Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma (Review)

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[Intervention Review]

Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

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ABSTRACT

Background

Dampness and mould in buildings have been associated with adverse respiratory symptoms, asthma and respiratory infections of inhabitants. Moisture damage is a very common problem in private houses, workplaces and public buildings such as schools.

Objectives

To determine the effectiveness of remediating buildings damaged by dampness and mould in order to reduce or prevent respiratory tract symptoms, infections and symptoms of asthma.

Search strategy

We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2011, Issue 2), which contains the Cochrane Acute Respiratory Infections Group's Specialised Register, MEDLINE (1951 to June week 1, 2011), EMBASE (1974 to June 2011), CINAHL (1982 to June 2011), Science Citation Index (1973 to June 2011), Biosis Previews (1989 to June 2011), NIOSHTIC (1930 to November 2010) and CISDOC (1974 to November 2010).

Selection criteria

Randomised controlled trials (RCTs), cluster-RCTs (cRCTs), interrupted time series studies and controlled before-after (CBA) studies of the effects of remediating dampness and mould in a building on respiratory symptoms, infections and asthma.

Data collection and analysis

Two authors independently extracted data and assessed the risk of bias in the included studies.

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Main results

We included eight studies (6538 participants); two RCTs (294 participants), one cRCT (4407 participants) and five CBA studies (1837 participants). The interventions varied from thorough renovation to cleaning only. We found moderate-quality evidence in adults that repairing houses decreased asthma-related symptoms (among others, wheezing (odds ratio (OR) 0.64; 95% confidence interval (CI) 0.55 to 0.75) and respiratory infections (among others, rhinitis (OR 0.57; 95% CI 0.49 to 0.66)). For children, we found moderate-quality evidence that the number of acute care visits (among others mean difference (MD) -0.45; 95% CI -0.76 to -0.14)) decreased in the group receiving thorough remediation.

One CBA study showed very low-quality evidence that after repairing a mould-damaged office building, asthma-related and other respiratory symptoms decreased. For children and staff in schools, there was very low-quality evidence that asthma-related and other respiratory symptoms in mould-damaged schools were similar to those of children and staff in non-damaged schools, both before and after intervention. For children, respiratory infections might have decreased after the intervention.

Authors' conclusions

We found moderate to very low-quality evidence that repairing mould-damaged houses and offices decreases asthma-related symptoms and respiratory infections compared to no intervention in adults. There is very low-quality evidence that although repairing schools did not significantly change respiratory symptoms in staff or children, pupils' visits to physicians due to a common cold were less frequent after remediation of the school. Better research, preferably with a cRCT design and with more validated outcome measures, is needed.

PLAIN LANGUAGE SUMMARY

Interventions for preventing or reducing symptoms of asthma, other respiratory symptoms and respiratory infections in mould-damaged buildings

Moisture damage is a very common problem in private houses, workplaces and public buildings around the world and has been associated with adverse respiratory symptoms, asthma and respiratory infections of inhabitants. Our aim was to determine the effectiveness of remediating buildings damaged by dampness and mould in reducing or preventing the occurrence of respiratory tract symptoms, infections and symptoms of asthma.

We included eight studies with 6538 participants; three randomised controlled trials (RCTs) and five non-RCTs. The interventions aimed to remove mould and dampness from family houses, schools or, in one study, an office building. When remediation of houses was compared to no intervention at all, we found evidence that mould remediation reduced asthma-related symptoms and respiratory infections. It also decreased the use of asthma medication in asthmatics. We found very low-quality evidence that after repairing a mould-damaged office that asthma-related and other respiratory symptoms decreased.

For extensive remediation compared with information only, there was moderate-quality evidence that the number of asthma symptom days among asthmatic children did not decrease significantly. However, the number of emergency and inpatient visits decreased after the repair of the building. Pupil visits to physicians due to a common cold were less frequent after the building was repaired but respiratory symptoms (stuffy nose, runny nose, dry throat, hoarseness, eye irritation) were similar before and after the intervention both among pupils and adults working in the schools. Due to a wide range of outcome measures and variation in study designs, it was difficult to draw hard conclusions. Better research is needed, preferably with a cluster-RCT (cRCT) design and with more validated outcome measures.

BACKGROUND

Description of the condition

Respiratory symptoms and diseases are related to exposure to mould in damp buildings (Bornehag 2001; Bornehag 2004; IoM 2004a; WHO 2009). According to these reviews, dampness and mould in buildings are associated with adverse respiratory symp-

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toms. Bornehag 2001 lists 51 studies, in most of which a relationship exists between self reported dampness and asthma, coughing and wheezing (odds ratios (OR) ranging from 1.4 to 2.2). Bornehag 2004 found 15 studies, 13 of which showed a relationship between asthma or wheezing and dampness. The third review (IoM 2004a) from the USA found sufficient evidence of a relationship between dampness or mould exposure and upper respiratory tract symptoms, coughing, wheezing and exacerbations of asthma.

The reviews found limited evidence that dyspnoea (defined as shortness of breath) is associated with dampness, or that lower respiratory tract infections (LRTIs) are related to dampness or mould exposure. However, a recent meta-analysis (Fisk 2007) based on the Institute of Medicine (IoM) review, yielded ORs that ranged from 1.34 to 1.75 for upper respiratory tract symptoms, coughing, wheezing, current asthma, asthma diagnosed at some stage and asthma development. With the exception of asthma development, the lower limit of the confidence interval (CI) exceeded 1.2. Interpretations across the world differ between the causal relationship of these exposures and health effects but the reviews agree that a need exists for increased public awareness and health measures to reduce dampness in buildings.

Exposure to damp buildings occurs in three different ways. First, people are exposed in their residences. It has been estimated that two-thirds of one-family houses and 60% of apartments are damaged by dampness during their intended period of use in Finland (Koivisto 1996; Nevalainen 1998; Partanen 1995). Second, workers are exposed at their workplaces. Third, children can be affected if they are exposed at school or at daycare centres.

Description of the intervention

The intervention in this review is remediation of damp buildings. Controlled trials have been carried out in schools: Savilahti 2000 studied children in two elementary schools and found that after renovation of moisture-damaged buildings, the prevalence of respiratory symptoms decreased and was no longer significantly different from the control group. Another study dealing with mould-damaged school buildings (Meklin 2002) compared the effectiveness of different kinds of renovations. One school was repaired thoroughly, one partially and one was left unrepaired. A school without mould problems was used as a control. The health improvements correlated with the degree of renovations: if no repairs were conducted, no improvement in health was observed. The longer pupils had been exposed to mould, the smaller the improvement in health observed after repairs.

In addition, follow-up studies of before-after comparisons in schools (Åhman 2000) and among workers (Sudakin 1998) report success in reducing symptoms. Similar studies have been performed on people working in contaminated buildings (Jarvis 2001). However, not all interventions seem to be successful (Rudblad 2002).

Although most trial authors studied self reported symptoms, there is some evidence that lung function measurements are also influenced by the interventions (Ebbehøj 2002).

How the intervention might work

Moulds and other microorganisms do not grow without dampness, so when a building is damp, it will also contain microbes (IoM 2004b). Dampness is the driving factor and yet health effects are mostly considered to be associated with microbial exposure, even though the specific causative agent is still unknown. In addition, analysis and measurement of mould exposure is difficult, whereas moisture damage due to dampness of buildings can be investigated more readily. Remediation of the buildings aims to remove damaged material (that usually also contains mould) and repair the causes of dampness (leaking roof or pipes, faults in construction, etc.). Interventions in this review included cleaning, repairing all relevant causes of moisture damage, removing damaged materials and replacing them with new ones, or effectively drying construction materials that could not be replaced (for example, concrete). In addition, if general remediation (for example, improving ventilation or other improvements to indoor air) was reported, this was taken into account in the evaluation, in which case the change in mould and moisture was noted.

Why it is important to do this review

We do not know of any previous reviews that summarise results of intervention studies in damp buildings. However, the World Health Organization (WHO) recommends that dampness and mould-related problems should be prevented and should be renovated when they occur because they increase the risk of hazardous exposure to microbes and chemicals (WHO 2009). We wanted to conduct a systematic review of the effects of repairing buildings damaged by dampness and mould on the prevention of recurrent acute respiratory tract symptoms, respiratory tract infections (RTIs) and asthma. RTI related to mould exposure is an important issue among children. In adults, the highest OR was for upper respiratory tract symptoms, followed by coughing, wheezing and current asthma (Fisk 2007). The association between recurrent acute RTIs and mould exposure is not clear; no causal relationship has been shown in studies. At work, asthma and asthma-like symptoms are important concerns. In 2007 in Finland, exposure to mould in the workplace was the most often reported cause of occupational asthma (37%) (Karjalainen 2007). If building repairs can be justified by evidence-based data as having positive health effects, the number of buildings repaired will increase, improving the health of those exposed.

OBJECTIVES

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To evaluate the effectiveness of repairing buildings damaged by dampness and mould in order to reduce or prevent RTIs, respiratory symptoms and asthma.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs), cluster-RCTs (cRCTs), controlled before-after (CBA) studies and interrupted time series (ITS) studies.

We anticipated that the availability of RCTs for this topic would be limited, due to the fact that these interventions are very different from clinical interventions. Remediation of moisture-damaged buildings is not implemented at an individual level; instead, the intervention is applied to a building and the health consequences for all individuals are followed. For example, schools have been repaired either thoroughly, partially or left without repairs, and the health of pupils has been observed. This makes individual randomisation impossible. In principle, this can be partly overcome by randomisation at the building level, as in a cluster-RCT. Randomisation of buildings is difficult because damage usually occurs in isolated buildings and it is very difficult to gather enough buildings to make randomisation possible. Therefore, we also included the following non-randomised designs in our review: CBA studies and ITS studies.

CBA studies (also called prospective cohort studies) are easier to perform, taking into account that the intervention is carried out at group level and that they still have reasonable validity. We have defined controlled before-after studies as studies in which measurements of the outcome are available both before and after the implementation of the intervention and for both the intervention and control group. We defined a control group as a group that is similar to the intervention group but has not undergone an intervention or an alternative intervention. In addition, we included controlled before-after studies with a non-exposed control group. Here, the hypothesis is that after the intervention, the outcome in the intervention group will have decreased to the same level as in the non-exposed control group - a so-called equivalence study design.

ITS studies are studies with or without a control group in which the outcome has been measured at least three times before the intervention and at least three times after the intervention. The intervention is applied at a specific well-defined moment in time and is supposed to have either an immediate effect or a long-term effect. The outcome is measured several times before and after the intervention, therefore it is possible to take time trends into account and thus make up for the lack of a control group.

We also collected uncontrolled before-after studies and case studies to use not as evidence of effectiveness but to compare with the results of higher quality studies in the Discussion section.

Types of participants

The review focused on studies of children (inhabitants of buildings, pupils of schools or children in daycare centres) and adults (inhabitants of buildings or employees) in buildings that had been damaged by water or moulds. We only accepted studies where the exposure was verified by samples taken from the air, dust or building materials, by specialist inspection or by participants' self reported observations of dampness through questionnaires or interviews (Koskinen 1999a).

Types of interventions

We included all interventions that involved repairs to buildings with moisture or mould damage. We categorised them according to the amount of repairs that had been carried out, that is either thoroughly repaired or partially repaired buildings. We compared these to cases of no intervention or, if data were available, among different categories of interventions.

Types of outcome measures

Primary outcomes

We included studies which reported data (incidence or prevalence) on acute RTIs, allergic alveolitis, asthma, asthma-like symptoms or other respiratory symptoms as outcome measures, based on medical measurements, medical records or self reported symptoms. We grouped outcomes in the studies into one of the following four categories.

1. Respiratory symptoms: any of these respiratory symptoms reported by means of a questionnaire (sore throat, eye irritation, nasal congestion, runny nose or sneezing).
2. Respiratory infections: acute respiratory infections (influenza-like symptoms, rhinitis, influenza, common cold, tonsillitis, otitis, bronchitis, sinusitis, conjunctivitis or pneumonia) based on medical records or as self reported diseases.
3. Allergic alveolitis (as physician's diagnosis) (Lacasse 2003).
4. Asthma-related outcomes or asthma-related symptoms by means of:

i) physician's diagnosis as reported by patients or their parents (of the children) (Toren 1993; Toren 2006); or

ii) asthma symptoms measured by a validated questionnaire (Burney 1989); or

iii) prescription of medication for asthma; or

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iv) diagnostic tests for asthma (hyper-responsiveness of the airways, bronchodilator response, variation in peak expiratory flow (PEF) measurements, increased exhaled nitric oxide (NO)) (Pellegrino 2005); or

v) self reported respiratory symptoms (coughing, wheezing, chest tightness or shortness of breath).

Search methods for identification of studies

Electronic searches

We searched the Cochrane Central Register of Controlled Trials (CENTRAL) 2011, Issue 2, part of *The Cochrane Library,* www.thecochranelibrary.com (accessed 15 June 2011), which includes the Cochrane Acute Respiratory Infection Group's Specialised Register, the Cochrane Occupational Health Field's Specialised Register and Economic Evaluations, MEDLINE (1951 to June week 1, 2011), EMBASE (1974 to June 2011), CINAHL (1982 to June 2011), Science Citation Index (1973 to June 2011), Biosis Previews (1989 to June 2011), NIOSHTIC (1930 to November 2010) and CISDOC (1974 to November 2010).

We used the terms listed in Appendix 1 to search MEDLINE and CENTRAL. We combined the MEDLINE search with the Cochrane Highly Sensitive Search Strategy for identifying randomised trials in MEDLINE: sensitivity- and precision-maximising version (2008 revision); Ovid format (Lefebvre 2009). We adapted these terms to search EMBASE (Appendix 2), CINAHL (Appendix 3), Science Citation Index (Appendix 4), Biosis Previews (Appendix 5), NIOSHTIC (Appendix 6) and CISDOC (Appendix 7).

Searching other resources

We did not apply any language or publication restrictions. We searched the databases of the WHO and the UK National Health Service. We screened the reference lists of all relevant papers for additional studies and we contacted trial authors of published trials and other experts in the field for information on unpublished trials.

Data collection and analysis

Selection of studies

Two review authors (RS, MJ) independently screened the identified titles and abstracts to choose potential studies using both the inclusion and exclusion criteria. We obtained the full text of articles that appeared to meet the inclusion criteria. We resolved disagreements by discussion and consulted a third review author (JV) if disagreements persisted.

Data extraction and management

We did not apply blinding of studies as we expected to recognise the studies. Two review authors (RS and JU) independently extracted data into data extraction forms. The form included essential study characteristics of the design, the participants and interventions; primary, secondary and intermediate outcomes and results. We also noted any adverse events and the sponsorship of the study.

Assessment of risk of bias in included studies

Two review authors (RS, JU) independently assessed the quality of the studies by using a consensus method if disagreements occurred. A third review author (JV) was consulted if disagreement persisted. We contacted the trial authors to provide additional information if information was missing for the evaluation of the methodological criteria.

We used the 'Risk of bias' tool recommended in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011) to assess the methodological quality of the included RCTs and cRCTs.

We used a validated instrument (Downs 1998) to appraise controlled before-after studies. The instrument has been shown to have good reliability, internal consistency and validity. We only used the scales on internal validity to judge the risk of bias of the included studies. We analysed the studies separately according to the study design.

Measures of treatment effect

We plotted the results for RCTs and controlled before-after studies of each trial as odds ratios (ORs) and their 95% confidence intervals (CIs) for dichotomous outcomes and means and standard deviations (SD) for continuous outcomes.

Unit of analysis issues

Only one study employed a cRCT design and the trial authors adjusted for the cluster effect in their analyses. We used the raw data as reported by the authors for input into RevMan (RevMan 2011) because the effect sizes were only slightly different after adjustment and the clusters were very small.

Dealing with missing data

We contacted trial authors to obtain missing data in their reports, which were needed for meta-analysis. Shortt 2007 provided the numbers of people in the intervention and control groups. Howden-Chapman 2007 and Savilahti 2000 sent extra data files. We calculated missing statistics, such as standard deviations (SDs) or correlation coefficients, from other available statistics such as the P values according to the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011).

