

Date of Briefing – August 2005

What is the impact of environmental housing conditions on the health and well-being of children?

Key messages

- More than one million children live in housing in England that is considered sub-standard or unfit to live in
- On the whole, the research indicates that there is an association between homes with visible damp or mould and the prevalence of asthma or respiratory problems among children
- Dampness and mould has also been found to be associated with exacerbated symptoms among children with asthma or wheezing illness
- Poor quality housing can have an adverse effect on children's psychological well-being
- Parents and children both complain of the social stigma of living in bad housing
- Overcrowding and cooking with gas may cause respiratory infections in preterm infants.
- Interventions such as installing or improving heating systems has been found to be effective in alleviating the potentially adverse effects of damp on the health of children

Introduction

This section introduces and defines the scope of the briefing and the topic.

A SCARE briefing provides up-to-date information on a particular topic. It is a concise document summarising the knowledge base in a particular area and is intended as a 'launch pad' or signpost to more in-depth investigation or enquiry. It is not a definitive statement of all evidence on a particular issue. The briefing is divided into the different types of knowledge relevant to health and social care research and practice, as defined by the Social Care Institute for Excellence (SCIE) ⁽¹⁾. It is intended to help health and social care practitioners and policy-makers in their decision-making and practice.

This briefing focuses on how environmental housing conditions can affect the health and well-being of children. The concern is the immediate physical structure or environment rather than other elements of the accommodation, such as the neighbourhood or the appropriateness of the housing for disabled children. Therefore, although it is acknowledged that temporary accommodation and housing tenure also raise issues which can affect the health and well-being of children, the aim of this briefing is to consider only the impact of non-decent or substandard living conditions such as dampness and overcrowding, regardless of the status of the tenants. Poor housing conditions can have an impact on the health and well-being of parents too, and therefore affect their ability to parent ⁽²⁾, but this briefing considers the direct impact of the housing environment on the health of children only. The contribution of environment to household accidents is also not covered by this briefing.

Why this issue is important

A recent report found that more than one million children in England are currently in "damp, cold, infested" housing ^(2,3). More than one million houses in England are considered "unfit to live in" ^(3,4). However, there is currently no widely accepted definition of what constitutes sub-standard, inadequate or non-decent housing, although a recent Government policy document described decent homes as "homes that are warm and weatherproof with reasonably modern facilities" ⁽⁵⁾. According to a survey based on the 2001 census, "more than half a million families in Britain live in officially overcrowded housing", which is measured by whether a household "has fewer bedrooms than implied by the [bedroom] standard", as described in the Household Survey for England ⁽⁴⁾. These statistics are important because a person's physical environment can have an impact on their health and well-being. This is especially the case for young children, who can spend 90% of their time in the home ⁽⁶⁾. Other groups of children are also particularly vulnerable to environmental conditions within the home, especially children with asthma or related conditions, and small, immature

or preterm infants ^(2,7-9). Substandard housing has also been found by a US study to be one of a number of factors associated with child hunger ⁽¹⁰⁾. Finally, a major study has also found that exposure to “adverse housing conditions” in childhood increases the likelihood of certain illnesses in later life, even if these people live in good quality housing in adulthood ⁽¹¹⁾.

What do the different sources of knowledge show?

Organisational Knowledge

This section lists and briefly summarises documents that describe the standards that govern the conduct of statutory services, organisations and individuals in relation to the housing and health of children.

Office of the Deputy Prime Minister (2005). Housing Health and Safety Rating System

<http://www.odpm.gov.uk/index.asp?id=1157124>

The Housing Health and Safety Rating System (HHSRS) guidance is the basis for action against unacceptable housing conditions. This new standards system is provided for by the Housing Bill 2004 (Title link: <http://www.publications.parliament.uk/pa/ld200304/ldbills/071/2004071.htm>) and replaces the housing fitness standard set out in the Housing Act 1985.

Office of the Deputy Prime Minister (2005). Sustainable Communities. Homes for All.

<http://www.odpm.gov.uk/index.asp?id=1139865>

This describes a five year plan which offers everyone the opportunity of a decent home at a price they can afford.

Department of Work and Pensions (2005). Opportunity for All. Seventh Report.

