Effectiveness of home-based, multi-trigger, multicomponent interventions with an environmental focus for reducing asthma morbidity: a community guide systematic review

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CRD summary
The authors concluded that home-based multi-trigger multicomponent interventions with an environmental focus were effective in improving overall quality of life and productivity in children and adolescents with asthma. The effectiveness of these interventions in adults was inconclusive due to the small number of studies and inconsistent results. The conclusions reflect the evidence presented.

Authors' objectives
To evaluate the evidence of effectiveness of home-based multi-trigger multicomponent interventions with an environmental focus to improve asthma-related morbidity outcomes.

Searching
MEDLINE, EMBASE, ERIC, PsycINFO, Web of Science, The Cochrane Library, Sociological Abstracts and CINAHL were searched to February 2008 for articles in English. Bibliographies of reference lists were scanned for additional studies. Experts in the field were contacted.

Study selection
Eligible studies evaluated home-based multi-trigger and multicomponent interventions with an environmental component. Interventions needed to include at least one home visit, target multiple asthma triggers and evaluate at least one health outcome. Comparison groups could be concurrent or historical. The primary outcomes of interest were quality of life (symptom-days, quality of life scores), utilisation of healthcare, productivity (school or work days missed) and physiological (pulmonary function). Studies that evaluated primary prevention or occupational asthma were excluded.

The content and components of the included interventions and settings varied widely between studies (data reported in an online appendix). Most of the included studies conducted an environmental assessment; these ranged from minor (non-structural) to major (structural). Most studies also included education with and without remediation. The number of home visits ranged from one to eight. Visits were made by community health workers, nurses, respiratory therapists, physicians, social workers, housing officers, environmental educators and trained sanitarians or a mixture of specialists. Most of the studies targeted homes where only children or adolescents had asthma. Most of the studies were conducted in USA and others were in UK, Canada and Japan.

The authors did not state how many reviewers selected studies for inclusion.

Assessment of study quality
Quality was assessed taking into consideration suitability of study design and execution. Study execution was rated as good (0 to 1 limitations), fair (2 to 4 limitations) or limited (more than 5 limitations) based on relevant criteria. Only studies rated as good or fair were included in the review.

Two reviewers independently assessed quality using a standard form. Differences were resolved through discussion with the entire review team.

Data extraction
Data were extracted to enable calculation of effect sizes for each outcome. Continuous outcomes were reported as either group mean differences or relative percentage changes. Dichotomous outcomes were reported as absolute percentage point changes. Data were grouped into studies of adults, children and adolescents and categorised by outcome.

It appeared that two reviewers independently extracted data using a standard form. Differences were resolved through
Methods of synthesis
Data were pooled and summary effect measures reported as medians with interquartile intervals for outcomes. Range of values were reported where there were fewer than seven studies for each outcome. Studies where data could not be converted to effect measures were not included in the summary effect measures in the synthesis. Subgroup analyses were conducted by study design (controlled versus uncontrolled) and quality of life instrument.

Results of the review
Twenty-three studies (4,755 participants, range 18 to 1,033) were included in the review: 13 RCTs, one before-and-after concurrent comparison group study and nine before-and-after studies with no concurrent comparison. One RCT was rated as good quality and the others were fair. Follow-up ranged from one month to 48 months. Drop-out rates (where available) ranged from 0% to 78%.

Quality of life in children and adolescents (16 studies): There was a clinically significant reduction in the number of days with asthma symptoms (median -0.8 symptom days/two-week period, range -2.3 to 0.6; six studies) for intervention groups. Subgroup analysis found a median reduction in symptom-days/two-week period of -0.7 (six controlled studies) and -2.3 symptom days (one uncontrolled study).

The proportion of children with asthma symptoms at follow-up reduced significantly overall for intervention groups (median -15.4%, range -36% to +1.7%; four studies). There was a smaller reduction for controlled trials (-5.2%; two studies) compared with uncontrolled trials (-27.4%; two studies). There was an improvement in symptom or quality of life scores for intervention groups (median 16.5%, interquartile intervals 1.8% to 25%; nine studies) but this was not deemed to be clinically significant. There was a smaller improvement in subgroup analysis for controlled trials (median 3%; five studies) than uncontrolled studies (median 25%; four studies).

Quality of life in adults (two studies): One study reported a significant improvement in quality of life or symptoms. The other study found no significant improvements.

Productivity in children and adolescents (10 studies): There was a reduction in the number of school days missed per year for intervention groups (median -12.3 school days missed per year, interquartile intervals -31.2 to -3.4; five studies). There was a smaller reduction for controlled trials (-6.5 days per year) compared to uncontrolled studies (-18.2 days per year).

Productivity in adults (one study): There were no significant differences between groups in the proportion of people who missed more than one work or school day per year due to asthma.

Healthcare utilisation in children and adolescents (18 studies): There was a borderline reduction for the number of acute care visits per year for intervention groups (median -0.57 visits per year, interquartile intervals -1.71 to -0.33; 10 studies). Again this improvement was smaller for controlled studies (-0.37; six studies) compared with uncontrolled studies (-3.38; four studies).

Healthcare utilisation in adults (one study): There were no significant differences between groups for the proportion of adults with one or more acute care visit for asthma symptoms.

Physiologic pulmonary function in children and Adolescents (seven studies): Two studies reported improvements in pulmonary function testing. The five other studies found no significant improvements overall.

Cost information
Cost benefit ratios ranged from $5.3 to $14.0 (three studies). Cost effectiveness studies reported costs ranged from $12 to $57 per additional asthma symptom-free day.

Authors’ conclusions
Home-based multi-trigger multicomponent interventions with an environmental focus were effective in improving overall quality of life and productivity in children and adolescents with asthma. The effectiveness of these interventions in adults was inconclusive due to the small number of studies and inconsistent results.
The review question was clearly defined with broad inclusion criteria. Several relevant sources were searched and some efforts were made to reduce potential for publication bias. Inclusion of studies was limited to those in English so there was potential for language bias. Study quality was assessed but detailed criteria were not stated and only an overall grading was provided so it was not possible to independently assess the quality of the individual studies. Methods to reduce reviewer error and bias were used for the assessment of validity and data extraction; it was unclear whether similar methods were used for study selection. The methods of synthesis were appropriate given the diversity between the studies in terms of study designs, interventions and their components, outcomes and outcome measurements. The authors noted that some of the results were of marginal clinical significance.

The authors conclusions reflect the evidence presented. Potential for language bias should be borne in mind.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated a need for additional research to evaluate the effectiveness of home-based multi-trigger multicomponent interventions with an environmental focus in adults. Research was needed to determine individual contributions of intervention components.

**Funding**

Oak Ridge Institute for Scientific Education (ORISE), USA.

**Bibliographic details**


**DOI**

10.1016/j.amepre.2011.05.012

**Original Paper URL**


**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Adolescent; Adult; Allergens /adverse effects; Asthma /epidemiology /etiology /prevention & control; Child; Efficiency; Environmental Exposure /adverse effects /prevention & control; Environmental Restoration and Remediation /methods; Home Care Services /organization & administration; House Calls; Housing; Humans; Quality of Life

**AccessionNumber**

12011004852

**Date bibliographic record published**

02/11/2011

**Date abstract record published**

08/08/2012

**Record Status**

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the reliability of the review and the conclusions drawn.