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From Jarvis 2001, we could only extract data for the case definitions "building related symptoms" and "respiratory illness", but not for single symptoms, because the symptom rates of both the index and control group were not reported systematically before and after remediation of the building. Jarvis did not report the symptom rate in the control group after the intervention. Therefore, we assumed that it was similar to that before the intervention.
From Kercsmar 2006, we extracted data on the mean asthma symptom days from the figures in the article. Two review authors (RS, JV) independently did this and obtained the same results. The figure showed bars with unequal parts for the 95% CI. We took the largest part of the bar to calculate the SD and calculated the SD from the standard error (SE) using the formula SE=SD/SQRT(N). We also calculated the SE from the 95% CI based on the formula SE=(upper limit - lower limit)/3.92, according to the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011).
In the case of Åhman 2000, two review authors (RS, JV) independently extracted the percentages for the outcomes from the figures and obtained the same results.
Patovirta 2004a reported a prevalence of respiratory infections and spirometry results but we could not use them as both the results of the control group and the baseline values were missing. We calculated SDs from the P values given in the article as they were not provided for the grouped symptoms. We calculated the F value based on the P values, taking the square root from the F value to equal the t-value. We then calculated the SDs based on the formula SE=MD/t according to the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011).
Savilahti 2000 reported the mean number of children's visits to a physician due to different respiratory infections that the authors found in the patient records and 95% CIs, which we recalculated into SDs. We could not calculate similar data for the self reported data of the patients despite getting extra data files from the trial authors.
We calculated numbers from the table in the Shortt 2007 article, since the trial authors could not provide them due to loss of the original files. We corrected the numbers of the control and intervention groups that were erroneously reversed in the article.

Assessment of heterogeneity

We defined clinically homogeneous studies as those with similar populations (inhabitants of houses, adults in schools and school children), interventions (any remediation of the buildings) and outcomes (asthma-related symptoms, respiratory infections, respiratory symptoms) measured at the same follow-up point (one to three-year follow up). We also tested for statistical heterogeneity by means of the Chi^2 test as provided in the meta-analysis graphs. If the I^2 statistic value resulting from this test is greater than 50%, heterogeneity among studies is substantial.

Assessment of reporting biases

We intended to assess publication bias with a funnel plot but the number of studies for this was insufficient.

Data synthesis

We pooled studies with sufficient data, judged to be clinically homogeneous, using RevMan 2011. We used a random-effects model when studies were statistically heterogeneous, otherwise we used a fixed-effect model.
We have presented results separately for RCTs and controlled before-after studies.
We used the GRADE approach as described in the *Cochrane Handbook for Systematic Reviews of Interventions* to present the quality of evidence (Higgins 2011). For RCTs we took high quality as the initial quality level and downgraded it to moderate, low or very low quality if there were one or more limitations according to the criteria 'risk of bias', 'consistency of results', 'directness of evidence', 'precision of results' or 'existence of publication bias'. For non-randomised studies we took low quality as the level of departure and upgraded the level to moderate or high quality if the included studies had large effects or no obvious bias. We further downgraded the quality to very low-quality evidence if the studies had limitations. The results of the grading of the evidence are shown in Table 1.

Table 1. Grading of the evidence

Comparison	Outcome	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Evidence quality
House remediation versus no remediation adults	Asthma-related symptoms	2 RCT studies (low risk of bias) and 1 CBA study (high risk of bias)	Inconsistent results between the high risk of bias study and the low risk of bias studies	-	-	-	Moderate-quality evidence

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Table 1. Grading of the evidence (*Continued*)

	Asthma medication	1 RCT study (low risk of bias)	Perceived change in medication inconsistent with the reported use of medication	-	-	-	Moderate-quality evidence
	Respiratory infections	2 RCT studies (low risk of bias) and 1 CBA study (high risk of bias)	-	-	Wide CIs in the high risk of bias study	-	Moderate-quality evidence
Office building remediation versus no exposure adults	Asthma-related symptoms	1 CBA study (high risk of bias)	-	-	-	-	Very low-quality evidence
	Respiratory symptoms	1 CBA study (high risk of bias)	-	-	-	-	Very low-quality evidence
House remediation versus information children	Asthma-related symptoms	1 cRCT study (low risk of bias)	-	-	In a mixed model a significant decrease at 10-month follow up	-	Moderate-quality evidence
	Number of acute care visits	1 cRCT study (low risk of bias)	-	-	A significant decrease only 6 to 12 months after remediation	-	Moderate-quality evidence
School remediation versus no exposure children	Asthma-related symptoms	1 CBA study (high risk of bias)	-	-	Wide CIs	-	Very low-quality evidence
	Respiratory infections	1 CBA study (high risk of bias)	-	-	-	-	Very low-quality evidence

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Table 1. Grading of the evidence (*Continued*)

	Respiratory symptoms	1 CBA study (high risk of bias)	-	-	-	-	Very low-quality evidence
School remediation versus no exposure in adults	Asthma-related symptoms	2 CBA studies (high risk of bias)	Inconsistent results	-	Wide CIs	-	Very low-quality evidence
	Respiratory infections	1 CBA study (high risk of bias)	-	-	No control group data	-	Very low-quality evidence
	Respiratory symptoms	2 CBA studies (high risk of bias)	Inconsistent results	-	Wide CIs	-	Very low-quality evidence

CI = confidence interval
RCT = randomised controlled trial
CBA = controlled before-after study
cRCT = cluster-randomised controlled trial

Subgroup analysis and investigation of heterogeneity

We accepted studies in which exposure was assessed by measuring fungal spores in the air or using cultures obtained from settled dust or material samples, visual observations of mould growth, or signs of moisture damage. We intended to perform a subgroup analysis according to exposure grade but the number of studies for this was insufficient.

Sensitivity analysis

We intended to perform a sensitivity analysis but the high-quality studies were too few in number.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

Results of the search

The original search retrieved a total of 6135 references from CENTRAL, MEDLINE, EMBASE, CINAHL, Science Citation Index, Biosis Previews, NIOSHTIC and CISDOC. Two review authors (MJ, RS) reviewed the retrieved results. We ran an updated search in June 2011 and retrieved a further 209 references. All together, 587 references dealt with the subject of the review. On the basis of the title and abstract, 19 seemed to fulfil the inclusion criteria and we read the full text. Two review authors (RS, JU) independently reviewed these results and seven articles fulfilled our inclusion criteria. We handsearched reference lists of these articles and included four academic dissertations (Immonen 2002; Koskinen 1999b; Patovirta 2005; Taskinen 2001) and one additional study.

Included studies

Study design

Of the eight studies, three were RCT studies (one of which was a cRCT), five were CBAs and none were ITS. In two studies (Howden-Chapman 2007; Shortt 2007) the unit of randomisation was either the household (N = 1350) or the house (N = 100).
In one CBA study (Jarvis 2001), symptoms of occupants of a large office building (N = 488) were compared before intervention

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and after reoccupation of the building. The occupants of a non-damaged building served as a control group.
In three CBA studies, a specific group of pupils or teachers (N = 44, 397 and 525) of moisture-damaged schools was followed and compared to the control group of a non-damaged school (Åhman 2000; Patovirta 2004a; Savilahti 2000).

Year and geographical location

Four studies were performed before the year 2000 and another four after this. Two studies were conducted in the USA, two in Finland, one in Sweden, one in Ireland, one in New Zealand and one in South Wales, UK.

Participants

The characteristics of the participants were not reported in detail in three studies (Jarvis 2001; Patovirta 2004a; Shortt 2007). The participants were all adults in the Patovirta 2004a study. Shortt 2007 focused on elderly people but did not report the age or gender of the participants. Jarvis 2001 also gave no more details of the participants other than that they were adult employees. In two studies, the participants were only children (Kercsmar 2006; Savilahti 2000). Three studies reported symptoms of both children and adults (Åhman 2000; Burr 2007; Howden-Chapman 2005). The sample sizes varied from 44 to 4407 participants, with an average of 565 participants.

Exposure

In five studies, water, mould or damp damage were determined on the basis of specialist inspections (Åhman 2000; Burr 2007; Jarvis 2001; Kercsmar 2006; Patovirta 2004a). In addition, two studies measured indoor humidity (Burr 2007; Kercsmar 2006) and four studies took microbiological samples (Jarvis 2001; Kercsmar 2006; Patovirta 2004a; Savilahti 2000). In two studies, the exposure to moulds was based on participants' own reports (Howden-Chapman 2005; Shortt 2007). In the study by Kercsmar 2006, dust samples were obtained from a child's bedroom and, in addition to mould, measurements of dust mite, cockroach, mouse and rat urine allergens and endotoxin were also taken.
The effectiveness of remediation was verified with the same measures as the exposure before intervention in seven studies. In one study the postintervention measurements were not mentioned (Åhman 2000).

Interventions

The contents of the interventions are summarised in Table 2.

Table 2. Contents of interventions aimed at eradicating indoor mould

Study	Type of intervention			Verification of mould damage			Control group	Notes
	Thorough remediation	Limited structural changes	Cleaning	Specialist observation	Microbiological samples	Self report		
Burr 2007			X	X			People in mould-damaged houses (waiting list)	
Howden-Chapman 2007		X (insulation package)				X	People in mould-damaged houses (waiting list)	
Jarvis 2001	X			X	X		People in a healthy building	

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Table 2. Contents of interventions aimed at eradicating indoor mould (*Continued*)

Kercsmar 2006	X			X	X		People in mould-damaged houses (waiting list)	
Patovirta 2004a	X			X	X		People in a healthy school	Intervention reported in a separate article
Savilahti 2000	X			X	X		People in a healthy school	
Shortt 2007		X (central heating)				X	People in mould-damaged houses, no intervention	
Åhman 2000	X			X			People in a healthy school	

In five studies the repairs aimed to remediate the wet structures and prevent further mould damage (Åhman 2000; Jarvis 2001; Kercsmar 2006; Patovirta 2004a; Savilahti 2000). In two studies, the repairs were not as extensive and in these studies technical improvements were made (Howden-Chapman 2007; Shortt 2007). In one study, the house was only cleaned thoroughly with fungicides without removing damaged structures and a positive input fan was installed (Burr 2007).

The repairs made to the school buildings were not described in detail but water-damaged material was removed and replaced with new material. Structural changes to prevent further water leakage were also carried out. Kercsmar 2006 directed interventions at reducing water infiltration, removing water-damaged building materials, making alterations to heating/ventilation/air conditioning, lead hazard control and environmental cleaning. General strategies included cleaning mould from hard surfaces, removing mould exposure pathways, stopping rainwater intrusion, exhausting water vapour from kitchens and bathrooms and repairing plumbing leaks. Specific interventions included repairing faulty cold-air return to furnaces, eliminating sub-slab heating duct systems, disconnecting and redirecting downspouts and reducing moisture in crawlspaces and basements.

Howden-Chapman 2007 described an intervention that included installing ceiling insulation, preventing draught around windows and doors, fitting sisal-containing paper beneath floor joists and a polythene moisture barrier on the ground beneath the house. Intervention integrity or compliance was checked by energy consumption from regional electricity and gas companies. In Shortt's study the main intervention was installing a heating system (Shortt 2007), in addition to minor improvements.

In the study of Jarvis 2001 the primary intervention proved to be insufficient, resulting in a second, more profound remediation. In the first intervention, they removed visibly moldy gypsum board, made structural changes including the replacement of windows and installed a vapour-air retarder. The second renovations included the removal of moldy wallboard, installation of Heating Ventilation and Air-conditioning (HVAC) insulation, the discarding of upholstered furniture, cleaning of interior surfaces and discarding of damaged books and archives.

Control group

In two RCT studies the control group was composed of a waiting list in which mould-exposed houses did not receive any remediation until the end of the intervention of the study group (Burr 2007; Howden-Chapman 2007). In the study of Burr 2007 an anti-mould kit was given one year later to the control group and in the study of Howden-Chapman 2007 the houses of the con-

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trol group were insulated at the end of the study. In the Kercsmar 2006 study families randomised to the control group were given information on how to improve home indoor air quality but were given no specific tangible resources, materials or advice to do so. At the end of the study, participants in the control group were given a vacuum cleaner and offered home remediation.

In three school studies, the control group consisted of pupils or teachers in non-damaged schools, at which no intervention was targeted (Åhman 2000; Patovirta 2004a; Savilahti 2000). The studies were thus set up to show that repairing water-damaged buildings leads to outcomes as in non-exposed persons in normal buildings. We called these 'equivalence studies'. Jarvis 2001 used two control groups: occupants of a comparison building not known to have indoor air complaints and occupants who had relocated from the subject building one month earlier. However, the before and after evacuation results of the latter are not systematically reported. In the study of Shortt 2007 the control group was exposed to moulds but did not undergo an intervention.

Follow up

The follow-up time varied from seven months to three years and in six studies was one year.

Health outcomes

All studies used self administered questionnaires to survey various health-related issues. Items related to respiratory health composed the majority of the questions. Objective measurements were used in four studies: one measured peak expiratory flow (PEF) rate variability (Burr 2007); one checked the number, duration and main International Classification of Diseases (ICD)-10 codes for hospital admissions (Howden-Chapman 2007); one reported the number of respiratory infections and use of antibiotics from the patient records (Savilahti 2000); and two studies measured changes in lung function measurements (Kercsmar 2006; Patovirta 2004a). One outcome in the study of Jarvis 2001 was hypersensitivity pneumonitis but no results of this are shown.

Excluded studies

Six studies were excluded because they were prospective cohort studies without a control group (Bernstein 1983; Haverinen-Shaughnessy 2004; Lloyd 2008; Patovirta 2004b; Santilli 2003; Stubner 2000). Howden-Chapman 2005 provided no information regarding respiratory health data but these are presented in another paper included in the review. The RCT study of Morgan 2004 focused on the exposure to dust mites, passive smoking, cockroaches, pets and rodents, as well as mould and it was impossible to extract the effects on respiratory health of mould remediation alone.

Risk of bias in included studies

The quality rating of included studies is presented in Table 3. The maximum internal validity score of the RCTs and cRCTs was nine out of 13 points. In three CBA studies it was seven points and in two it was five points.The reporting quality score was high, 10 to 11 points out of 11, in the RCT and cRCT studies and in one controlled before-after study, two CBA studies scored nine points out of 11 and two CBA studies two to four points.

Table 3. Quality rating of included studies

Study	Reporting quality range 0 to 11	External validity range 0 to 3	Internal validity total range 0 to 13	Blinding participants	Blinding outcomes	Blinding allocation	Randomised	Adjusted confounding	Adjusted lost follow up
Burr 2007	10	2	9	0	0	0	1	1	0
Howden-Chapman 2007	11	3	8	0	0	0	1	1	1
Jarvis 2001	4	3	4	0	0	0	0	0	0
Kercsmar 2006	11	1	8	0	0	0	1	0	1

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Table 3. Quality rating of included studies (*Continued*)

Patovirta 2004a	7	1	7	0	0	0	0	0	1
Savilahti 2000	11	3	7	0	0	0	0	0	1
Shortt 2007	2	1	5	0	0	0	0	0	0
Åhman 2000	9	3	7	0	0	0	0	1	1

0 = criterion not met; 1 = criterion met

Allocation

A permuted block scheme was used in the study of Kercsmar 2006. The other two RCT studies did not explain the method of allocation.

Blinding

The study participants were not blinded, with the exception of one study (Howden-Chapman 2007) in which the outcome assessors were blinded. The independent building inspectors and the community interviewers were not told which households were in the intervention group. However, because the householders knew which houses belonged to the intervention group, some of them may have revealed it to the interviewers, which means concealment may have been questionable.

Incomplete outcome data

The number of participants lost to follow up was clearly reported in six studies but only three studies gave characteristics of the participants that dropped out or reasons for it (Burr 2007; Howden-Chapman 2007; Kercsmar 2006).
Kercsmar 2006 used an intention-to-treat (ITT) analysis and reported the results as both "as-treated" and "as-randomised" analyses.