<http://www.official-documents.co.uk/document/cm66/6673/6673.asp>

This Government policy document outlines Government targets in relation to poverty and social disadvantage and poverty, including decent housing.

DEFRA (2004). UK Fuel Poverty Strategy

<http://www.defra.gov.uk/environment/energy/fuelpov/>

This is the Government's fuel poverty strategy. It sets out the framework for delivery of the Government's overall goal of seeking an end to the problem of fuel poverty, with the first target being to reach those who are most vulnerable to cold-related ill health by 2010. This includes children.

Department of Health (2004). Making Healthier Choices Easier

http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4094550&chk=aN5Cor

This is the Government White Paper which sets out the key principles for supporting the public to make healthier and more informed choices with regard to their health. The aim is “to improve the health of the population” by focusing on all of the determinants of health, including housing. The paper includes details of the Government's Public Service Agreements' (PSA) targets and their supporting strategies. These include bringing all social housing "into a decent condition" by 2010, especially in "deprived areas and . . . vulnerable households in the private sector, including families with children", with the intention of increasing "the proportion who live in homes that are in a decent condition".

Department of Health (2000). Framework for the Assessment of Children in Need and their Families Guidance.

http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4003256&chk=Fss1ka

This document describes a framework for assessing children's and families needs to identify “whether the child being assessed is in need . . . and which services would best meet the needs of this child and their family”. The needs of disabled family members must also be considered when assessing needs. Sections 5.69-5.71 cover housing. The guidance states that Housing Authorities should be “prepared to assist in the provision of accommodation” because “the provision of appropriate housing can make an important contribution to meeting the health and developmental needs of children”.

Department of Health (1998). Saving Lives. Our Healthier Nation

<http://www.archive.official-documents.co.uk/document/cm43/4386/4386.htm>

This is a government action plan to tackle poor health in the UK. This policy document recognises that “sub-standard housing” is a contributory factor in poor health and a source of health inequalities.

Children Act 1989

http://www.legislation.hmso.gov.uk/acts/acts1989/Ukpga_19890041_en_1.htm

If a child does not have the opportunity or is unable to achieve or maintain a “reasonable standard of health or development”, then they are regarded as being “in need”, which in turn means they are eligible for a range of support services. Under section 17 of this Act, a child is considered to be in need if “he is unlikely to achieve or maintain, or to have the opportunity of achieving or maintaining, a reasonable standard of health or development without the provision for him of services by a local authority” or if his “health or development is likely to be significantly impaired, or further impaired, without the provision for him of such services”.

UN Convention on the Rights of the Child

<http://www.unicef.org/crc/index.html>

This Convention was ratified by the UK in 1991. Article 6 states that States' actions should promote a life of human dignity, that is, States should fully ensure the right to an adequate standard of living, including the right to housing, nutrition and the highest attainable standards of health. Article 27.3 states that States Parties, in accordance with national conditions and within their means, shall take appropriate measures to . . . provide material assistance and support programmes, particularly with regard to nutrition, clothing and housing.

Policy Community Knowledge

This section summarises documents describing proposed structural models and guidance for the delivery of policy and improved practice. These documents are published by public policy research bodies, lobby groups, think tanks and related organisations.

Shelter (2005). Full House? How overcrowding affects families.

<http://england.shelter.org.uk/howtohelp/howtohelp-4482.cfm>

This is a recent report by Shelter examining the nature of overcrowding in homes and its effects on the lives of children.

Shelter (2004). Toying with their Future. The hidden cost of the housing crisis.

<http://england.shelter.org.uk/files/seealsodocs/3337/Toyingfuture%2Epdf>

This is a report about the current state of housing problems in the United Kingdom and how they affect children. It records the views of people living with these problems, and the professionals who support them. A series of recommendations to improve the housing situation are provided.

Acheson D. (1998). Independent Inquiry into Inequalities in Health. TSO, London

<http://www.archive.official-documents.co.uk/document/doh/ih/contents.htm>

This review of the evidence on inequalities in health in England was commissioned with the intention of informing the Government's strategy for health and to identify areas for policy development likely to reduce these inequalities. This includes identifying poor quality housing and its consequences, and making recommendations to counter existing inequalities. It calls for the development of policies to improve housing and limit the effects of sub-standard or inadequate housing.

