

A pilot randomised controlled trial of an intervention to reduce children's exposure to second-hand smoke in the home in disadvantaged communities in Scotland

AIMS

Context

- Creating a smoke-free home is key to reducing children's second-hand smoke exposure, and may also increase the likelihood of parents/carers quitting smoking
- There is no consensus on how best to support disadvantaged families to create a smoke-free home
- Use of nicotine replacement therapy (NRT) for temporary abstinence from smoking in the home may overcome barriers to stopping smoking indoors, including a lack of opportunities to take smoking outside the home and practical difficulties associated with sole parenting.

Aims

- We conducted a pilot randomised controlled trial evaluating the use of free, posted-to-home, nicotine replacement therapy (NRT) combined with behavioural support by telephone to help parents/carers who smoke to reduce children's exposure to second-hand smoke in the home

- The primary objective was to assess the feasibility of trial procedures, including recruitment, randomisation, retention, adherence, intervention delivery and data collection
- The secondary objective was to evaluate methods for collecting objective measures of second-hand smoke exposure together with resource use and economic data to inform the design of a future definitive trial.

KEY FINDINGS

- Recruitment was challenging and insufficient participation rates suggest that a larger trial to study intervention effectiveness is impractical in Scotland
- The study demonstrated acceptability of randomisation, feasibility of intervention delivery, and high rates of retention and adherence to the intervention
- The study also showed that second-hand smoke exposure can be measured using airborne fine Particulate Matter (PM2.5)* sensors in homes.

**Particulate matter (PM 2.5) refers to fine particles in the air that are 2.5 micrometers or smaller in diameter. These particles are extremely small, invisible and are produced when a cigarette burns. Because they are so small, PM2.5 particles can be inhaled deep into the lungs and can enter the bloodstream, making them one of the most harmful air pollutants.*

WHAT DID THE STUDY INVOLVE?

Methodology

- Participants were recruited through existing NHS Lanarkshire initiatives and social media
- Parents/carers >18 years old, smoke in the home, and care for one or more children aged 0-16 years were eligible to take part
- Participants were randomised to either the intervention (Group A) or control (Group B) arm

- Group A received NRT posted-to-home for 12 weeks free of charge, alongside fortnightly telephone calls and materials to support them reduce children's exposure to second-hand smoke
- Group B were signposted to the Scottish Government's 'Take it Right Outside' website which provides interactive advice on creating a smoke-free home
- To assess children's exposure to second-hand smoke, participants installed an air quality monitor to measure fine particulate matter ($PM_{2.5}$) concentrations in their living room for 7 days at baseline and 12-week follow-up and/or collected and posted saliva samples from their youngest child (age 5 or over) for cotinine analysis*.

** Salivary cotinine provides a measure of the amount of nicotine a person has taken into their body and is widely accepted as one of the best ways of quantifying how much second-hand smoke a person has inhaled.*

Public involvement:

- The study design was co-produced with individuals who smoke through two pilot studies conducted with mothers, fathers, and caregivers living in low-income areas in Edinburgh, Scotland
- The first pilot study explored preferences for smoke-free home interventions, with participants expressing strong support for the use of NRT for temporary abstinence, viewing it as a safer alternative to indoor e-cigarette use
- The second study pilot-tested the use of free NRT from pharmacies for use in the home for temporary abstinence for up to 12 weeks. Interviews indicated support for this novel approach, with suggestions for improvement shaping the design of the current pilot randomised controlled trial
- During the course of the pilot randomised controlled trial, two public involvement groups - the University of Nottingham Tobacco and Nicotine Group and an Edinburgh-based Fathers group - advised on inclusive recruitment strategies and compensation rates for participation.

WHAT WERE THE RESULTS AND WHAT DO THEY MEAN?

