

SYNTHESIS

Smoke-Free Series: Smoke-Free Home Environments

Research Question: What is the effectiveness of interventions to reduce exposure to secondhand smoke (SHS) in the home setting?

Key Messages

- Three systematic reviews were included in this document on smoke-free homes – secondhand smoke (SHS) exposure.
- Interventions to reduce exposure to SHS in the home setting showed mixed effectiveness. Household smoking bans have been shown to decrease exposure to SHS. Interventions for smokers to reduce their cigarette consumption or quit smoking also reduce exposure to SHS at home, though the effect is not always sustained over time.
- There are limited studies with objective measures to assess the effectiveness of interventions to reduce exposure to SHS.
- These findings add to the evidence base regarding the effectiveness of interventions to reduce secondhand smoke exposure in the home. Consistent with home-based interventions summarized in the Smoke-Free Ontario Scientific Advisory Committee 2016 (SFO-SAC 2016) report, smoking bans and supporting behaviour change among smokers were associated with reduced secondhand smoke exposure.
- More studies that use biomarkers and examine reductions in exposure over time are needed.

Background

- Children are most commonly exposed to SHS in the home environment;¹ increased exposure to SHS is known to cause lower respiratory illnesses, asthma, middle ear disease (e.g., recurrent otitis media) and lower levels of lung function in children.²
- In Ontario, Canada, most public places have been made smoke-free by the *Smoke-Free Ontario Act, 2017* that restricts smoking in venues both in indoor settings (e.g., restaurants, public venues, workplaces) and outdoor settings (e.g., parks and playgrounds, sports fields, restaurant

patios).³ Therefore, unregulated environments, such as the home without indoor smoking bans are notable places of SHS exposure for both children and adults.⁴

- Evidence from the SFO-SAC (2016)⁵ found that complete smoke-free policies in multi-unit housing are effective to reduce exposure to SHS and thirdhand smoke, and smoke-free housing policies encourage positive changes in smoking behaviour, such as reduced smoking and increased cessation.
- This synthesis is focused on the evidence published since the SFO-SAC (2016) report, specifically on interventions to reduce secondhand smoke exposure in the home.

Methods

- A peer-reviewed literature search was conducted in September 2019 by Public Health Ontario (PHO) Library Services for articles published between 2015 and 2019. The search did not extend earlier than 2015 because a comprehensive summary of evidence on this research question was previously done (see the Protection Chapter in SFO-SAC (2016)).⁵
- The search involved four databases, including MEDLINE, Embase, CINAHL and SocINDEX. The following search terms were included, but were not limited to: smoke-free, housing, secondhand smoke, and multi-unit housing. The full search strategy is available upon request from PHO.
- Articles were eligible for inclusion if they were review-level articles, published between 2015 and 2019, and addressed smoke-free interventions in the home setting that resulted in reduced exposure to secondhand smoke at home and/or measured smoking cessation outcomes for the smoker(s) at home. Articles that were not in the home setting, did not have effectiveness outcomes (e.g., cessation, prevention, protection outcomes), or were not reviews (e.g., primary studies, letters, editorials) were excluded.
- One reviewer screened titles and abstracts, and two reviewers screened full-text versions of all articles for inclusion. For all relevant papers, one PHO staff extracted relevant data and summarized content.
- Quality appraisal was conducted for each included review using the [Healthevidence.org](https://www.healthevidence.org) Quality Assessment Tool for Review Articles.⁶ Two reviewers made independent assessments for each of the 10 quality criteria. Any discrepancies were resolved by discussion.

Findings

- The literature search identified 107 articles, of which three met inclusion criteria.⁷⁻⁹ All three papers were systematic reviews.⁷⁻⁹ The three reviews were appraised as strong quality.⁷⁻⁹ Jurisdictions of the included studies within reviews included: the United States, Australia, the

Netherlands, China, Bangladesh, Turkey, Taiwan, Iran, and Hong Kong. The findings below are organized by review.

- The systematic review by Brown et al., (2017) examined family-focused interventions to reduce harms from smoking and SHS exposure in primary aged school children. They found that due to differences in outcomes measured across studies, the findings regarding the most effective approach or intervention to reduce SHS exposure in the home environment were mixed.⁷
 - The intervention groups of the included studies showed significantly higher instances of smoke-free homes based on child and/or parent self-report. The various interventions included school-based interventions to support families implementing smoke-free homes; counselling and health education for families; parental behavioural counselling for SHS exposure reduction; and testing the effects of air filters/cleaners for children with asthma.
 - Of the studies that used the biomarker urine cotinine to measure SHS exposure, one showed lower child urine cotinine at six months in the intervention group; however, the other studies that used this biomarker measure did not show any decreased urine cotinine levels over time.
- The systematic review by Dherani et al., (2017) examined behaviour change interventions to reduce SHS exposure at home for pregnant women (e.g., home smoking bans or smoking cessation for the person in the household that smokes).⁸ The interventions used various behavioural models (e.g., the Health Belief Model, the Trans-theoretical Model), different modes of delivery (e.g., advice from doctors, telephone hot-line, one-on-one counselling, role playing, motivational interviewing), and in different settings (e.g., the home setting or hospital clinic setting). Among the intervention groups of the included studies in the review, there was a decrease in exposure to SHS in the home at the follow-up period, though the decreases were modest and the measure was self-report. One study did assess the impact of SHS reduction on pregnancy outcomes (i.e., a range of low birth weight to very pre-term birth) and showed that reduced SHS exposure reduced instances of lower birth weight to very pre-term birth. Overall, the included studies in the review did show moderate reductions in exposure to SHS outcomes; however, it is challenging to know the extent of the effect of the intervention on reduced SHS exposure with non-objective measures. More studies using biochemical measures and clinical measures in a variety of settings are needed.
- The review by Zhou et al., (2019) examined the effectiveness of interventions that reduced exposure to parental SHS in homes among children in China (e.g., partial or full home smoking bans or smoking cessation for the person in the household that smokes).⁹ The range of interventions in the included studies were self-help materials, poster prompts at home warning against smoking at home, individual counselling, group counselling, and counselling via mobile phone (with five of the included studies being developed based on theoretical frameworks: protection motivation theory, trans-theoretical model, theory of planned behaviour, and the 5A's approach). The intensity of the interventions ranged from one to six sessions and follow-up

ranged from immediate post-study follow-up to 21 months follow-up. Overall, the effectiveness of the interventions from the included studies were mixed. There was some degree of a positive effect in reduction of tobacco consumption and SHS exposure at home in the intervention groups; however, some studies found that the reduction in tobacco consumption was not sustained at longer follow-up periods (e.g., three to six months, 12 months, 21 months).

Limitations

- Very few of the included studies within reviews used objective measures (e.g., the biomarker such as urine cotinine), so it is challenging to know the extent of the effectiveness of the interventions and the outcomes.
- Some of the individual studies within the reviews were from non-OECD countries and the review by Zhou et al. (2019) is based in China, Hong Kong, and Taiwan, and may not be applicable to the Canadian context.⁹

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