5 teachers from each participating school were invited to take part in the study. Informed written consent was obtained from teachers and coaches.

The study received ethical approval from the LJMU's Research Ethics Committee [12/SPS/038].

Description of the SFS intervention

Formative work

Formative work included the development of the SFS logo and creation of clear health promotion messages, in accordance with guidance from the National Institute for Health and Care Excellence (NICE, 2008). Brand development was undertaken in partnership with a specialist marketing company and was tested through focus groups with children and young people. SFS was officially launched in February 2011, via a community event and

social-marketing campaign. Following the launch, two feasibility studies were undertaken (between Spring/Summer 2011 and Winter/Spring 2012) to test intervention components and research measures, within different settings and across age groups. During this formative phase, SFS was trialled across five youth clubs with children and young people aged six to 18 years (Foweather et al., 2011; Romeo-Velilla et al., in press; Hilland et al, in press), and the following year in three primary schools with Year 5 children (Trigwell et al., 2012). Efforts were directed towards Year 5 children because evidence suggests that smoking patterns begin prior to experimentation, with the development of attitudes and beliefs (Porcellato et al., 1999), and by age 11, almost one-quarter of children will have tried smoking (NHS Information Centre, 2010); therefore, it is recognised smoking prevention education must target primary school children. This view is supported by the National Curriculum, which includes alcohol and drug education as a part of the statutory science subject for Key Stage 2 (children aged 7 to 11 years), and suggests PSHE education, whilst a non-statutory topic but a necessary part of primary children's education (Department of Education, 2013), should offer a comprehensive approach to smoking education (www.mentor-adepis.org). Knowledge gained from both feasibility studies was instrumental in the development of a larger school-based SFS intervention delivered across Liverpool, ensuring children, coaches and teachers informed the project design. Table 1 (page 99) summarises the main findings and recommendations from this formative work.

Theoretical model

A socio-ecological model was used to guide the intervention components, recognising the importance of intrapersonal, interpersonal, organisational and policy structures on smoking behaviour and how they can work both independently and synergistically to impact behaviour (Kaczynski et al., 2008). In addition, a logic model was used to map the design of the study. Logic models are often used in the development and evaluation of health promotion projects since they offer a visual

representation of the intervention's theory for change (i.e. how the intervention aims to prevent the onset of smoking among children) and rationale for activities (Coffman, 1999; Goodstadt, 2005; Bartholomew et al. 2011).

The logic model displayed in Figure 1 (page 101) represents the anticipated causal relationship between the planned project input (resources, project partners and formative work), activities (recruitment, development of resources and delivery of intervention components), outputs (number of participants recruited and intervention activities delivered), outcomes (immediate and short/mid-term) and long-term impact of the intervention (Coffman, 1999, The Health Communication Unit, 2007).

Project components

Training for project delivery

In line with NICE (2010) recommendations, which stipulates staff who are working in smoking prevention should be sufficiently trained, external sports coaches employed to deliver SFS sessions and at least one teacher from each participating school were required to take part in a bespoke SFS training workshop. Teachers who attended the training were asked to feedback information to colleagues. The workshop comprised of a two-hour theory and one-hour practical session, delivered within local leisure centres during school hours. The workshop provided coaches and teachers with details of the project, as well as key facts about smoking relating to prevalence, social influences and its impact on health and sport. Participants were also informed of the SFS key messages to promote and integrate into PA sessions (see Table 2, page 100), and given tips on how to do this in a sensitive but effective manner. SFS key messages were adapted from a US based tobacco-control programme, Tobacco Free Athletes, and from information provided by the World Health Organisation (www.who.int/en/). Messages were amended to ensure their relevance for a UK audience and suitability for children following formative work. Guidance on how to deliver smoking messages were developed using a Tobacco Stinks campaign resource (www.tobaccostinks.com).

Workshops were delivered between October 2012 and February 2013; all teaching staff

completed the training by November 2012. All sports coaches received the training prior to delivering SFS coaching sessions in schools. The theory components of the workshops were delivered by the SFS Research Officer (JT) and Project Officer (CM), NHS Smoke Free Coordinator (HC), whilst the practical session was led by LCC sport coaches and a dance instructor.

SFS training resources

SFS coaches and each school received SFS training resources, comprising of a SFS training manual and smoke free pledges for children, adapted from the Tobacco Free Athletes project.

The training manual summarised information addressed in the training and included ten session plans, covering at least one of the five SFS themes:

- smoking and health
- smoking and sport performance
- contents of a cigarette and financial cost of smoking
- smoking and social influences
- benefits of participating in PA.