Selective reporting

The paper by Howden-Chapman 2007 did not report the results of measured fungal activity, allergens or smoking in the paper included in this review. Multiple logistic regression was used to analyse the relation between symptoms and school in the article of Åhman 2000. However, not all of these results were reported in the paper. In the study of Patovirta 2004a, spirometry results were reported only in the end of mould repair in the index and control group, and the follow-up data concerns only the index group. Results of self reported health status were shown only from the index group. Evidently, Jarvis 2001 have used multiple regression analyses to adjust confounders but the results are not shown.

Other potential sources of bias

Especially in the non-randomised studies there were important baseline differences between the intervention and control groups. Only three studies tried to adjust for these differences in their analyses (Table 3).

Effects of interventions

1. Remediation versus no intervention in houses - effects on adults' respiratory health

We identified three studies for this comparison (Burr 2007; Howden-Chapman 2007; Shortt 2007). One included the removal of all visible mould, fungicide treatment in mould-damaged houses and the installation of a positive input fan in damaged houses (Burr 2007). The other intervention used the installation of a standard retrofit insulation package (Howden-Chapman 2007). One study (Burr 2007) reported changes in respiratory symptoms at six and 12 months after intervention and the other (Howden-Chapman 2007) reported results only one year after the trial. These studies were rated as high quality. The study of Shortt 2007 is a controlled before-after study evaluating the effect of energy efficiency measures, including central heating system, on specific illnesses of the participants.

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1.1. Asthma-related outcomes or asthma-related symptoms in randomised controlled trials (RCTs)

For the comparison of remediation versus no remediation, we found evidence that remediation improved asthma-related symptoms (wheezing) compared to no intervention with an odds ratio (OR) of 0.45 (95% confidence interval (CI) 0.17 to 1.19) (Analysis 1.1) at six months after remediation (Burr 2007). At 12-month follow up, the pooled results of Burr 2007 and Howden-Chapman 2007 showed a significant decrease in asthma symptoms (wheezing) with an OR of 0.64 (95% CI 0.55 to 0.75) (Analysis 1.1.2). There was also evidence following remediation of a significant perceived change in asthma medication use at six months (OR 0.11; 95% CI 0.04 to 0.28) (Analysis 1.1.3) but not at 12-month follow up (OR 0.98; 95% CI 0.53 to 1.84) (Analysis 1.1.4) when compared to no remediation (Burr 2007). In addition, use of preventers diminished significantly at both six and 12 months but use of relievers only at 12 months (Burr 2007). Breathing problems were significantly less at both six and 12 months follow up in the intervention group (OR 0.19; 95% CI 0.08 to 0.42 and OR 0.33; 95% CI 0.17 to 0.63, respectively) (Burr 2007).

Remediation decreased morning phlegm in the intervention group compared to the control group with an OR of 0.65 (95% CI 0.53 to 0.78) (Analysis 1.1.13) (Howden-Chapman 2007). Sleep and speech disturbed by wheezing were also reported less in the intervention group compared to control with OR 0.65 (95% CI 0.50 to 0.85) (Analysis 1.1.14) and 0.56 (95% CI 0.36 to 0.87) (Analysis 1.1.15) (Howden-Chapman 2007).

1.2. Asthma-related outcomes in controlled before-after (CBA) studies

Shortt 2007 found a decrease in reported asthma symptoms after the intervention but ORs were not significant either before or after the intervention: OR at baseline 1.44 (95% CI 0.45 to 4.62) and at follow up 0.57 (95% CI 0.10 to 3.25) (Analysis 1.2).

We conclude that in the comparison of remediation versus no remediation there is moderate-quality evidence (two low risk of bias studies and one high risk of bias study) that remediation decreases asthma-related symptoms, compared to no intervention.

1.3 Respiratory infections in RCTs

For the comparison of remediation versus no remediation we found no evidence that remediation decreased rhinitis symptoms at six-month follow up compared to the control group, with OR 0.58 (95% CI 0.23 to 1.44) (Burr 2007). However, there was evidence that remediation decreased rhinitis and colds or flu at 12-month follow up compared to no remediation with a pooled OR of 0.57 (95% CI 0.49 to 0.66) (Burr 2007; Howden-Chapman 2007) (Analysis 1.3).

We also found evidence in the comparison of remediation versus no remediation that rhinoconjunctivitis was reported less frequently in the intervention group compared to the control group with no intervention at 12-month follow up (OR 0.36; 95% CI 0.15 to 0.87) but not at six months follow up (OR 0.36; 95% CI 0.13 to 1.01) (Burr 2007).

1.4 Respiratory infections in CBAs

We found evidence that the number of chest infections decreased after remediation in Shortt 2007 when compared to no remediation. At baseline, the OR for chest infections was 18.71 (95% CI 2.33 to 150.47) and at follow up 1.88 (95% CI 0.50 to 7.10). There was only one case of pneumonia in the intervention group both at baseline and after intervention, whereas the control group had no cases of pneumonia (OR 3.59; 95% CI 0.14 to 90.36) (Analysis 1.4).

We conclude that the comparison of remediation versus no remediation shows moderate-quality evidence that remediation of mould in houses decreases respiratory infections in asthma patients and in patients with respiratory symptoms.

2. Remediation versus no exposure in offices - effects in adults

2.1. Asthma-related outcomes or asthma-related symptoms in CBA studies

We found evidence that remediation decreased respiratory asthma-related symptoms in the intervention group when compared to the non-exposed control group (Jarvis 2001). At baseline there was a statistically significant difference in the prevalence of respiratory illness between the intervention building and control building (OR 3.71; 95% 2.16 to 6.37), which disappeared after remediation (OR 1.30; 95% 0.72 to 2.35). A case of respiratory illness was when an individual respondent reported at least two out of three chest symptoms: coughing, wheezing or shortness of breath (Analysis 2.1).

2.2 Respiratory symptoms in CBA studies

For the comparison of remediation versus no exposure, we found evidence that remediation decreased building-related symptoms in the intervention group: at baseline there was a statistically significant difference in the prevalence of building-related symptoms between the index building and control building (OR 5.33; 95% CI 3.03 to 9.35) that disappeared after remediation (OR 1.37; 95% CI 0.73 to 2.54) (Jarvis 2001) (Analysis 2.1). Building-related symptoms were classified if an individual respondent reported symptoms in at least three of the following five symptom categories, while working in the building: nasal, throat, eyes, neuropsychological or headache.

For the comparison of remediation versus no exposure, we found very low-quality evidence that asthma-related symptoms and other respiratory symptoms are more common in occupants of a mould-

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damaged office building before remediation. However, after remediation they were similar to those of a control group in a non-damaged office building.

3. Mould remediation versus information only in houses - effects on respiratory health of children

3.1 Asthma-related outcomes or asthma-related symptoms in RCTs

Comparison of the unadjusted mean maximal asthma symptom days in the index and control group at baseline and after 12 months revealed no statistically significant differences (mean difference (MD) -1.00; 95% CI -4.83 to 2.83 at baseline and -2.45; 95% CI -6.11 to 1.21 at one-year follow up) (Kercsmar 2006) (Analysis 3.1). However, participants in the remediation group reported fewer symptom days at the last follow up compared to those in the control group. In a mixed model adjusted for baseline asthma severity and season of the year, the authors report a significant decrease in asthma symptom days at 10-month follow up and last visit. The evidence showed that the number of acute care visits decreased during the postremediation period (six to 12 months after remediation) when compared to the group that received information only (MD -0.45; 95% CI -0.76 to -0.14).

For the comparison of extensive remediation versus information only, we conclude that there is moderate-quality evidence that the number of asthma symptom days in asthmatic children did not decrease significantly after remediation compared to the control group that received only cleaning information. However, the number of acute care visits decreased in the intervention group.

4. Mould remediation versus no exposure in schools - effects on children

4.1 Asthma-related outcomes or asthma-related symptoms in CBA studies

In the comparison of remediation versus no exposure, we found no evidence that asthma-related symptoms decreased after the intervention but the 95% CI indicated that there is still considerable uncertainty about this effect. The prevalence of coughing in the index and control group was the same at baseline and after remediation, and the difference between the intervention and control groups was not significant (OR 1.03; 95% CI 0.59 to 1.81) (Åhman 2000) (Analysis 4.1).

No one reported dyspnoea or wheezing before or after the remediation of the school building (Åhman 2000).

4.2 Respiratory infections in CBA studies

For the comparison of remediation versus no exposure we found evidence that visits to a physician due to a common cold were more frequent among the pupils of the mould-damaged school before remediation than among those of a healthy school (MD 0.12; 95% CI 0.03 to 0.21). However, after thorough reparations, the difference was no longer significant (MD 0.03; 95% CI -0.05 to 0.11) (Savilahti 2000) (Analysis 4.1). The differences in the number of visits to a physician due to all respiratory infections between the index and control group were not significant at baseline or after remediation (MD 0.17; 95% CI -0.05 to 0.39 and 0.05; 95% CI -0.12 to 0.22). On studying the data from the patient records, we also found no significant effect of remediation on the number of visits due to tonsillitis, otitis, sinusitis, bronchitis or pneumonia or in use of antibiotics. Based on the results of the questionnaires, the authors report a decrease in the incidence of respiratory symptoms, common colds and bronchitis in the renovated school when compared to the control school. These data were based on questionnaire results that we were not able to use.

4.3 Respiratory symptoms in CBA studies

For the comparison of remediation versus no exposure we found no evidence that respiratory symptoms decreased in the intervention group compared to those in a healthy school (Åhman 2000) (Analysis 4.3). The prevalence of eye irritation symptoms was higher in the index school than in the control school both before and after remediation (OR 24.52; 95% CI 1.47 to 409.79 and 18.68; 95% CI 1.10 to 315.84). Using multiple logistic regression analysis of the symptoms, with adjustment for a recent common cold, atopy and "unrest in class", Åhman 2000 report that a significantly elevated prevalence odds ratio for eye irritation decreased after remediation.

The prevalence of a stuffy nose among the pupils in the index school was higher than in the control school before remediation (OR 2.19; 95% CI 1.14 to 4.19). After remediation, the figures remained similar (OR 3.03; 95% CI 1.38 to 6.67).

The intervention did not affect the occurrence of a runny nose: the OR for a runny nose was the same at both baseline and follow up (OR 1.48; 95% CI 0.71 to 3.10).

The differences in the prevalence of dry throat between the index and control group were not significant at baseline or after remediation (OR 1.43; 95% CI 0.61 to 3.38)).

The differences in the prevalence of hoarseness between the index and control group were not significant at baseline or after remediation (OR 1.48; 95% CI 0.71 to 3.10 and 1.24; 95% CI 0.49 to 3.17).

We found very low-quality evidence that asthma-related symptoms and other respiratory symptoms in children in mould-damaged schools were similar to those of children in non-damaged schools either before or after intervention (Åhman 2000). There was very low-quality evidence that visits to a physician due to a

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common cold were more frequent among the pupils of the mould-damaged school than in the healthy school, but after remediation, the number of visits due to a common cold remained similar (Savilahti 2000).

5. Mould remediation versus no exposure in schools - effects on adults

In the controlled before-after studies of Patovirta 2004a and Åhman 2000, the respiratory health of teachers and other personnel was followed after extensive remediation in the schools. Follow-up time in the study of Patovirta 2004a was up to three years and in the study of Åhman 2000 seven months.

5.1 Asthma-related outcomes or asthma-related symptoms in CBA studies

We found no evidence of the effect of the intervention in the comparison of remediation versus no exposure in adults. In the beginning there was no difference between the symptoms of the index and control group (MD 0.50; 95% CI -0.28 to 1.28) (Patovirta 2004a). There was also no significant difference after one or three years (MD 0.12; 95% CI -0.69 to 0.93 and 1.31; 95% CI 0.28 to 2.34, respectively). The outcome consisted of a sum of lower respiratory symptoms. These included coughing with phlegm, dyspnoea and wheezing, which can all be defined as asthma-related symptoms.

In the study of Åhman 2000, coughing was not significantly more common in the exposed group at baseline or after the intervention (OR 8.02; 95% CI 0.42 to 152.85 and OR 3.31; 95% CI 0.15 to 72.32) (Analysis 5.1). At baseline, five of the 34 members of the personnel in the index school reported dyspnoea, while in the control school no one had symptoms of dyspnoea. At follow up, two people reported dyspnoea in the index school but in the control group there were no complaints of dyspnoea. The odds ratio for dyspnoea was 8.02 (95% CI 0.42 to 152.85) at baseline, and at the follow up it was 3.31 (95% CI 0.15 to 72.32).

At baseline two of the 34 members of the personnel in the index school reported wheezing, while in the control school no one suffered from these symptoms. At follow up there were no complaints of wheezing in either group. The odds ratio for wheezing was 3.31 (95% CI 0.15 to 72.32) in the beginning and at the follow up it was not estimable.

5.2 Respiratory infections in CBA studies

In the study of Patovirta 2004a, the authors report a decreased incidence of self reported tonsillitis, infection of the middle ear, bronchitis, pneumonia and sinusitis in the index group after remediation at one and three-year follow up but no data for respiratory infections in the control group are shown (Analysis 5.2).

5.3 Respiratory symptoms in CBA studies

In the study of Patovirta 2004a, irritative symptoms meant nasal bleeding, rhinitis, sore throat, hoarseness, coughing and eye irritation. The index group and control group did not differ from each other at the baseline (MD 0.38; 95% CI -1.68 to 2.44) or after intervention at one and three-year follow up (MD -0.20; 95% CI -2.33 to 1.93 and -0.30; 95% CI -2.65 to 2.05, respectively) (Analysis 5.4).

In the study of Åhman 2000, no one reported eye symptoms in the control group at either baseline or follow up. There were also no eye symptoms in the index group after remediation (Analysis 5.3). The odds ratio for eye irritation was 8.02; 95% CI 0.42 to 152.85 in the beginning, and at the follow up it was not estimable.

At baseline, the index group reported fewer stuffy nose symptoms than the control group, but the difference was not statistically significant (OR 0.80; 95% CI 0.16 to 3.99). The numbers did not change after remediation (OR 0.80; 95% CI 0.16 to 3.99) (Åhman 2000).

There were no reports of runny noses in the index group at baseline, but they increased after remediation. The odds ratio for a runny nose at baseline was 0.11 (95% CI 0.01 to 2.48) and 0.38 (95% CI 0.06 to 2.46) at follow up (Åhman 2000).

At baseline there were no complaints of dry throat in the control group. The odds ratio for dry throat in the mould-damaged school when compared to a healthy school was 13.79 (95% CI 0.75 to 252.77) at the beginning and 1.64 (95% CI 0.29 to 9.32) after remediation (Åhman 2000).

Hoarseness was not significantly more common in the index group at baseline (OR 11.73; 95% CI 0.63 to 216.96) or after intervention (OR 3.31; 95% CI 0.15 to 72.32) (Åhman 2000).

Concerning remediation of mould in schools, we conclude that there is very low-quality evidence that asthma-related symptoms and other respiratory symptoms in adults working in a mould-damaged school are similar to those working in a non-damaged school, either before or after remediation of the building.

Economic outcomes

One study (Howden-Chapman 2007) also included an economic evaluation in its report and concluded that a modest investment (GBP 700 excluding taxes) led to significant improvements in self reported health and a lower risk of children being absent from school or adults taking sick days. A conservative cost-benefit analysis of the intervention indicated that the tangible health and energy benefits outweighed the costs by a factor approaching two. Kercsmar 2006 also reports the costs of the intervention per household (USD 3458 ± 2795), but presents no cost-benefit analysis. Shortt 2007 reports a significant fall in household fuel costs, from GBP 1113 per annum to GBP 751.56 ($P < 0.001$) on average.

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DISCUSSION

Summary of main results

We found moderate-quality evidence that remediation of mould in houses decreases asthma-related symptoms and decreases respiratory infections, compared to no intervention. There was very low-quality evidence that asthma-related symptoms and other respiratory symptoms in children and school personnel in mould-damaged schools are similar to those of children and personnel in non-damaged schools either before or after profound remediation of moisture damage, but there is still considerable uncertainty about this effect size. However, we found very low-quality evidence that visits to a physician due to a common cold among school children decreased after remediation, when compared to a healthy school.