Practitioner Knowledge

This section describes studies carried out by health and social care practitioners, documents relating their experiences regarding the topic, and resources produced by local practitioner bodies to support their work.

Liverpool City Council (2003). Housing Strategy Statement. Health Impact Assessment.

http://www.phel.nice.org.uk/hiadocs/HIA_LiverpoolCC_Housing_Strategy.pdf

This document reports on initiatives to tackle cold housing conditions by providing central heating and/or insulation for households with asthmatic children and older people, and measures to involve children and young people in the development of housing strategies.

Fletcher P. & Spencer S. (2000). Housing for Health. A Good Practice Guide for Tackling Health Inequalities in Tyne and Wear, and Directory of Health and Housing Initiatives. Health Action Zone Network.

This Guide includes details about the implementation of a “repairs on prescription scheme”, in which hospital consultants make recommendations for housing improvements to alleviate asthma among child patients. Another initiative approaches tenants to enquire about the impact of renovations on their lives and well-being.

Research Knowledge

This section summarises the best available research literature. The focus is on studies undertaken in the United Kingdom, so that the findings are as relevant as possible to the intended audience of the briefing.

The limitations of the research

There are many good quality case-control studies to provide important data on the relationship between housing conditions and health, regardless of socio-economic status or household income. However, a recent review of the literature on the risks to child health posed by housing conditions found that there was a lack of standardized measures for assessing housing quality and hazards, and a paucity of research on interventions ⁽¹²⁾. Many of the existing studies also only examine small samples ⁽⁷⁾ and some rely on self-report measures of dampness and / or respiratory symptoms ^(7,9). Only a few studies apply objective or validated measures of respiratory symptoms ^(8,13) or housing quality, such as the degree of dampness, moisture or mould in the home ^(8,13,14). However, it is also the case that the results of this research are not entirely conclusive, and highlight the need for further work in this field. A recent systematic review found similar limitations among the literature regarding the effect of housing improvements on the health of adults and children ⁽¹⁵⁾. Finally, the research has tended to focus almost exclusively on the effects of damp or mould, there is virtually nothing on the

psychological, social and behavioural effects of poor physical environments on children ⁽⁶⁾.

What are the effects of dampness, moisture and mould?

Dampness usually means the presence of water damage, damp stains, visible mould and condensation. Some studies and reviews from the UK and elsewhere have reported an association between dampness, moisture and mould and the prevalence of respiratory symptoms among children of all ages ^(8,16-21). For example, one review found that children in homes with damp and/or mould are two and a half times more likely to have coughs or wheezing than children in “dry” homes ⁽¹⁸⁾. Another UK study found that visible mould was significantly associated with an increased risk of wheezing illness among children aged 9-11 years ⁽⁸⁾. This significant association between visible mould and damp spots inside the house has also been reported by a large Swedish study of households with children aged 1-6 years ⁽²⁰⁾, a Finnish study of preschool and school-aged children ⁽²²⁾, and a wider European study of older children in which the prevalence of asthma and chronic cough was higher in “damp” compared to “dry” homes ⁽¹³⁾.

Other recent Swedish case-control studies have also found a significant association between asthma or wheezing and dampness in the home, such as the amount and frequency of windowpane condensation ^(23,24). The association between moisture and cough or respiratory problems is particularly significant with regard to nocturnal symptoms ^(8,21,22) and more significant still for children who have a predisposition to allergies ^(8,13,19). The Finnish study also found a significant association between eczema in preschool children and visible moisture and mould in the home, and a relationship between these environmental conditions and nausea in older children ⁽²²⁾. All age groups in this study were found to visit primary care more frequently than their counterparts in dryer houses ⁽²²⁾. However, some of this research focuses only on children who already have asthma or some form of wheezing, rather than considering the possible effects of dampness on children without this condition ^(7,17,21,23-25), although, one UK study did find a significant association between wheezing and dampness when compared to controls without a history of wheezing ⁽⁸⁾.

Given the limitations of these studies, described above, the associations must be considered with caution, however, especially since it is also the case that other studies examining preschool children and adolescents have found no such significant association between damp and respiratory problems ^(25,26).