SFS themes were informed by previous research, data from SFS feasibility studies, and discussions with steering group members (academics, teachers and health practitioners). Once the themes and learning outcomes of sessions were agreed by project partners, session plans were designed by experienced sport coaches and a dance instructor, and reviewed by the SFS research team. Teachers then reviewed the plans, to ensure their usability and alignment with the National Curriculum outcomes for Key Stage 2. Session plans included learning and PE Curriculum outcomes, key messages for delivery and details of activities. Each session plan included: a 'SFS starter' (one or two warm-up activities), at least one main activity and a cool down. Each activity was given a child-friendly name (e.g. 'Nicotine Attack'). Sessions were designed to last for 60 minutes (see Table 3, page 100, for an example activity).

Teachers were incentivised to deliver a minimum of five session plans to Year 5 classes over the 2012/13 academic year up until post-data collection (May/ June 2013). Schools who met this requirement, and completed an evaluation for each session, received SFS

branded sports equipment (sports cones and bibs) at the end of the intervention.

Training resources also included SFS pledges for Year 5 children. Teachers were asked to encourage children to sign the pledge to be smoke free. It was recommended that children were given the opportunity to sign the pledge following the delivery of a SFS session delivered by a SFS coach or teacher.

SFS coaching sessions and school assembly

Each school received five SFS coaching sessions during school hours between October 2012 and April 2013. Generally, sessions replaced usual PE lessons. Schools received one multi-skill (delivered by LCC sports coaches), two dance (LCC instructors) and two football sessions (one by Everton in the Community and one by Liverpool FC Foundation coaches).

Excluding the session delivered by Everton in the Community, session plans were included in the SFS training manual. Collectively, session plans were designed so the five sessions delivered by coaches would cover information on all five SFS themes. Furthermore, teachers (particularly those who delivered PE to Year 5) were actively encouraged to watch or participate in coaching sessions.

On completion of the SFS coaching sessions, school received an assembly (between April and May 2013) from a local sport star (Tom Wolfenden, Natasha Jonas and Matthew Lee), celebrating children's participation in the project.

During the assembly, a member of the SFS research team (JT, CM or LF) re-capped smoke free messages through a question and answer session with children, before a sports star discussed their sporting achievements and the importance of being smoke-free.

The assembly concluded with a question and answer session between the sports star and children, with each participating child also receiving a certificate.

Based on school preferences, assemblies were delivered to the whole school, all junior year groups or only Year 5.

SFS branded collateral

All Year 5 children were given SFS branded water bottles, drawstring bags and pens. Teaching staff who attended the training, and additional staff who delivered PE to Year 5

children, received a SFS drawstring bag, note pad, pen, whistle and lanyard.

Incentives for comparison schools

Children from comparison schools were given SFS branded collateral for participating in the study (water bottle and drawstring bag). On completion of follow-up data collection, children will also receive SFS branded pens and each school will be given a SFS training pack.

Research and Evaluation

The primary aim of the research study was to assess the effectiveness of the intervention on Year 5 children's attitudes toward smoking, intentions to smoke and self-efficacy to stay a non-smoker. Short-term effects of SFS were tested immediately post-intervention. Mid to long-term effectiveness will be measured at approximately 12 months post-intervention. A secondary aim was to conduct a process evaluation, examining how SFS was implemented, and to explore views regarding its acceptability and sustainability. In particular, process data were collected to explore intervention strengths, identify improvements needed to aid delivery in future practice and address assumptions regarding intervention implementation.

Data collection

To measure the effectiveness of SFS, data were collected at baseline and post-intervention. Measures included a health-related smoking questionnaire (covering demographics and smoking-related concepts, including: behaviour, intentions, refusal self-efficacy, attitudes, family and friends smoking status, exposure to second-hand smoke, health status and enjoyment of PA) and expired Carbon Monoxide readings (an objective measure of smoking status). A questionnaire was also employed to assess the impact of the SFS training workshop on coaches' and teachers' confidence to deliver SFS. This was completed by coaches and teachers pre-training and immediately post-training, and only by teachers six months post-training. To help interpret impact data, on completion of the project, focus groups with children, and interviews with teachers and coaches, were conducted.

Process measures were also employed to explore project implementation, including SFS

booking logs, focus groups with children, semi-structured interviews with teachers and SFS coaches, project evaluation questionnaires (completed by children and teachers), as well as self-evaluations (completed by teachers) and direct observations (by researchers) of project delivery.