Overall completeness and applicability of evidence

All the included studies are pragmatic trials that focus on showing that the remediation of mould and moisture damage in buildings decreases symptoms. The effect of mould remediation on health is difficult to study and this may explain why we found only few studies. All the interventions in the studies are used in current practice. There is a wide variation in the thoroughness of mould remediation, varying from complete rebuilding to improving heating and ventilation. All studies focused on respiratory symptoms, which is the main health effect implicated in mould infestation of buildings. Mould infestation is a problem in ordinary houses, apartment buildings, office buildings and schools, affecting both adults and children. All these types of buildings and participants were represented in the included studies.

We found four studies in which the authors had used an equivalence design, meaning that they tried to show that the symptoms after remediation decrease to a level similar to that of individuals in non-damaged buildings. However, in most of these studies there was no difference between the symptoms of the index and control groups at baseline and thus no improvement could be seen after the remediation of moisture damage. A limited exposure time may explain the lack of an effect in the school studies. It is possible that the youngest pupils spend only a couple of hours per day at school and this may not be long enough to cause respiratory symptoms. It is also possible that the missing effects in children reflect inaccurate observation by parental respondents. In the study of Savilahti, the patient records of the local health centre were also reviewed and a decrease in the number of visits due to a common cold was seen.

Quality of the evidence

Double-blinding and placebo-control components of study populations are difficult to include in the designs of studies on the effects of the moisture remediation in damaged buildings. Nevertheless, single-blinding was used in one study (Howden-Chapman 2007). Three studies targeted the remediation of school buildings. These studies may over-report symptoms, because moisture damage is usually obvious and well known.

In no intervention control group studies, a placebo effect cannot be ruled out. However, some studies had objective outcomes that may be more reliable than the results of questionnaires. Kercsmar 2006 reports that pulmonary function data were only available for a limited number of study participants and does not present the data in her article. However, she reports that no significant improvement was seen in lung function measurements. Patovirta 2004a reports spirometry results at the end of mould removal, but does not provide any data for these measures before intervention. Two studies found a decreased need for visits to physicians based on patient records (Howden-Chapman 2007; Savilahti 2000) and there was also a trend toward fewer hospital admissions for respiratory conditions.

The baseline and postintervention evaluations were either performed by trained specialists, through microbiological analyses, or were based on participants' own reports. However, microbiological assessments from indoor air or materials are prone to many kinds of bias. Quantitative evaluation of the degree of moisture damage by observation is difficult and subjective. What makes the research on health effects of moulds challenging is that the specific agents causing respiratory symptoms in mould-damaged buildings are still not known.

Respiratory symptoms were surveyed using various questionnaires. Jarvis 2001 used the questionnaire of the American Thoracic Society supplemented by some additional questions. The instrument in the study of Kercsmar 2006 was the Children's Health Survey for Asthma. Only two studies (Åhman 2000; Patovirta 2004a) used the same questionnaire (Örebro MM40). Those used in other studies were not standardised. The prevalence of symptoms was difficult to compare because of different wording and definitions in the questionnaires. The terms may mean different things for different respondents; for example, for some, rhinitis may mean a viral disease, whereas others may consider it an allergic disease. In fact, these diseases may also be confused clinically.

Adjustment for confounding factors was considered inadequate in most studies. In three studies, the characteristics of the participants in the intervention and control groups were not reported at all. This is very unfortunate, as there may be many biases that affect the results. For example, it has been shown that women report more subjective symptoms than men. The age, prevalence of atopy and number of smokers should also be reported in order to be able to compare the index and control groups.

Potential biases in the review process

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We did not exclude studies because of language restrictions and we had easy access to the Finnish literature from which we found some additional references.

In order to be realistic and avoid missing valuable evidence we also included non-randomised studies. The inclusion of non-randomised studies with an equivalent design posed a particular challenge because the results are difficult to interpret. The studies were not of high quality and data were missing, which made it difficult to impute. Most of these studies had non-significant findings. We believe that this is a realistic interpretation of the evidence in spite of our assumptions and imputations.

Some original studies had more sophisticated analyses in the original studies than those implemented in RevMan 2011. We could not import the results of questionnaire studies of the Savilahti 2000 questionnaire studies because they used a repeated measures analysis. They report a significantly higher risk of common cold and bronchitis in a mould-damaged school when compared to a healthy school before remediation. After remediation, the difference was no longer significant. An improvement was seen for all respiratory diseases, except otitis media. Our interpretation of their results may have been too conservative.

The Åhman 2000 study presents the results in diagrams, from which the data were extracted to the RevMan data tables. Although our manual measurements from the diagrams may not have been sufficiently precise, the order of magnitude should be correct.

We chose to include a wide range of respiratory symptoms because effects are reported for all these symptoms. However, this creates the challenge of how to combine the results of studies that have various outcomes. We tried to overcome this by grouping the symptoms into categories that made some clinical sense, and this might have created an overly optimistic view of the results.

Agreements and disagreements with other studies or reviews

Four reviews have been published on the association of moulds with health effects (Bornehag 2001; Bornehag 2004; IoM 2004a; WHO 2009). The first one concludes: "Even if the mechanisms (of the effects of dampness on health) are unknown, there is sufficient evidence to take preventive measures against dampness in buildings". The second one underlines the importance of finding out and remediating the reasons for the humidity problem. The two other reviews are in line with these. However, the effectiveness of remediation from the point of respiratory health has not been reviewed before, which may be due to the challenges that we encountered.

Four studies in this review aimed to improve poor housing conditions by installing a heating system (Shortt 2007), insulation (Howden-Chapman 2007), removing mould (Burr 2007) or some other solution (Kercsmar 2006). One systematic review on health effects of housing improvement has previously been published (Thomson 2001). It concluded that many studies showed health gains after the intervention, but the small study populations and the lack of controlling confounders limited the generalisability of these findings. This also holds true for some non-randomised studies in our review but three housing improvement studies were randomised controlled trial (RCT) or cluster-RCT (cRCT) studies, which is the best design for controlling confounding factors.

We found several before-after studies without a control group dealing with respiratory health and moisture remediation of the buildings. These were not included in this review but we summarised some of their relevant results.

Haverinen-Shaughnessy 2008 report seven case studies of buildings that underwent different degrees of moisture and mould damage remediation. They also report the health effects. The results show that successful remediation is difficult to perform. Only in one of the seven cases was remediation completely successful. Unfortunately, the response rate in this case was too low to be able to draw conclusions about changes in the health complaints. The authors conclude that although remediation had been partially successful, or even though problems in other parts of the building remained, partial improvement in symptoms was detected in half of the cases and in half no improvement was observed at all.

Immonen 2002 studied four schools: one moisture-damaged that had been recently renovated, one healthy school building and two schools in which moisture damage was observed but not renovated. This study was not included in the review, because there were no measurements of symptoms before the remediation. However, the study compared the prevalence of respiratory symptoms in 'damaged', 'non-damaged' and 'renovated' school buildings. No changes could be observed in the prevalence of respiratory symptoms of children between these schools during a three-year follow up. However, the authors point out that although the median concentration of total viable moulds decreased after repairs, there were still occasional spores of moisture-indicative moulds. As a whole, the fungal concentrations in the indoor air of the damaged schools were low - lower than in homes with moisture problems (Meklin 2002). This may explain the lack of differences between schools not only in the study of Meklin 2002 but also in the school studies included in this review.

Positive effects of housing improvements to eliminate dampness and mould have been reported in non-controlled studies. For example, a decrease in respiratory infections after mould remediation in four patients was reported by Lloyd 2008. The article describes two cases of children and a teenager who became medication and asthma-free after remediation. One person with bouts of severe bronchitis was cured and one person's sinusitis problems ended. After remediation, a three-year follow-up study of pupils exposed to moulds in the school showed a decreased need for antibiotics (first and second follow up), less coughing with phlegm (second follow up), nocturnal coughing (first follow up) and asthma (second follow up) (Haverinen-Shaughnessy 2004). The prevalence of stuffy nose, rhinitis, sore throat, hoarseness, nasal bleeding, coughing with and without phlegm, dyspnoea and wheezing seemed to

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decrease in the study of Lignell 2007. Respiratory symptoms were measured in a moisture-damaged school one and two years before renovation, during renovation and one and two years after renovation. Symptoms were compared to a reference school without moisture problems but no longitudinal analysis was made regarding the changes before and after renovation.

AUTHORS' CONCLUSIONS

Implications for practice

Moderate-quality evidence exists that the remediation of mould-damaged houses decreases asthma-related symptoms, the use of asthma medication in asthma patients and respiratory infections. There is also moderate-quality evidence that although remediation does not significantly decrease the number of symptom days in asthmatic children, the number of acute care visits and hospitalisations decreases after remediation. We found very low-quality evidence that after repairing a mould-damaged office building asthma-related and other respiratory symptoms decreased. There is very low-quality evidence that profound remediation of moisture-damaged schools does not decrease the respiratory symptoms of the school personnel nor of school children. This may be explained by the fact that the occurrence of respiratory symptoms in the intervention and control groups did not differ from each other at baseline. Also, negative findings can be explained by the fact that bronchial asthma is a chronic disease and not quickly reversible or at all reversible, if the disease has become severe. In favour of the effectiveness of the remediation of mould damage is the finding that visits of children to a physician due to a common cold are less frequent in a mould-damaged school after remediation.

Implications for research

Better quality, prospective, controlled and preferably randomised studies are needed to find the most effective way to carry out remediation of damp and mould-damaged buildings to minimise respiratory health hazards. For effects on respiratory health, we recommend the development and use of validated questionnaires on respiratory symptoms and infections and also studies with objective outcomes, such as spirometry with bronchodilation testing, hyper-responsiveness or inflammation markers of the airways. Rather large sample sizes are needed to detect statistically significant differences between groups, especially when the occurrence of symptoms in a study population is low. Asthma is often a chronic disease and the reversibility of the respiratory symptoms is not clear, therefore it would be advisable to study the incidence of symptoms and asthma in incoming participants in mould-damaged and healthy school buildings instead of changes in the prevalence.

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* *Indicates the major publication for the study*

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CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Burr 2007

Methods	RCT
Participants	Participants aged 3 to 61 who reported symptoms of asthma in the last 12 months and indoor mould in 81 intervention houses (115 persons) and 83 control houses (117 persons) in South Wales
Interventions	Removal of all visible mould and fungicide treatment in mould-damaged houses. A positive input fan was also installed in damaged houses
Outcomes	Buildings - Primary: presence of visible indoor mould Secondary: temperature and humidity Patients - Primary: variability in peak expiratory flow rate Secondary: perceived improvement in breathing, reported change in medication use, wheezing and symptoms of rhinitis and rhinoconjunctivitis
Notes	The intervention was only partially successful, because by 12 months mould was present in 40% of the intervention houses and 78% of the control houses

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants not blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Outcome assessors not blinded
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Characteristics of drop-outs reported
Selective reporting (reporting bias)	Unclear risk	-

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Howden-Chapman 2007

Methods	cRCT
Participants	1350 households in which at least one household member had reported respiratory symptoms in the past year or had a history of asthma, pneumonia or chest infections. Members were planning to stay in the house for the next 2 winters living in uninsulated dwellings in 7 low-income communities in New Zealand (4407 participants)
Interventions	Installation of a standard retrofit insulation package
Outcomes	Buildings - Primary: changes in self reported dampness and warmth, measured temperature and relative humidity, comfort charts, self reported fuel usage, measured data from energy companies Secondary: changes in musty smell, observed mould, mould speciation, mould mass, endotoxins, beta-glucans, dust mite allergens, smoking behaviour Patients - Primary: wheezing, days off work or school, self reported visit to general practitioner, general practitioner reported visit, hospital admittance, main code respiratory condition Secondary: SF-36: vitality, happiness, general health; self reported symptoms of colds or flu
Notes	The intervention was not specifically aimed at reducing exposure to mould

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants not blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Outcome assessors blinded
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Characteristics of drop-outs reported
Selective reporting (reporting bias)	High risk	Not all outcomes reported: fungal activity, allergens, smoking

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Jarvis 2001

Methods	Controlled before-after study
Participants	488 current occupants of a moisture-damaged office building
Interventions	1. Intervention: removal of visibly moldy gypsum board, structural changes including replacement of windows and installation of a vapour-air retarder 2. Intervention: because there was new mould growth after the first intervention, the second intervention included removal of moldy wallboard, HVAC insulation, upholstered furniture was discarded, interior surfaces were cleaned, damage books and archives were discarded
Outcomes	Buildings: inspection of possible new mould growth, air sampling of the moulds Participants: respiratory symptoms, discomfort complaints, medication, sick leave
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	-
Allocation concealment (selection bias)	Unclear risk	-
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	-
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	-
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	-
Selective reporting (reporting bias)	Unclear risk	-

Kercsmar 2006

Methods	RCT
Participants	Symptomatic children (n = 62), 2 to 17 years of age, living in a home with indoor mould and who had physician-diagnosed asthma for at least 3 months before enrolment, had made at least 2 emergency department visits or had at least 1 hospitalisation for asthma in the 12 months preceding enrolment

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Kercsmar 2006 (*Continued*)

Interventions	Interventions were directed at reducing water infiltration, removal of water-damaged building materials, alterations to heating/ventilation/air conditioning, lead hazard control and environmental cleaning
Outcomes	Building: a standardised visual assessment tool was used to score the extent of visible moulds present in multiple areas of the home. Dust samples were obtained from the child's bedroom to measure mould, dust mite, cockroach, mouse and rat urine allergens and endotoxin Patients: primary: maximum number of asthma symptom days Secondary: hospitalisation, emergency department visits, pulmonary function data, children's health survey of asthma (CHSA), inflammatory markers
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Permuted block scheme
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No blinding of participants
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No blinding of outcome assessors
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Characteristics of drop-outs described
Selective reporting (reporting bias)	Low risk	All outcomes reported

Patovirta 2004a

Methods	Controlled before-after study
Participants	44 teachers working in a complex of 3 school buildings, 2 of which were water-damaged
Interventions	Thorough remediation of the water-damaged schools
Outcomes	Buildings: reported in Haverinen et al 1999 Participants: self reported allergic symptoms, infections, respiratory, skin and general symptoms Results of lung function measurements (n = 23)

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Patovirta 2004a (*Continued*)

Notes	Data for self reported infections and allergic symptoms of control group not shown	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	-
Allocation concealment (selection bias)	Unclear risk	-
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	-
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	-
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	-
Selective reporting (reporting bias)	Unclear risk	-

Savilahti 2000

Methods	Controlled before-after study	
Participants	The study group consisted of 397 children aged 7 to 12 in a mould-damaged school and a control group of 192 non-exposed children of the same age in a control school	
Interventions	Thorough remediation of the moisture-damaged school	
Outcomes	Building: investigation of the buildings. Microbiological samples from the air, surfaces and materials Participants: occurrence of respiratory infections (common cold, tonsillitis, otitis, sinusitis, bronchitis)	
Notes	The moisture damage was verified using microbiological samples from the air, surfaces and materials. Following renovation, new samples were taken	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	-

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Savilahti 2000 (*Continued*)

Allocation concealment (selection bias)	Unclear risk	-
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	-
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	-
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	-
Selective reporting (reporting bias)	Unclear risk	-

Shortt 2007

Methods	Controlled before-after study
Participants	Elderly, low-income families and the infirm, 54 households in the experimental group and 46 in the control group
Interventions	Energy efficiency measures, including central heating systems
Outcomes	Buildings: participants' opinion whether their homes suffered from condensation, mould and damp Temperature change Participants: satisfaction rates with internal temperature Prevalence of angina, arthritis/rheumatism, chest infections, bronchitis, pneumonia/ hypothermia, stress/mental illness
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	-
Allocation concealment (selection bias)	Unclear risk	-
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	-

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Shortt 2007 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	-
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	-
Selective reporting (reporting bias)	Unclear risk	-