Results:

- Recruitment took place between June 2024 to September 2025. Of the 462 individuals who expressed an initial interest in taking part:
  - 83 were motivated to quit smoking and were instead referred to the local cessation service
  - 27 were recruited to the study and randomised to either Group A (n=17) or Group B (n=10)
  - 20 participants completed the 12-week study
  - No risks and/or safety concerns associated with this approach were reported by participants
- Approximately one-quarter (n=27/100) of the intended sample size was recruited
- Over 70% (12/17) of those assigned to the intervention arm and 90% of those assigned to the control arm (9/10) completed the study process
- In the intervention arm, over 70% (12/17) received more than one NRT delivery and engaged with at least one fortnightly telephone call
- The total cost of delivering the 12-week intervention, including NRT product and staff time for support, was estimated to be £244 per individual – comparable with other smoking cessation/reduction interventions
- Household air quality monitoring was the more acceptable way to measure children's exposure to second-hand smoke – with all participants selecting this approach
- Both the intervention arm and the control arm experienced reductions in household $PM_{2.5}$ concentrations. The effect was stronger in the intervention group (-45% v -26%).

What do these results mean?

- Recruitment challenges likely reflect a Scotland-wide reduction in the proportion of individuals who smoke in the home in the presence of children over the past decade, and perceived stigma in acknowledging this practice to healthcare staff

- Our findings highlight the value of integrating smoke-free home interventions within wider tobacco control strategies, which could increase cessation service reach in areas of deprivation. On this basis, we have co-developed and published a 'How to Guide'* with our NHS partners, for NHS Health Boards in Scotland, should they wish to try out this approach

  * *https://shine.ac.uk/wp-content/uploads/2026/09/HowTo-NRT-for-smoke-free-homes.pdf*

- Our study findings demonstrate both high retention and NRT adherence rates, suggesting that use of free posted-to-home NRT alongside behavioural support by telephone is both feasible and acceptable to those participants who agree to take part

- Our findings show that posting-to-home is a feasible and acceptable way to dispense NRT products, which has potential benefits for future research and practice

- Our findings also show that household measurement of $PM_{2.5}$ at baseline and follow-up was achievable among those who were recruited to the study.

WHAT IMPACT COULD THE FINDINGS HAVE?

- These findings build on previous studies conducted in Scotland and Nottingham, showing that providing individuals who smoke with free posted-to-home NRT as a way of creating a smoke-free home and reducing children's exposure to second-hand smoke in the home, is feasible, acceptable and cost effective

- Current National Institute for Health and Care Excellence (NICE) guidance supports the use of NRT for temporary abstinence in the home. NHS Health Boards should consider this approach, using the 'How-to-Guide'

- Although recruitment rates were insufficient to recommend the development of a larger trial in Scotland to test effectiveness of this approach, our findings could be used as a basis for trial development in other countries where smoking in the home remains commonplace and NRT is licensed. This may be particularly relevant in South-East Asian countries, for example, where smoking prevalence and second-hand smoke exposure remain high, alongside a rapid increase in multi-generational housing.

HOW WILL THE OUTCOMES BE DISSEMINATED?

Outcomes have been disseminated in a variety of ways, including presentations at UK and international conferences and webinars, and through the development and publication of peer-reviewed journal articles. Our study protocol has been published, and our main findings paper is currently in submission. We have a third paper in draft form detailing process evaluation and interview findings. We have also developed a How to Guide for NHS Health Boards to support practitioners should they wish to use this approach at local level. For full details of dissemination activities to date, please see the accompanying outcomes report.

CONCLUSION

Although recruitment rates were insufficient to recommend the development of a larger trial in Scotland, the study otherwise demonstrated acceptability and feasibility of use of NRT for temporary abstinence in the home to reduce children's exposure to second-hand smoke. The effectiveness of this approach should be evaluated in countries where smoking in the home is more common, thereby making recruitment at scale practical, and where NRT is licenced for use.

RESEARCH TEAM & CONTACT

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Additional Information:

- The study received £299,933 funding from the Scottish Government Chief Scientist Office (HIPS/22/25)
- The study obtained ethical approval from the West of Scotland Research Ethics Service 3 (15/12/2023, ref 23/WS/0153; Amendment 13/12/2024, ref AM01) and Research and Development Management approval from NHS Lanarkshire (22/05/2024,R&D ID: L22083).
- The study protocol is registered with the ISRCTN registry (ISRCTN79307718).