A schematic overview of intervention activities and research measures is shown in Figure 2 (page 102). The collection of post-intervention and process data was completed in May 2013 and a follow-up study to assess mid to long-term intervention effectiveness is planned for May/ June 2014 (for baseline to post-intervention results, see Foweather et al., 2013).

Conclusion

This article describes the design of a novel primary school-based PA intervention to prevent smoking uptake among nine to ten year-olds developed from evidence-based practice. The evaluation of the SFS project is ongoing; it is suggested that results of the study will provide valuable insight into the effectiveness of the SFS project and its implementation. If eventually proven to have a long-term impact on children's smoking-related attitudes, intentions and self-efficacy to be smoke free, there will be grounds to promote PA as an important component of a smoking prevention strategy and potentially other health risk behaviours. Importantly, the strengths of the intervention design, which is based on extensive formative work and working with local partners, will help to ensure that SFS can reach large cohorts of children, across diverse social backgrounds, utilising existing PE and sport infrastructures to aid long-term sustainability.

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Table 1. Main findings and recommendations from SFS feasibility studies

SFS feasibility study 1: community intervention	
Key findings	<ul style="list-style-type: none"> • Self-report data revealed that the campaign had no effect on children and young people's smoking behaviour (due to ceiling effect). Significant positive educational effects were observed in relation to attitudes and beliefs around smoking and weight gain, and smoking addiction. • Coaches' confidence to convey the SFS message significantly increased following the training workshop. • Stakeholders and some coaches suggested that the training workshop needed more practical tips in addition to the theoretical content to support the coaches in raising smoking issues • Whilst coaches considered the manual useful in delivery of SFS sessions, some coaches felt that they should have received the coaching manual at the beginning of the intervention. • Coaches implemented a range of techniques to deliver SFS key messages. However, a significant number of children and young people could not recall their coaches raising smoking issues with them during SFS activities. • PA was considered an acceptable method to deliver smoke free messages, however, a number of coaches commented that they found the youth club setting a challenging environment, with the lack of structure and children and young people's behaviour making it difficult to deliver health messages; coaching experience in community settings appeared to be a critical factor in managing these conflicts.
Key recommendations	<ul style="list-style-type: none"> • Brief intervention training should take into account different styles of learning, for example kinaesthetic, visual and auditory. • Brief intervention training should include a practical element within the workshop, where the coaches can practise ways of implementing messages through sport. • The coaching manual should be distributed to coaches at the workshop with directed learning to ensure that coaches access the information found within. • Experienced coaches (at least level 2) should be utilised to deliver SFS. • The SFS campaign should be trialled in more structured settings, such as voluntary sports clubs and schools.
SFS feasibility study 2: school intervention	
Key findings	<ul style="list-style-type: none"> • Self-report data revealed that the campaign had no effect on children's smoking behaviour (due to ceiling effect). Significant positive educational effects were again observed in relation to attitudes and beliefs around smoking, weight, and addiction. • Whilst coaches/ instructors recalled the three-hour training workshop to improve their knowledge surrounding smoke free messages, interview data suggested further practical demonstrations surrounding the delivery of these messages through activity would have been useful. • The structure of SFS (launch event, coaching sessions, and celebration event) was considered acceptable to teachers; although it was suggested by teachers that the celebration event could be utilised to show case children's smoking-related knowledge and present awards. • Overall, children, teachers and coaches provided a positive review of sessions. Activities delivered appeared to vary between classes. Moreover, it was reported sessions sometimes lacked structure and became repetitive, and teachers noted inconsistencies in the content of messages between coaches. • Schools were considered a suitable setting to deliver SFS, and the use of PA to deliver smoke free messages was considered acceptable; Children, teachers and coaches believed teachers could deliver smoke free messages during PE lessons.
Key recommendations	<ul style="list-style-type: none"> • A practical element to the training should be included where ideas of how to deliver sessions are practised. • Base each coaching session on a SFS theme (e.g. smoking and health, smoking and sport performance, and smoking and social influences) and develop SFS session plans for delivery by coaches. • Develop a support package for teacher delivery of SFS. • Change structure of celebration event to highlight end of intervention, showcasing children's learning and present awards.

Table 2. Examples of SFS key messages for delivery to children

• Key Messages*
• Smoking cuts down on fitness.
• Smoking reduces the amount of oxygen you can take in.
• A smoker's heart beats faster than that of a non-smoker.
• A non-smoker can recover from strenuous exercise quicker than those who smoke.