Åhman 2000

Methods	Controlled before-after study
Participants	Pupils and personnel at 2 schools 337 pupils and 34 personnel in the intervention school and 224 and 21 personnel in the control school
Interventions	A new ventilated floor was installed and water damaged wallboards were exchanged
Outcomes	Participants: physical and psycho-social school-environment parameters Frequency of irritating symptoms including respiratory symptoms
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	-
Allocation concealment (selection bias)	Unclear risk	-
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	-
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	-
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	-
Selective reporting (reporting bias)	Unclear risk	-

cRCT = cluster-randomised controlled trial

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HVAC = heating ventilation and air-conditioning
RCT = randomised controlled trial
SF-36 = short-form health survey

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Bernstein 1983	A case study without a control group describing symptoms compatible with hypersensitivity pneumonitis in 2 of 14 employees in a clerical office
Haverinen 1999	The symptoms were not surveyed after reparation of the building
Haverinen-Shaughnessy 2004	No control group was included
Howden-Chapman 2005	The paper describes the purpose and methods of a study which is included in this review (Howden-Chapman 2007)
Iossifova 2010	No control group
Johnson 2009	No control group
Lloyd 2008	The study did not address mould remediation and respiratory symptoms. The aim of this study was to examine the effect of improving the thermal quality of housing on blood pressure and general health
Morgan 2004	The focus of the study was in the reduction of the levels of cockroach allergen and dust-mite allergen (Der f1) and complications of asthma. No outcomes reported regarding the remediation of buildings
Santilli 2003	The focus was in the measurement of mould spore counts. The health outcomes of 12 participants were descriptive
Stubner 2000	No control group was included in the study, no data on health outcomes
Wilkerson 2004	No new study, the author has referred the study of Morgan 2004

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DATA AND ANALYSES

Comparison 1. Mould remediation versus no intervention in houses - effects in adults

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Asthma-related outcomes RCT	2		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 Wheezing in last 4 weeks at 6 months	1	128	Odds Ratio (M-H, Fixed, 95% CI)	0.45 [0.17, 1.19]
1.2 Wheezing in last 4 weeks at 12 months	2	2945	Odds Ratio (M-H, Fixed, 95% CI)	0.64 [0.55, 0.75]
1.3 Medication in last 6 months at 6 months	1	125	Odds Ratio (M-H, Fixed, 95% CI)	0.11 [0.04, 0.28]
1.4 Medication in last 6 months at 12 months	1	168	Odds Ratio (M-H, Fixed, 95% CI)	0.98 [0.53, 1.84]
1.5 Breathing worse or similar at 6 months	1	125	Odds Ratio (M-H, Fixed, 95% CI)	0.19 [0.08, 0.42]
1.6 Wheezing affects activities at 6 months	1	128	Odds Ratio (M-H, Fixed, 95% CI)	0.48 [0.23, 1.03]
1.7 Wheezing affects activities at 12 months	1	171	Odds Ratio (M-H, Fixed, 95% CI)	0.88 [0.48, 1.64]
1.8 Breathing worse or similar at 12 months	1	162	Odds Ratio (M-H, Fixed, 95% CI)	0.33 [0.17, 0.63]
1.9 Use of preventer in last 4 weeks at 6 months	1	128	Odds Ratio (M-H, Fixed, 95% CI)	0.30 [0.11, 0.81]
1.10 Use of preventer in last 4 weeks at 12 months	1	171	Odds Ratio (M-H, Fixed, 95% CI)	0.22 [0.08, 0.57]
1.11 Use of reliever in last 4 weeks at 6 months	1	128	Odds Ratio (M-H, Fixed, 95% CI)	0.86 [0.32, 2.34]
1.12 Use of reliever in last 4 weeks at 12 months	1	171	Odds Ratio (M-H, Fixed, 95% CI)	0.33 [0.14, 0.75]
1.13 Morning phlegm worse or similar	1	1926	Odds Ratio (M-H, Fixed, 95% CI)	0.65 [0.53, 0.78]
1.14 Sleep disturbed by wheezing (worse or similar)	1	983	Odds Ratio (M-H, Fixed, 95% CI)	0.65 [0.50, 0.85]
1.15 Speech disturbed by wheezing (worse or similar)	1	975	Odds Ratio (M-H, Fixed, 95% CI)	0.56 [0.36, 0.87]
1.16 Days off work (worse or similar)	1	1165	Odds Ratio (M-H, Fixed, 95% CI)	0.64 [0.50, 0.83]
1.17 Days of school (worse or similar)	1	502	Odds Ratio (M-H, Fixed, 95% CI)	0.54 [0.37, 0.79]
2 Asthma-related outcomes CBA	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
2.1 Asthma at baseline	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.2 Asthma at follow up	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Respiratory infections RCT	2		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Rhinitis at 6 months	1	126	Odds Ratio (M-H, Fixed, 95% CI)	0.58 [0.23, 1.44]
3.2 Rhinitis at 12 months	2	3080	Odds Ratio (M-H, Fixed, 95% CI)	0.57 [0.49, 0.66]

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3.3 Rhinoconjunctivitis at 6 months	1	126	Odds Ratio (M-H, Fixed, 95% CI)	0.36 [0.13, 1.01]
3.4 Rhinoconjunctivitis at 12 months	1	171	Odds Ratio (M-H, Fixed, 95% CI)	0.36 [0.15, 0.87]
4 Respiratory infections CBA	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
4.1 Chest infections or bronchitis at baseline	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.2 Chest infections or bronchitis at follow up	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.3 Pneumonia at baseline	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.4 Pneumonia at follow up	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Comparison 2. Mould remediation versus no exposure in offices - effects in adults

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Respiratory symptoms CBA	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 Building-related symptoms at baseline	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.2 Building-related symptoms at follow up	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.3 Respiratory illnesses at baseline	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.4 Respiratory illnesses at follow up	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Comparison 3. Mould remediation versus information only in houses - effects in children

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Asthma-related outcomes RCT	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
1.1 ED/inpatient visits 6 to 12 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.2 ED/inpatient days 0 to 12 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.3 Maximal symptom days baseline, unadjusted	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.4 Maximal symptoms at 12 months follow up, unadjusted	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.5 Maximal symptom days at baseline, adjusted	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.6 Maximal symptom days at 12 months follow up, adjusted	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

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Comparison 4. Mould remediation versus no exposure in schools - effects in children

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Asthma-related outcomes CBA	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 Coughing before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.2 Coughing after intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.3 Dyspnoea before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.4 Dyspnoea after intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.5 Wheezing before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.6 Wheezing after intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Respiratory infections CBA	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2.1 All respiratory infections at baseline	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.2 All respiratory infections at follow up	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.3 Common cold at baseline	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.4 Common cold at follow up	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.5 Tonsillitis at baseline	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.6 Tonsillitis at follow up	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.7 Otitis at baseline	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.8 Otitis at follow up	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.9 Sinusitis at baseline	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.10 Sinusitis at follow up	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.11 Bronchitis or pneumonia at baseline	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.12 Bronchitis or pneumonia at follow up	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.13 Use antibiotics at baseline	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.14 Use antibiotics at follow up	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Respiratory symptoms CBA	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
3.1 Eye irritation before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.2 Eye irritation after intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.3 Stuffy nose before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.4 Stuffy nose after intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

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3.5 Runny nose before intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.6 Runny nose after intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.7 Dry throat before intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.8 Dry throat after intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.9 Hoarseness before intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.10 Hoarseness after intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Comparison 5. Mould remediation versus no exposure in schools - effects in adults

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Asthma-related outcomes CBA	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 Cough before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.2 Cough after intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.3 Dyspnoea before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.4 Dyspnoea after intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.5 Wheezing before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.6 Wheezing after intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Asthma symptom score	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2.1 Lower respiratory symptoms at baseline	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.2 Lower respiratory symptoms 1-year follow up	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.3 Lower respiratory symptoms 3-year follow up	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Respiratory symptoms CBA	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
3.1 Eye irritation before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.2 Eye irritation after intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.3 Stuffy nose before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.4 Stuffy nose after intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.5 Runny nose before intervention	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

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3.6 Runny nose after intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.7 Dry throat before intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.8 Dry throat after intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.9 Hoarseness before intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.10 Hoarseness after intervention	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4 Respiratory symptom score	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4.1 Irritative symptoms at baseline	1	Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.2 Irritative symptoms at 1-year follow up	1	Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.3 Irritative symptoms at 3-year follow up	1	Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

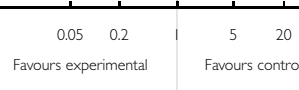
Analysis 1.1. Comparison 1 Mould remediation versus no intervention in houses - effects in adults, Outcome 1 Asthma-related outcomes RCT.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 1 Mould remediation versus no intervention in houses - effects in adults

Outcome: 1 Asthma-related outcomes RCT

Study or subgroup	Remediation n/N	No remediation n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
1 Wheezing in last 4 weeks at 6 months					
Burr 2007	52/67	54/61		100.0 %	0.45 [0.17, 1.19]
Subtotal (95% CI)	**67**	**61**		**100.0 %**	**0.45 [0.17, 1.19]**
Total events: 52 (Remediation), 54 (No remediation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.61 (P = 0.11)					
2 Wheezing in last 4 weeks at 12 months					
Burr 2007	67/89	61/81		3.9 %	1.00 [0.50, 2.01]
Howden-Chapman 2007	412/1409	544/1366		96.1 %	0.62 [0.53, 0.73]
Subtotal (95% CI)	**1498**	**1447**		**100.0 %**	**0.64 [0.55, 0.75]**
Total events: 479 (Remediation), 605 (No remediation)					
Heterogeneity: Chi² = 1.65, df = 1 (P = 0.20); I² =40%					
Test for overall effect: Z = 5.71 (P < 0.00001)					
3 Medication in last 6 months at 6 months					
Burr 2007	30/66	52/59		100.0 %	0.11 [0.04, 0.28]



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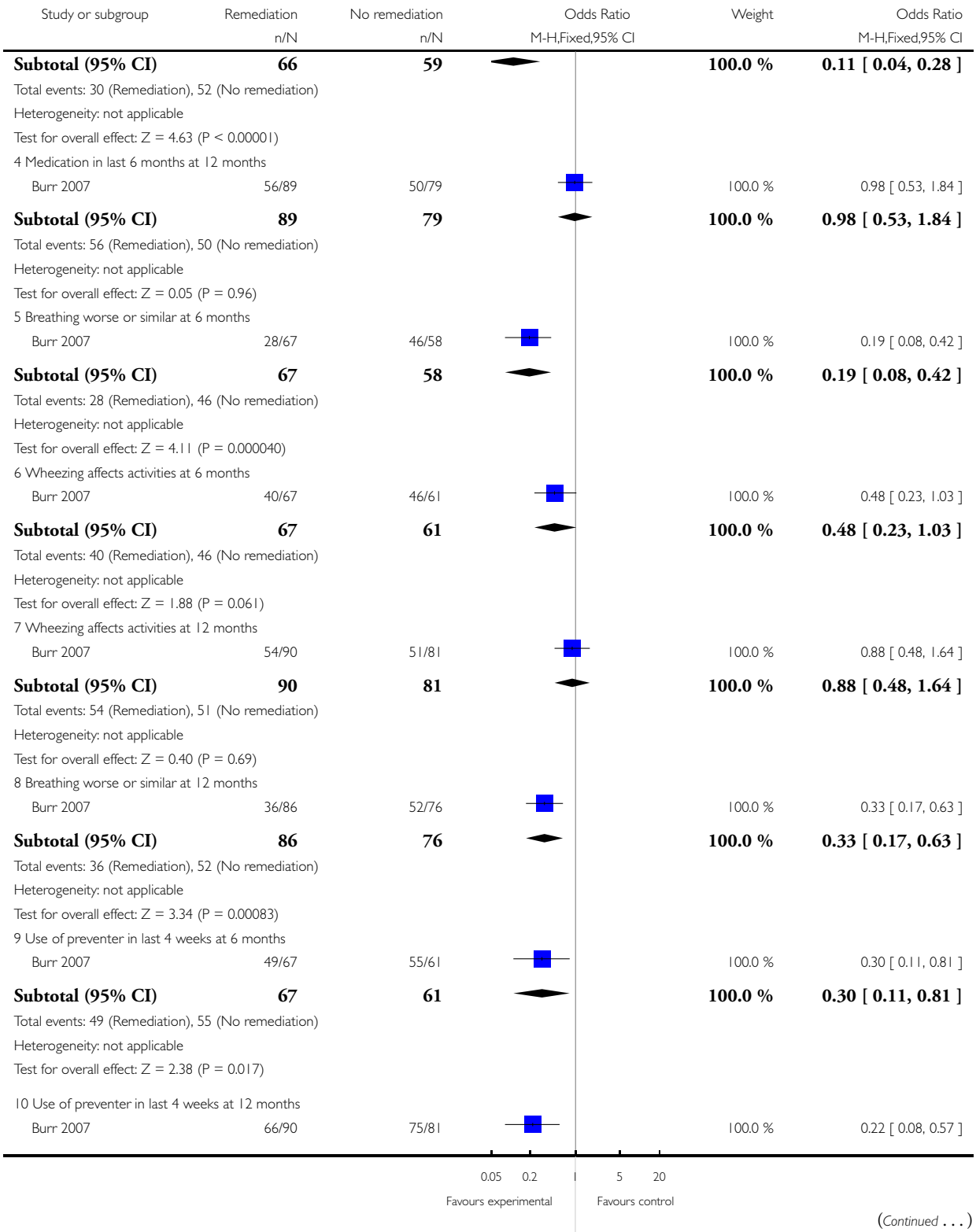

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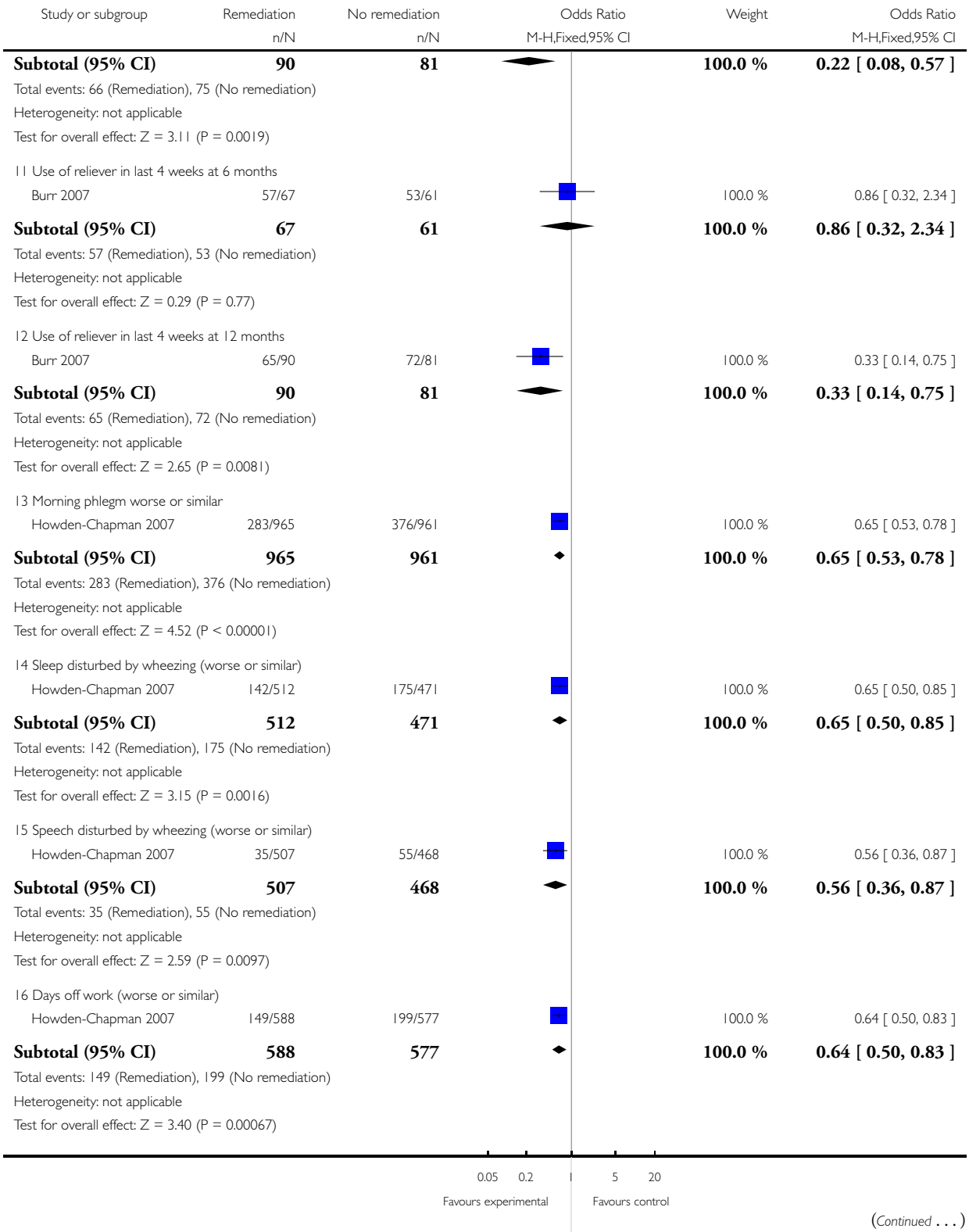

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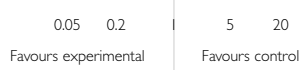
Study or subgroup	Remediation n/N	No remediation n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
17 Days of school (worse or similar)					
Howden-Chapman 2007	149/246	189/256		100.0 %	0.54 [0.37, 0.79]
Subtotal (95% CI)	**246**	**256**		**100.0 %**	**0.54 [0.37, 0.79]**
Total events: 149 (Remediation), 189 (No remediation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 3.15 (P = 0.0016)					



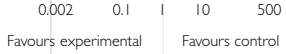
Analysis 1.2. Comparison 1 Mould remediation versus no intervention in houses - effects in adults, Outcome 2 Asthma-related outcomes CBA.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 1 Mould remediation versus no intervention in houses - effects in adults

Outcome: 2 Asthma-related outcomes CBA

Study or subgroup	Remediation n/N	No remediation n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Asthma at baseline				
Shortt 2007	7/46	6/54		1.44 [0.45, 4.62]
2 Asthma at follow up				
Shortt 2007	2/46	4/54		0.57 [0.10, 3.25]



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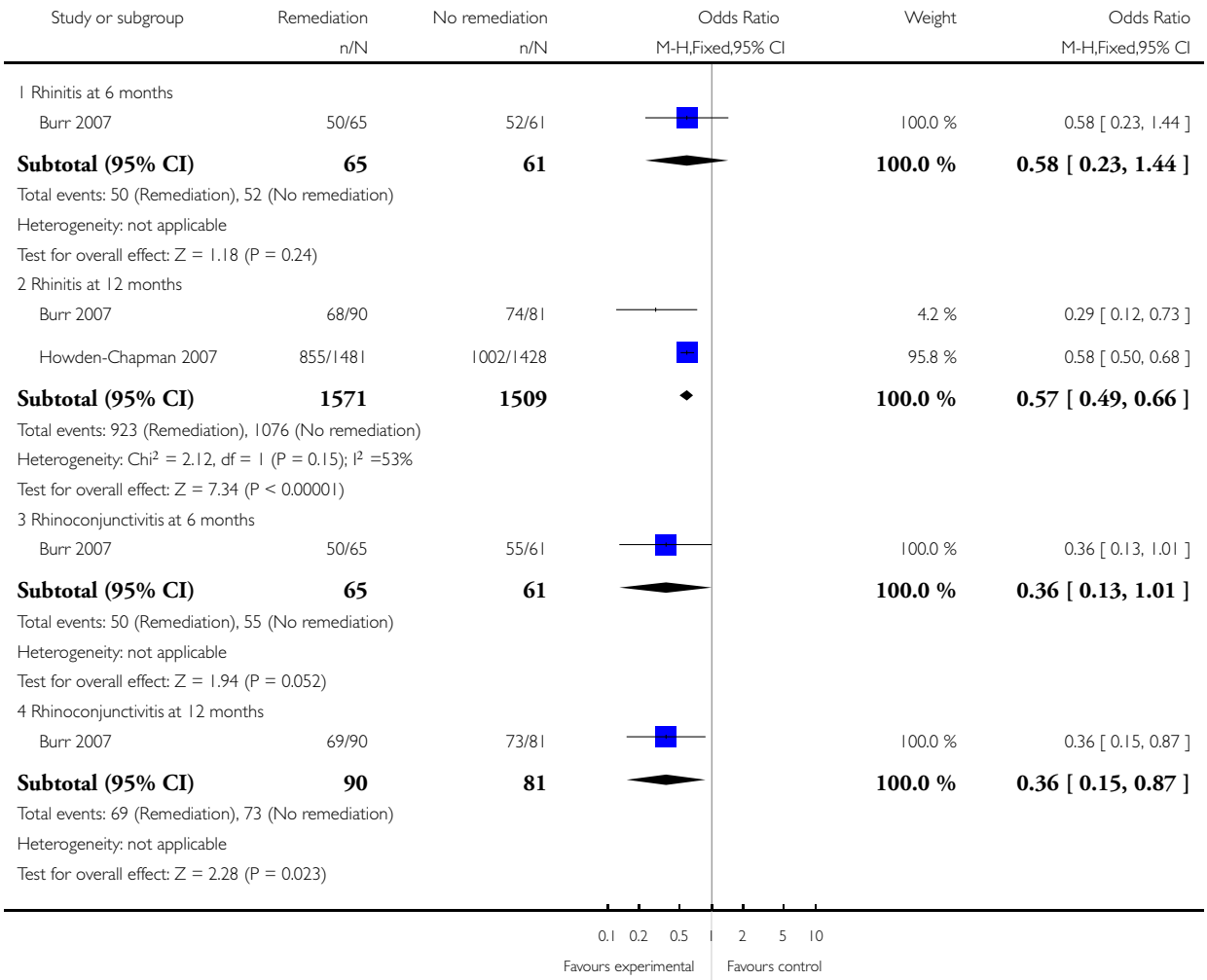
Analysis 1.3. Comparison 1 Mould remediation versus no intervention in houses - effects in adults, Outcome 3 Respiratory infections RCT.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 1 Mould remediation versus no intervention in houses - effects in adults

Outcome: 3 Respiratory infections RCT



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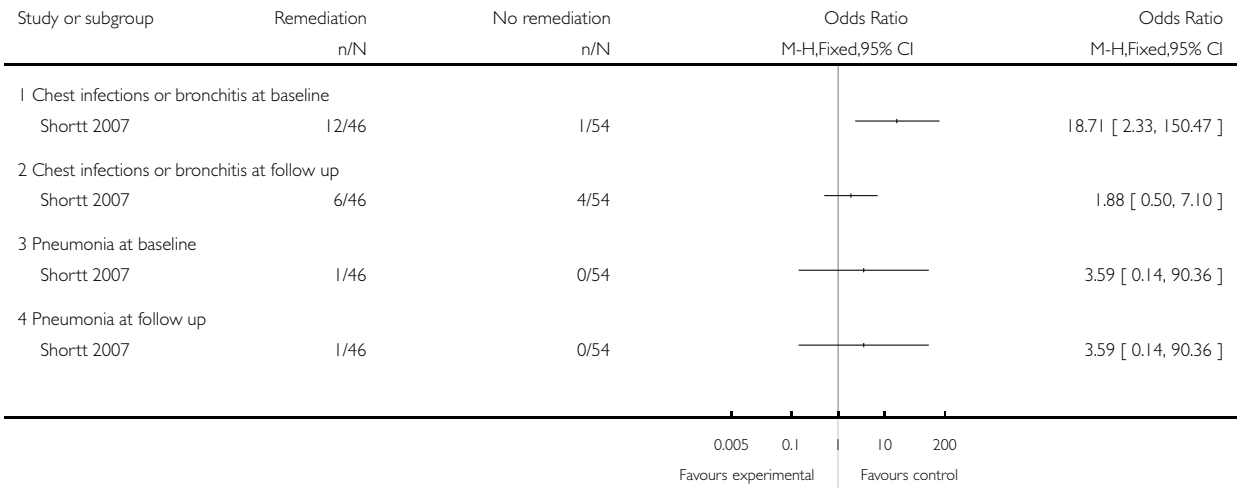
Analysis 1.4. Comparison 1 Mould remediation versus no intervention in houses - effects in adults, Outcome 4 Respiratory infections CBA.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 1 Mould remediation versus no intervention in houses - effects in adults

Outcome: 4 Respiratory infections CBA



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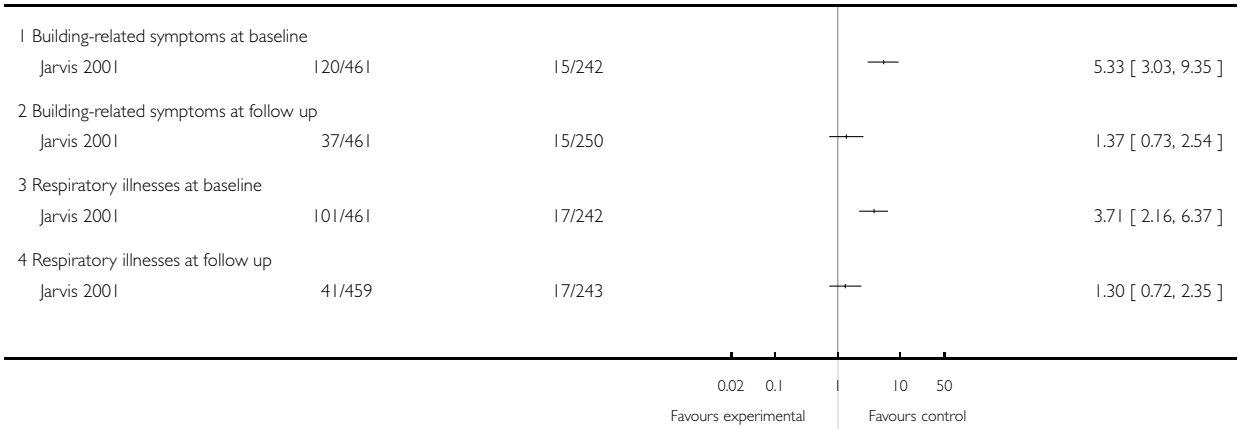
Analysis 2.1. Comparison 2 Mould remediation versus no exposure in offices - effects in adults, Outcome 1 Respiratory symptoms CBA.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 2 Mould remediation versus no exposure in offices - effects in adults

Outcome: 1 Respiratory symptoms CBA

Study or subgroup	Remediation n/N	No Exposure n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Building-related symptoms at baseline				
Jarvis 2001	120/461	15/242		5.33 [3.03, 9.35]
2 Building-related symptoms at follow up				
Jarvis 2001	37/461	15/250		1.37 [0.73, 2.54]
3 Respiratory illnesses at baseline				
Jarvis 2001	101/461	17/242		3.71 [2.16, 6.37]
4 Respiratory illnesses at follow up				
Jarvis 2001	41/459	17/243		1.30 [0.72, 2.35]



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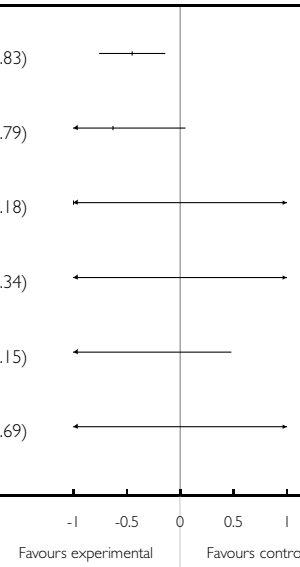
Analysis 3.1. Comparison 3 Mould remediation versus information only in houses - effects in children, Outcome 1 Asthma-related outcomes RCT.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 3 Mould remediation versus information only in houses - effects in children

Outcome: 1 Asthma-related outcomes RCT

Study or subgroup	Remediation N	Mean(SD)	Information only N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
1 ED/inpatient visits 6 to 12 months						
Kercsmar 2006	29	0.07 (0.37)	33	0.52 (0.83)		-0.45 [-0.76, -0.14]
2 ED/inpatient days 0 to 12 months						
Kercsmar 2006	29	0.28 (0.8)	33	0.91 (1.79)		-0.63 [-1.31, 0.05]
3 Maximal symptom days baseline, unadjusted						
Kercsmar 2006	29	4.7 (8.08)	33	5.7 (7.18)		-1.00 [-4.83, 2.83]
4 Maximal symptoms at 12 months follow up, unadjusted						
Kercsmar 2006	29	2.25 (2.69)	33	4.7 (10.34)		-2.45 [-6.11, 1.21]
5 Maximal symptom days at baseline, adjusted						
Kercsmar 2006	29	1.7 (2.47)	33	3.5 (6.15)		-1.80 [-4.08, 0.48]
6 Maximal symptom days at 12 months follow up, adjusted						
Kercsmar 2006	29	3.25 (3.98)	33	4.4 (4.69)		-1.15 [-3.31, 1.01]



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Analysis 4.1. Comparison 4 Mould remediation versus no exposure in schools - effects in children, Outcome 1 Asthma-related outcomes CBA.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 4 Mould remediation versus no exposure in schools - effects in children

Outcome: 1 Asthma-related outcomes CBA

Study or subgroup	Remediation n/N	No Exposure n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Coughing before intervention				
hman 2000	34/337	22/224		1.03 [0.59, 1.81]
2 Coughing after intervention				
hman 2000	34/337	22/224		1.03 [0.59, 1.81]
3 Dyspnoea before intervention				
hman 2000	0/337	0/224		0.0 [0.0, 0.0]
4 Dyspnoea after intervention				
hman 2000	0/337	0/337		0.0 [0.0, 0.0]
5 Wheezing before intervention				
hman 2000	0/337	0/224		0.0 [0.0, 0.0]
6 Wheezing after intervention				
hman 2000	0/337	0/224		0.0 [0.0, 0.0]

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Analysis 4.2. Comparison 4 Mould remediation versus no exposure in schools - effects in children, Outcome 2 Respiratory infections CBA.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 4 Mould remediation versus no exposure in schools - effects in children

Outcome: 2 Respiratory infections CBA

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
1 All respiratory infections at baseline						
Savilahti 2000	365	0.81 (1.31)	176	0.64 (1.15)		0.17 [-0.05, 0.39]
2 All respiratory infections at follow up						
Savilahti 2000	365	0.55 (0.98)	176	0.5 (0.91)		0.05 [-0.12, 0.22]
3 Common cold at baseline						
Savilahti 2000	365	0.25 (0.57)	176	0.13 (0.43)		0.12 [0.03, 0.21]
4 Common cold at follow up						
Savilahti 2000	365	0.16 (0.46)	176	0.13 (0.41)		0.03 [-0.05, 0.11]
5 Tonsillitis at baseline						
Savilahti 2000	365	0.12 (0.47)	176	0.24 (1.58)		-0.12 [-0.36, 0.12]
6 Tonsillitis at follow up						
Savilahti 2000	365	0.06 (0.3)	176	0.17 (1.15)		-0.11 [-0.28, 0.06]
7 Otitis at baseline						
Savilahti 2000	365	0.29 (0.84)	176	0.25 (0.65)		0.04 [-0.09, 0.17]
8 Otitis at follow up						
Savilahti 2000	365	0.26 (0.8)	176	0.21 (0.68)		0.05 [-0.08, 0.18]
9 Sinusitis at baseline						
Savilahti 2000	365	0.04 (0.35)	176	0.06 (0.33)		-0.02 [-0.08, 0.04]
10 Sinusitis at follow up						
Savilahti 2000	365	0.03 (0.19)	176	0.03 (0.06)		0.0 [-0.02, 0.02]
11 Bronchitis or pneumonia at baseline						
Savilahti 2000	365	0.11 (0.44)	176	0.08 (0.66)		0.03 [-0.08, 0.14]
12 Bronchitis or pneumonia at follow up						
Savilahti 2000	365	0.04 (0.27)	176	0.05 (0.3)		-0.01 [-0.06, 0.04]
13 Use antibiotics at baseline						
Savilahti 2000	365	0.43 (0.82)	176	0.38 (0.68)		0.05 [-0.08, 0.18]
14 Use antibiotics at follow up						
Savilahti 2000	365	0.29 (0.62)	176	0.33 (0.64)		-0.04 [-0.15, 0.07]