*Additional messages were delivered during the delivery of sessions in accordance to SFS key themes

Table 3. Example activity included in the training manual

Session type	Theme of session	Learning outcomes	SFS Key messages to be delivered	Example game
Multi-skill	Smoking and health	Describe the long and short term effects of smoking on health Recognise the advantages of being smoke free	Young smokers produce phlegm (Yuck!) more than twice as often as those who don't smoke	Clear it out! In teams ('non-smoker' vs. 'smoker'), children complete a hockey obstacle course by dribbling a large foam ball through a channel (made with ropes and slalom of cones). This represents the journey that phlegm takes down the throat and through the respiratory tract culminating in the lungs (represented using a hoop). Once through the obstacle course, children have to hit the ball into the hoop from a distance of around three metres (space dependant) until it stays in. The 'non-smoking' team then pick the ball up and run back with it, whilst the 'smoking' team must travel back not using their hands (with the ball between their feet) to show smokers difficulties in getting phlegm up.

*Note: Additional key message delivered in accordance to the SFS key themes

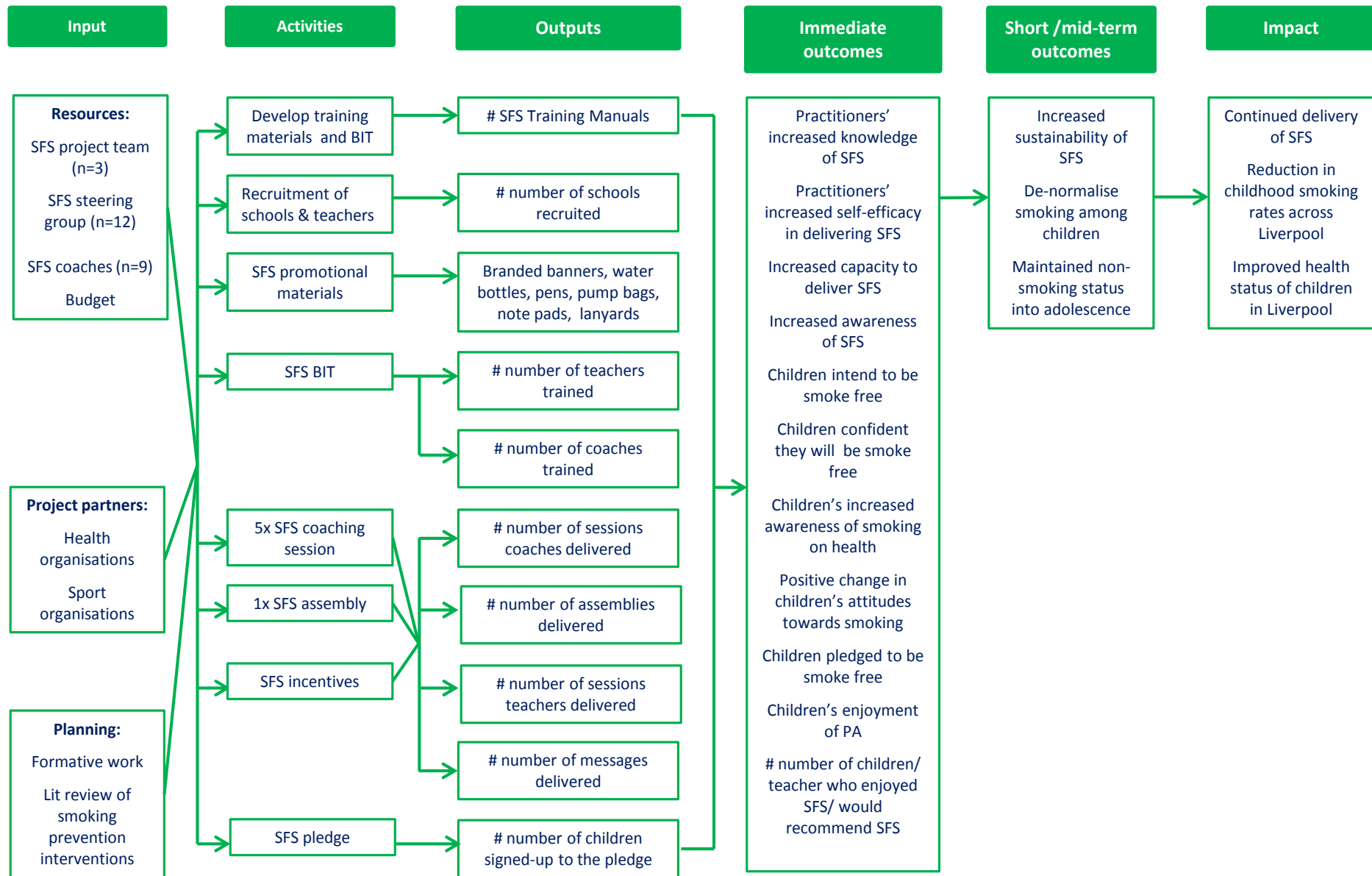


Figure 1. Logic model overview of SmokeFree Sports 2012-13 intervention

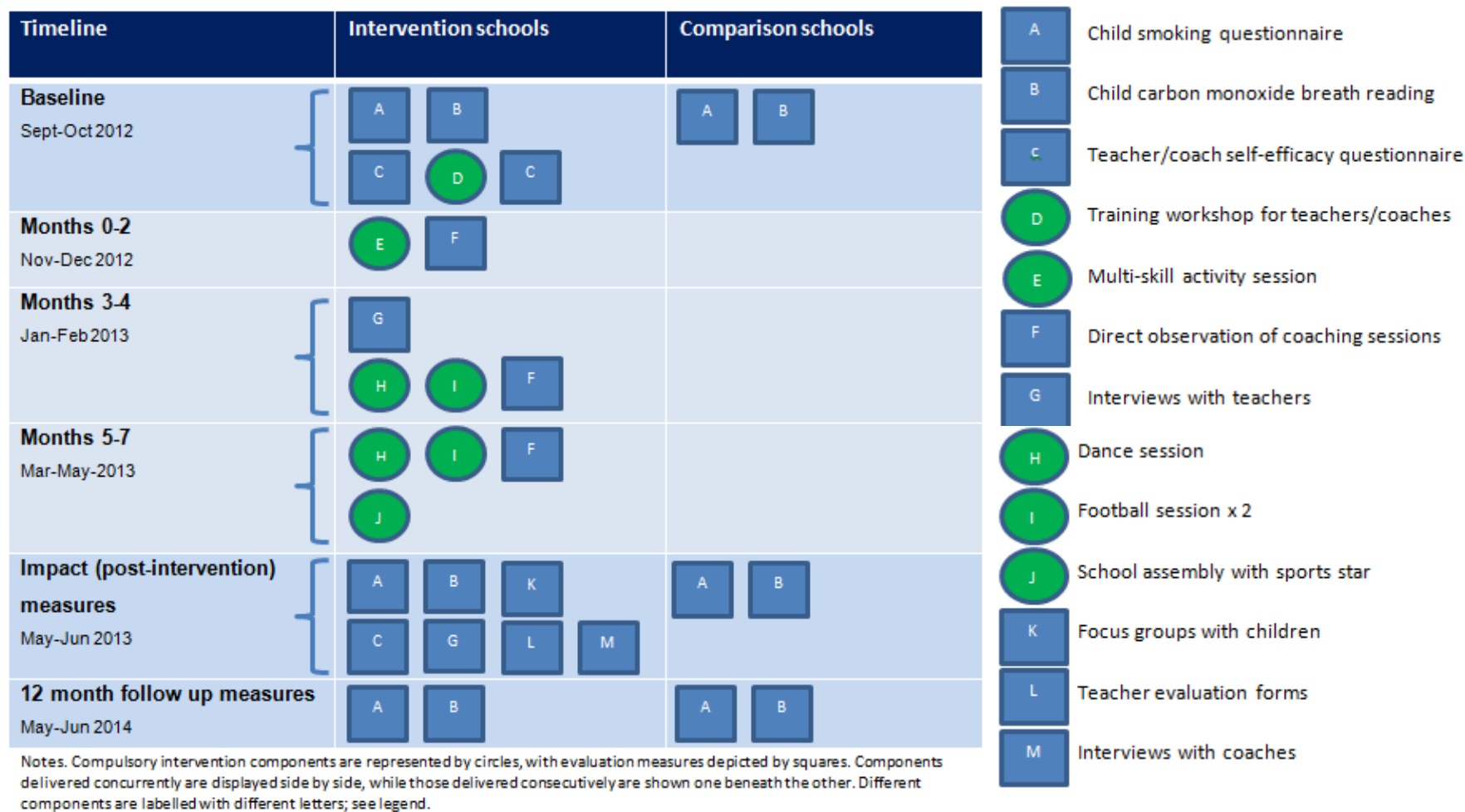


Figure 2. Schematic overview of SmokeFree Sports 2012-13 intervention