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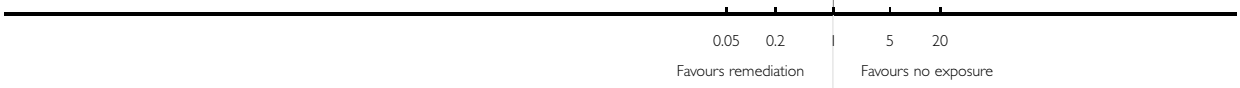
Analysis 4.3. Comparison 4 Mould remediation versus no exposure in schools - effects in children, Outcome 3 Respiratory symptoms CBA.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 4 Mould remediation versus no exposure in schools - effects in children

Outcome: 3 Respiratory symptoms CBA

Study or subgroup	Remediation n/N	No Exposure n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Eye irritation before intervention				
hman 2000	17/337	0/224		24.52 [1.47, 409.79]
2 Eye irritation after intervention				
hman 2000	13/337	0/224		18.68 [1.10, 315.84]
3 Stuffy nose before intervention				
hman 2000	40/337	13/224		2.19 [1.14, 4.19]
4 Stuffy nose after intervention				
hman 2000	34/337	8/224		3.03 [1.38, 6.67]
5 Runny nose before intervention				
hman 2000	24/337	11/224		1.48 [0.71, 3.10]
6 Runny nose after intervention				
hman 2000	24/337	11/224		1.48 [0.71, 3.10]
7 Dry throat before intervention				
hman 2000	17/337	8/224		1.43 [0.61, 3.38]
8 Dry throat after intervention				
hman 2000	20/337	8/224		1.70 [0.74, 3.94]
9 Hoarseness before intervention				
hman 2000	24/337	11/224		1.48 [0.71, 3.10]
10 Hoarseness after intervention				
hman 2000	13/337	7/224		1.24 [0.49, 3.17]



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Analysis 5.1. Comparison 5 Mould remediation versus no exposure in schools - effects in adults, Outcome 1 Asthma-related outcomes CBA.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 5 Mould remediation versus no exposure in schools - effects in adults

Outcome: 1 Asthma-related outcomes CBA

Study or subgroup	Remediation n/N	No Exposure n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Cough before intervention				
hman 2000	5/34	0/21		8.02 [0.42, 152.85]
2 Cough after intervention				
hman 2000	2/34	0/21		3.31 [0.15, 72.32]
3 Dyspnoea before intervention				
hman 2000	5/34	0/21		8.02 [0.42, 152.85]
4 Dyspnoea after intervention				
hman 2000	2/34	0/21		3.31 [0.15, 72.32]
5 Wheezing before intervention				
hman 2000	2/34	0/21		3.31 [0.15, 72.32]
6 Wheezing after intervention				
hman 2000	0/34	0/21		0.0 [0.0, 0.0]

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Analysis 5.2. Comparison 5 Mould remediation versus no exposure in schools - effects in adults, Outcome 2 Asthma symptom score.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 5 Mould remediation versus no exposure in schools - effects in adults

Outcome: 2 Asthma symptom score

Study or subgroup	Remediation N	Mean(SD)	No Exposure N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
1 Lower respiratory symptoms at baseline						
Patovirta 2004a	27	3.67 (1.36)	12	3.17 (1.04)		0.50 [-0.28, 1.28]
2 Lower respiratory symptoms 1-year follow up						
Patovirta 2004a	26	4.48 (1.36)	11	4.36 (1.04)		0.12 [-0.69, 0.93]
3 Lower respiratory symptoms 3-year follow up						
Patovirta 2004a	22	5.81 (1.85)	9	4.5 (1.04)		1.31 [0.28, 2.34]

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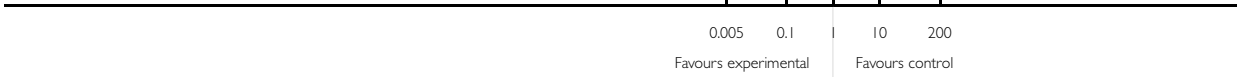
Analysis 5.3. Comparison 5 Mould remediation versus no exposure in schools - effects in adults, Outcome 3 Respiratory symptoms CBA.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 5 Mould remediation versus no exposure in schools - effects in adults

Outcome: 3 Respiratory symptoms CBA

Study or subgroup	Remediation n/N	No Exposure n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Eye irritation before intervention				
hman 2000	5/34	0/21		8.02 [0.42, 152.85]
2 Eye irritation after intervention				
hman 2000	0/34	0/21		0.0 [0.0, 0.0]
3 Stuffy nose before intervention				
hman 2000	4/34	3/21		0.80 [0.16, 3.99]
4 Stuffy nose after intervention				
hman 2000	4/34	3/21		0.80 [0.16, 3.99]
5 Runny nose before intervention				
hman 2000	0/34	2/21		0.11 [0.01, 2.48]
6 Runny nose after intervention				
hman 2000	2/34	3/21		0.38 [0.06, 2.46]
7 Dry throat before intervention				
hman 2000	8/34	0/21		13.79 [0.75, 252.77]
8 Dry throat after intervention				
hman 2000	5/34	2/21		1.64 [0.29, 9.32]
9 Hoarseness before intervention				
hman 2000	7/34	0/21		11.73 [0.63, 216.96]
10 Hoarseness after intervention				
hman 2000	2/34	0/21		3.31 [0.15, 72.32]



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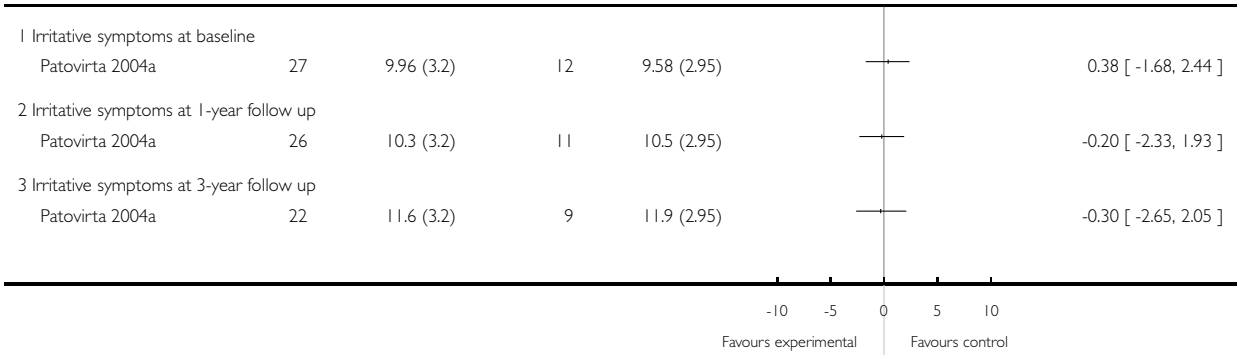
Analysis 5.4. Comparison 5 Mould remediation versus no exposure in schools - effects in adults, Outcome 4 Respiratory symptom score.

Review: Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma

Comparison: 5 Mould remediation versus no exposure in schools - effects in adults

Outcome: 4 Respiratory symptom score

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
1 Irritative symptoms at baseline						
Patovirta 2004a	27	9.96 (3.2)	12	9.58 (2.95)		0.38 [-1.68, 2.44]
2 Irritative symptoms at 1-year follow up						
Patovirta 2004a	26	10.3 (3.2)	11	10.5 (2.95)		-0.20 [-2.33, 1.93]
3 Irritative symptoms at 3-year follow up						
Patovirta 2004a	22	11.6 (3.2)	9	11.9 (2.95)		-0.30 [-2.65, 2.05]



APPENDICES

Appendix 1. MEDLINE search strategy

1.1 PubMed search strategy 12 March 2009 (searched from 1951 to March 2009)

"Respiratory Tract Diseases"[Mesh] OR "Respiratory Tract Infections"[Mesh] OR [respiratory[tw] AND (infection[tw] OR disease[tw] OR symptom[tw])] or [respiratory[tw] AND (infections[tw] OR diseases[tw] OR symptoms[tw])] OR "Sick Building Syndrome"[Mesh] OR "Sick Building Syndrome"[tw] OR "Otitis Media"[Mesh] OR "Common Cold"[Mesh] OR "Influenza, Human"[Mesh] OR "Asthma"[Mesh] OR "Rhinitis"[Mesh] OR "Sinusitis"[Mesh] OR "Cough"[Mesh] OR "Conjunctivitis"[Mesh] OR "Eye Diseases/microbiology"[Mesh] OR "otitis media"[tw] OR wheez*[tw] OR "common cold"[tw] OR influenz*[tw] OR asthma*[tw] OR rhinit*[tw] OR sinusit*[tw] OR conjunctivit*[tw] OR "eye symptom"[tw] OR "eye symptoms"[tw] OR cough*[tw]
AND
"Humidity"[Mesh] OR "Fungi"[Mesh] OR "Water"[Mesh] OR "Air Microbiology"[Mesh] OR "Air Pollution, Indoor"[Mesh] OR damp*[tw] OR moistur*[tw] OR humid*[tw] OR mould*[tw] OR mold'[tw] OR condensation*[tw] OR fungal*[tw] OR fungi*[tw] OR "water vapour"[tw] OR "water vapours"[tw] OR "water vapor"[tw] OR "water vapors"[tw] OR spore*[tw] OR micro-organism*[tw] OR microorganism*[tw]
AND
repair*[tw] OR renoval*[tw] OR remediat*[tw] OR rebuild*[tw] OR reconstruct*[tw] OR drain*[tw] OR remov*[tw] OR reparat*[tw] OR reduce*[tw] OR reduci*[tw] OR reduct* OR dehumidificat*[tw] OR refurbis*[tw] OR recapsul*[tw] OR decontaminat*[tw] OR dry[tw] OR drying[tw] OR drain[tw]
AND
(effect* [tw] OR control* [tw] OR evaluation* [tw] OR program* [tw]) AND (work[tw] OR works*[tw] OR work'*[tw] OR worka*[tw] OR worke*[tw] OR workg*[tw] OR worki*[tw] OR workl*[tw] OR workp*[tw] OR occupation* [tw] OR prevention* [tw] OR protect* [tw]) OR [(randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized controlled trials[Mesh] OR random allocation[Mesh] OR double-blind method[Mesh] OR single-blind method[Mesh] OR clinical trial[pt] OR clinical trials[Mesh] OR

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clinical trial[tw] OR ((singl*[tw] OR doubl*[tw] OR trebl*[tw] OR tripl*[tw]) AND (mask*[tw] OR blind*[tw])) OR latin square[tw] OR placebos[Mesh] OR placebo*[tw] OR random*[tw] OR research design[Mesh:noexp] OR comparative study[pt] OR evaluation studies OR follow-up studies[Mesh] OR prospective studies[Mesh] OR cross-over studies[mesh] OR controll*[tw] OR prospectiv*[tw] OR volunteer*[tw]) NOT (animal[Mesh] NOT human[Mesh])]

1.2 MEDLINE search strategy (searched from January 2009 to week 1 June 2011)

1 exp Respiratory Tract Diseases/ (916682)
2 exp Respiratory Tract Infections/ (254193)
3 (respiratory adj3 (infection* or disease* or symptom*)).tw. (55505)
4 Sick Building Syndrome/ (506)
5 sick building syndrome.tw. (402)
6 exp Otitis Media/ (19648)
7 Common Cold/ (3169)
8 Influenza, Human/ (25979)
9 Asthma/ (92422)
10 exp Rhinitis/ (22580)
11 exp Sinusitis/ (13677)
12 Cough/ (10339)
13 exp Conjunctivitis/ (15085)
14 exp Eye Diseases/mi [Microbiology] (9411)
15 (otitis media or wheez* or common cold* or influenza* or asthma* or rhinit* or sinusit* or cough* or conjunctivit* or eye symptom*).tw. (223775)
16 or/1-15 (1031347)
17 Humidity/ (10976)
18 exp Fungi/ (260197)
19 Water/ (90607)
20 Air Microbiology/ (5872)
21 Air Pollution, Indoor/ (7560)
22 (damp* or moistur* or humid* or mould* or mold* or condensation* or fungal* or fungi* or water vapour* or water vapor* or micro?organism* or spore*).tw. (206107)
23 or/17-22 (503666)
24 (repair* or renovat* or remediat* or rebuild* or reconstruct* or drain* or remov* or reparat* or reduc* or dehumidificat* or refurbis* or recapsul* or decontaminat* or dry or drying or drain*).tw. (2344067)
25 16 and 23 and 24 (3983)
26 randomized controlled trial.pt. (307057)
27 controlled clinical trial.pt. (83492)
28 randomized.ab. (211386)
29 placebo.ab. (124882)
30 clinical trials as topic.sh. (153231)
31 randomly.ab. (154072)
32 trial.ti. (91538)
33 26 or 27 or 28 or 29 or 30 or 31 or 32 (710393)
34 exp animals/ not humans.sh. (3604852)
35 33 not 34 (656888)
36 25 and 35 (389)
37 limit 36 to ed=20090101-20101128 (32)

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Appendix 2. Embase.com search strategy

2.1 EMBASE search strategy (1974 to March 2009)

"respiratoy tract disease"/exp OR "sick building syndrome"/exp OR "otitis media"/exp OR "common cold"/exp OR asthma/exp OR rhinitis/exp OR cough/exp OR sinusitis/exp OR conjunctivitis/exp OR "otitis media" OR wheez* OR "common cold" OR influenza OR asthma OR rhinit* OR conjunctivit* OR "eye symptom*" OR "eye synptoms" OR sinusit*

AND

fungus/exp OR "air microbiology"/exp OR "indoor microbiology"OR "indoor air pollution/exp OR "indoor air pollution"/ OR damp* OR moistur* OR humid* OR mould* OR mold* OR condensation* OR fungal* OR fungi* OR microorganism* OR "micro organisms" OR spore* OR "water vapor"/exp OR "water vapour"/exp

AND

repair* OR renovar* OR remediat* OR rebuild* OR reconstruct* OR drain* OR reparat* OR reduct* OR dehumidificat* OR refurdis* OR recapsul* OR decontaminat* OR dry OR drying OR drain

AND

"controlled clinical trial"/lim OR "randomized controlled trial"/lim OR random* OR crossover* OR assign* OR allocat* OR placebo*OR volunteer* OR cohort* OR control* OR methodology/exp OR prospective* OR volunteer*

AND

humans/lim

2.2 EMBASE search strategy (January 2009 to June 2011)

17 #12 AND #16

16 #13 OR #14 OR #15

15 'methodology'/exp

14 random*:ab,ti OR placebo*:ab,ti OR factorial*:ab,ti OR crossover*:ab,ti OR 'cross-over':ab,ti OR 'cross over':ab,ti OR volunteer*:ab,ti OR assign*:ab,ti OR allocat*:ab,ti OR ((singl* OR doubl*) NEAR/2 (blind* OR mask*)):ab,ti OR cohort*:ab,ti OR prospectiv*:ab,ti

13 'controlled clinical trial'/exp OR 'single blind procedure'/exp OR 'double blind procedure'/exp OR 'crossover procedure'/exp OR 'cohort analysis'/exp OR 'prospective study'/exp

12 #7 AND #10 AND #11

11 repair*:ab,ti OR renovat*:ab,ti OR remediat*:ab,ti OR rebuild*:ab,ti OR reconstruct*:ab,ti OR remov*:ab,ti OR reparat*:ab,ti OR reduc*:ab,ti OR dehumidificat*:ab,ti OR refurbis*:ab,ti OR recapsul*:ab,ti OR decontaminat*:ab,ti OR dry:ab,ti OR drying*:ab,ti OR drain*:ab,ti

10 #8 OR #9

9 damp*:ab,ti OR mositure*:ab,ti OR humid*:ab,ti OR mould*:ab,ti OR mold*:ab,ti OR condensation*:ab,ti OR fungal*:ab,ti OR fungi*:ab,ti OR 'water vapour':ab,ti OR 'water vapor':ab,ti OR microorganism*:ab,ti OR 'micro-organism':ab,ti OR 'micro-organisms':ab,ti OR spore*:ab,ti OR 'air microbiology':ab,ti OR 'indoor microbiology':ab,ti OR 'indoor air pollution':ab,ti

8 'humidity'/exp OR 'fungus'/exp OR 'indoor air pollution'/de OR 'microbiology'/exp

7 #1 OR #2 OR #3 OR #4 OR #5 OR #6

6 'otitis media':ab,ti OR 'common cold':ab,ti OR 'common colds':ab,ti OR rhinit*:ab,ti OR sinusit*:ab,ti OR asthma:ab,ti OR flu:ab,ti OR wheez*:ab,ti OR cough*:ab,ti OR conjunctivit*:ab,ti OR 'eye symptoms':ab,ti OR 'eye symptom':ab,ti OR influenza*:ab,ti

5 'sick building syndrome':ab,ti

4 (respiratory NEAR/3 (infection* OR disease* OR symptom*)):ab,ti

3 'otitis media'/exp OR 'common cold'/de OR 'influenza'/exp OR 'rhinitis'/exp OR 'sinusitis'/exp OR 'asthma'/exp OR 'coughing'/de OR 'irritative coughing'/de OR 'conjunctivitis'/exp OR 'eye disease'/exp

2 'sick building syndrome'/de

1 'respiratory tract disease'/exp OR 'respiratory tract infection'/exp

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Appendix 3. CINAHL (EBSCO) search strategy

3.1 CINAHL search 13 March 2009

respiratory tract disease.mp. OR respiratory tract diseases.mp. OR respiratory tract infection.mp. OR respiratory tract infections.mp. OR (respiratory adj3 (infection$ or disease$ or symptom$)).mp. OR sick building syndrome$.mp. OR otitis media.mp. OR common cold.mp. OR asthma.mp. OR rhinitis.mp. OR sinusitis.mp. OR conjunctivitis.mp. OR cough.mp. OR wheez$.mp. OR eye symptom$.mp. OR eye disease$

AND

humidity.mp. OR fungi.mp. OR water.mp. OR "air microbiology".mp. OR "indoor air pollution".mp. OR (damp$ or moistur$ or humid$ or mould or moulds or mold or molds).mp. OR (condensation$ OR fungal$ OR fungi$).mp. OR ("water vapour$" OR "water vapor$").mp. OR (microorganism$ OR micro organism$).mp. OR spore$.mp.

AND

(repair$ OR renovat$ OR remediat$ OR rebuild$ OR reconstruct$).mp. OR (drain$ OR remov$ OR reparat$ OR reduct$ OR dehuminificat$ OR refurbis$ OR recapsul$ OR decontaminat$ OR dry or drying).mp.

AND

clinical trials.mp OR [(ramdom$.mp. OR controll$.mp.)AND (trial.mp. OR trials.mp.)] OR random allocat$.mp. OR random assign$.mp. OR [(singl* OR doubl* OR trebl* OR tripl*) AND (mask* OR blind*) OR placebo$ OR evaluat$.mp. OR (cross-over$ OR comparativ$ OR volunteer$ OR prospectiv$).mp

3.2 CINAHL search strategy (2009 to June 2011)

S41 S26 and S39

S40 S26 and S39

S39 S28 or S29 or S30 or S31 or S32 or S33 or S34 or S35 or S36 or S37 or S38

S38 TI (cohort stud* or observation* stud*) or AB (cohort stud* or bservation* stud*)

S37 (MH "Cross Sectional Studies")

S36 (MH "Correlational Studies")

S35 (MH "Case Control Studies+")

S34 (MH "Prospective Studies+")

S33 (MH "Quantitative Studies")

S32 TI (random* or placebo*) or AB (random* or placebo*)

S31 TI (singl* blind* or doubl* blind* or tebl* blind* or tripl* blind* or singl* mask* or doubl* mask* or tripl* mask* or trebl* mask*) or AB (singl* blind* or doubl* blind* or trebl* blind* or tripl* blind* or singl*mask* or doubl* mask* or tripl* mask* or trebl* mask*)

S30 TI clinic* N2 trial* or AB clinic* N2 trial*

S29 PT clinical trial

S28 (MH "Clinical Trials+")

S27 S18 and S24 and S25

S26 S18 and S24 and S25

S25 TI (repair* or renovat* or remediat* or rebuild* or reconstruct* or remov* or reparat* or reduc* or dehumidif* or refurbis* or recapsul* or decontaminat* or dry or drying or drain*) or AB (repair* or renovat* or remediat* or rebuild* or reconstruct* or remov* or reparat* or reduc* or dehumidif* or refurbis* or recapsul* or decontaminat* or dry or drying or drain*)

S24 S19 or S20 or S21 or S22 or S23

S23 TI (damp* or moistur* or humid* or mould* or mold* or condensation* or fungal* or fungi* or water vapour* or water vapor* or microorganism* or micro-organism* or spore*) or AB (damp* or moistur* or humid* or mould* or mold* or condensation* or fungal* or fungi* or water vapour* or water vapor* or microorganism* or micro-organism* or spore*)

S22 (MH "Air Pollution, Indoor")

S21 (MH "Air Microbiology")

S20 (MH "Fungi+")

S19 (MH "Humidity")

S18 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17

S17 TI (otitis media or common cold* or influenza* or flu or asthma* or rhinit* or sinusit* or cough* or conjunctivit* or eye symptom*) or AB (otitis media or common cold* or influenza* or flu or asthma* or rhinit* or sinusit* or cough* or conjunctivit* or eye symptom*)

S16 (MH "Eye Diseases+/MI")

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S15 (MH “Conjunctivitis+”)
S14 (MH “Cough”)
S13 (MH “Sinusitis+”)
S12 (MH “Rhinitis+”)
S11 (MH “Asthma”)
S10 (MH “Influenza”) OR (MH “Influenza, Human”)
S9 (MH “Common Cold”)
S8 (MH “Otitis Media+”)
S7 TI respiratory N5 symptom* or AB respiratory N5 symptom*
S6 TI respiratory N5 disease* or AB respiratory N5 disease*
S5 TI respiratory N5 infection* or AB respiratory N5 infection*
S4 TI sick building syndrome* or AB sick building syndrome*
S3 (MH “Sick Building Syndrome”)
S2 (MH “Respiratory Tract Infections+”)
S1 (MH “Respiratory Tract Diseases+”)

Appendix 4. Science Citation Index (ISI Thomson) search strategy

4.1 Science Citation Index search 12 March 2009

TS= “respiratory tract disease*” OR TS=“respiratory tract infection*” OR TS=[(respiratory SAME (infection* or disease* or symptom*)] OR TS=“sick building symdrome*” OR TS=“otitis media*” OR TS=“common could” OR TS=asthma OR TS=influenza OR TS= wheez* OR TS=rhinit* OR TS=(sinisit* OR conjunctivit* OR cough) OR TS= “eye symptom*” OR TS=”eye diseases”
AND
TS=humidity OR TS= fungi OR TS=water OR TS= “air microbiology” OR TS=“indoor air pollution” OR TS=damp* OR TS= moistur* OR TS=humid* OR TS=mould* OR TS=mold* OR TS=condensation* OR TS=fungal* OR TS=fungi* OR TS=“water vapour*”OR TS=“water vapor*” OR TS=spore* OR TS=microorganism* OR TS=micro-organism*
AND
TS=repair* OR TS=renoval* OR TS=remediat* OR TS=rebuild* OR TS=reconstruvt* OR TS=drain* OR TS=remov* OR TS=reparat* OR TS=reduce* OR TS=reduci* OR TS=reduct* OR TS=dehumidufícat* OR TS=refurbis* OR TS=recapsul* OR TS=decontaminat* OR TS=dry OR TS=drying
AND
TS=random* OR TS=control* OR TS=trial OR TS=trials OR TS=allocat* OR assign* OR TS= blind*OR TS=clinical* OR TS=“latin square” OR TS=placebo* OR TS=comparativ* OR TS=evaluation* OR TS=follow* OR TS=prospectiv* OR TS=”cross-over” OR TS= volunteer* OR TS=singl* OR TS=doubl* OR TS=tripl*

4.2 Science Citation Index search (2009 to June 2011)

Topic=(respiratory SAME (infection* or disease*) or “sick building syndrome” or “otitis media” or “common cold*” or influenza* or flu or asthma or rhinitis or sinusitis or cough or coughing or conjunctivitis or “eye disease*” or “eye symptom*”) AND Topic= (humid* or fungi or fungal or fungus or water or “air microbiology” or “indoor air pollution” or damp* or moistur* or mould* or mold* or condensation* or “water vapour” or “water vapor” or spore* or microorganism* or micro-organism*) AND Topic=(repair* or renovat* or remediat* or rebuild* or reconstruct* or drain* or remov* or reparat* or reduc* or dehumidif* or refurbis* or recapsul* or decontaminat* or dry or drying)
Refined by: Topic=(random* or control* or trial or trials or allocat* or assign* or blind* or clinical* or “latin square” or placebo* or camparativ* or evaluation* or follow* or prospectiv* or “cross-over” or volunteer* or singl* or doubl* or tripl*)

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Appendix 5. OSH search strategy

5.1 OSH search 19 March 2009

CCOHS, CISDOC, NIOSHTIC and RILOSH databases

respirator* OR otitis OR asthma OR rhinitis OR sinusitis OR cough OR wheez* OR conjunctivitis

AND

humidit* OR fungi* OR fungal OR water OR indoor OR damp* OR moistur* OR mould* OR mold OR molds OR condensation* OR spore*

AND

repair* OR renovat* OR remediat* OR rebuild* OR reconstruct* OR drain* OR remov* OR reparat* OR reduc* OR rehumidificat* OR refurbish* OR recapsul* OR decontaminat*

AND

random* OR control* OR allocate* OR assign* OR trial OR trials OR singl* OR doubl* OR clinical OR evaluation* OR follow* OR prospective* OR volunteer* OR effect* OR evaluat* OR program* OR prevent*

5.2 OSH search update 29 November 2010

CCOHS, CISDOC, NIOSHTIC and RILOSH databases

respirator* OR otitis OR asthma OR rhinitis OR sinusitis OR cough OR wheez* OR conjunctivitis

AND

humidit* OR fungi* OR fungal OR water OR indoor OR damp* OR moistur* OR mould* OR mold OR molds OR condensation* OR spore*

AND

repair* OR renovat* OR remediat* OR rebuild* OR reconstruct* OR drain* OR remov* OR reparat* OR reduc* OR rehumidificat* OR refurbish* OR recapsul* OR decontaminat*

AND

random* OR control* OR allocate* OR assign* OR trial OR trials OR singl* OR doubl* OR clinical OR evaluation* OR follow* OR prospective* OR volunteer* OR effect* OR evaluat* OR program* OR prevent*

OSH UPDATE Search History (copied directly from the database 8.12.2010)

Databases NIOSHTIC, NIOSHTIC-2, CISDOC, RILOSH, CCOHS

Step: Hits: Strategy:

#1 59226 GW{respirator* OR otitis OR asthma OR rhinitis OR sinusitis OR cough OR wheez* OR conjunctivitis}

#2 59244 GW{humidit* OR fungi* OR fungal OR water OR indoor OR damp* OR moistur* OR mould* OR mold OR molds OR condensation* OR spore*}

#3 97795 GW{repair* OR renovat* OR remediat* OR rebuild* OR reconstruct* OR drain* OR remov* OR reparat* OR reduc* OR rehumidificat* OR refurbish* OR recapsul* OR decontaminat*}

#4 415900 GW{random* OR control* OR allocate* OR assign* OR trial OR trials OR singl* OR doubl* OR clinical OR evaluation* OR follow* OR prospective* OR volunteer* OR effect* OR evaluat* OR program* OR prevent*}

#5 1849 #1 AND #2 AND #3 AND #4

#6 493271 DC{OUNIOC OR OUNIOS OR OURILO OR OUCISD OR OUCCOHS}

#7 1167 #5 AND #6

#8 14662 PY{2009 OR 2010}

#9 34 #7 AND #8

Appendix 6. BIOSIS search strategy

BIOSIS search history 13 March 2009 (OVID)

respiratory tract disease.mp. OR respiratory tract diseases.mp. OR respiratory tract infection.mp. OR respiratory tract infections.mp. OR (respiratory adj3 (infection$ or disease$ or symptom$)).mp. OR sick building syndrome.mp. OR otitis media.mp. OR common cold.mp. OR asthma.mp. OR rhinitis.mp. OR sinusitis.mp. OR conjunctivitis.mp. OR cough.mp. or wheez$.mp. OR "eye symptom$".mp.

AND

humidity.mp. OR fungi.mp. OR water.mp. OR "air microbiology".mp. OR "indoor air pollution".mp. OR (damp$ or moistur$ or humid$ or mould or moulds or mold or molds).mp. OR (condensation$ OR fungal$ OR fungi$).mp. OR ("water vapour$" OR "water vapor$").mp. OR (microorganism$ OR micro-organism$).mp. OR spore$.mp.

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AND
(repair$ OR renovat$ OR remediat$ OR rebuild$ OR reconstruct$).mp. OR (drain$ OR remov$ OR reparat$ OR reduct OR dehuminificat$ OR refurbis$ OR recapsul$ OR decontaminat$ OR dry OR drying).mp.
AND
(ramdom$ OR controll$ OR trial OR trials OR clinical).mp. OR (allocat$ OR assign$ OR singl$ OR doubl$ OR evaluat$).mp. OR (cross-over$ OR comparativ$ OR volunteer$ OR prospectiv$).mp.
AND
limit to human
AND
limit to article or "review articles"

Appendix 7. Cochrane Library databases search strategy

Cochrane Library databases search 13 March 2009 (Wiley InterScience)
Respiratory Tract Diseases/exp OR (respiratory and (infection* or disease* or symptom*)) OR "Sick building Syndrome"/exp OR "sick building syndrome" OR "Otitis Media"/exp OR "common Cold"/exp OR "Influenza, Human"/exp OR Asthma/exp OR Sinusitis/exp OR Conjunctivitis/exp OR ("Eye Diseases"exp wirh MI/qualifier) OR Cough/exp OR "otitis media" OR wheez* OR "common cold" OR influenz* OR asthma* OR rhinit* OR sinusit* OR conjunctivit* OR "eye symptom" OR cough
AND
Fungi/exp OR Humidity/exp OR "Air Microbiology"/exp OR "Air Pollution, Indoor/exp OR damp* OR moistur* OR humid* OR mould* OR mold* OR condensation* OR fungal* OR fungi* OR "water vapor" OR "water vapors" OR micro-organism* OR microorganism* OR spore*
AND
repair* OR renovat* OR remediat* OR rebuild* OR reconstruct* OR drain* OR remov* OR reparat* OR reduct* OR rehumidificat* OR refurbis* OR recapsul* OR decontaminat* OR dry OR drying

Appendix 8. Glossary

- Vapour-air retarder: a device to diminish water content of the indoor air.
- Preventer: asthma medicine to prevent asthma attacks, generally inhaled corticosteroids.
- Sisalated paper: paper that contains sisal fibres.

HISTORY

Protocol first published: Issue 3, 2009

Review first published: Issue 9, 2011

CONTRIBUTIONS OF AUTHORS

Riitta Sauni and Jos Verbeek conceived the idea and prepared the protocol and review.

Merja Jauhiainen and Riitta Sauni planned the search strategy.

Riitta Sauni, Jukka Uitti and Jos Verbeek extracted data and assessed risk of bias.

The other review authors commented on the protocol and the various drafts of the review and helped with conceptual problems.

The authors of the chosen articles were excluded from evaluating their own studies.

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DECLARATIONS OF INTEREST

None of the authors have accepted financial benefits from any organisation that may in any way gain or lose financially from the results of our study or the conclusions of our review.

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