What are the effects of other household environmental factors?

Research from the United States has found that indoor allergens, especially dust mites, can exacerbate or cause asthma ⁽²⁷⁾. Also, overcrowding has been found by one study to be associated with lower respiratory tract infection in preterm

infants but not term infants ⁽⁹⁾. Overcrowding has also been found by other studies to have an impact on the psychological health of very young children ⁽⁶⁾. A US study which used an objective measure of housing quality, which included heating, wall and ceiling surfaces, but not dampness specifically, and the condition of structures such as stairs, found that there was an association between adverse housing conditions and the poor psychological health of children aged 8-11 years ⁽¹⁴⁾. As well as depression and anxiety, these children demonstrated less ability to persist with tasks. The study hypothetically explained these children's feelings of helplessness as a response to "chronic exposure to aversive housing conditions that one can do little to change" ⁽¹⁴⁾.

Gas cooking has been found by one study to be associated with lower respiratory tract infection in preterm infants at home ⁽⁹⁾. No such effect has been found for term infants ⁽⁹⁾ or adolescents ⁽²⁵⁾, but has been reported for young adults ⁽²⁸⁾. Substandard housing conditions can potentially have substantial physical effects on newborns and other babies. A national investigation undertaken by Shelter came across so-called "buggy babies", who are left in their prams either because the surrounding conditions in the home are so bad, or because of overcrowding. These babies can develop deformed skulls because they spend almost all of their time in a lying position in the pram; the soft bone therefore becomes misshapen before setting permanently ⁽²⁾. It has also been found that lead can have an adverse impact on the intellectual development of some very young children under two years of age ⁽²⁹⁾, and that the risk of lead poisoning is greater in older, less expensive housing ⁽³⁰⁾.

Finally, a recent review of the evidence on this topic, commissioned by the Office of the deputy Prime Minister, also reported a possible association between housing conditions and child mortality, and possible relationships between the housing environment and meningitis, tuberculosis and children's mental health. However, once again, the research has clear limitations and its findings are to be treated with caution ⁽³¹⁾.

What interventions are effective in addressing these issues?

A UK study examined the effectiveness of installing central heating into homes in which the bedrooms of children aged 9-11 years were found to be unheated and in most cases damp ⁽⁷⁾. The study found that respiratory problems among children with asthma, both cough and more severe symptoms, were significantly alleviated by the installation of central heating. The amount of school-time lost by these children was also significantly and positively affected ⁽⁷⁾. However, an earlier, similar study investigating the effect of an improved heating system in countering the adverse effect of damp on the health on children found that the intervention prevented further deterioration in their health, but did not improve it ⁽³²⁾.

One US study assessed the value of targeting blood lead levels (BLLs) testing at very young (9-24 months) children in older and less expensive housing, and successfully identified higher BLLs among this group, which could then be addressed by safer housing policies ⁽³⁰⁾. Another US review found that children exposed to lead dust as a result of living in substandard housing could be given modest protection by professional visiting dust control teams, but it is unlikely that this service would be available to all relevant people in high-risk housing ⁽³³⁾. Rehousing may also have a positive impact on residents' mental health, but the association has not been proven unequivocally ⁽⁶⁾. Finally, randomized trials of interventions to manage dust-mite levels to reduce their effect on childhood asthmatics have found that only intensive actions such as frequent, intense cleaning and carpet removal can have any effect ⁽³³⁾.

User & Carer Knowledge

This section summarises the issues raised by young people, parents and professionals, both as described by the literature and as defined through local consultation.

The relationship between housing conditions and respiratory illness is a particular concern of parents. The impact of housing conditions can be broader than just a direct effect on a child's respiratory health. One parent told a recent investigation by Shelter that, "My 10 year old's asthma is getting worse because of the damp. Mould is growing on the carpets and I have to spend loads on heating instead of proper food for my kids" ⁽³⁾. Children and parents can also experience social stigma as a result of their living conditions, and this can affect their school and social lives. One mother has said how she had "letters from school telling me the kids smelt really bad . . . it was their clothes that stank from being in the flat. I'd washed them and everything, but it doesn't help, everything stinks" ⁽³⁾.

Useful Links

This section lists sources of information relevant to professionals who work within this field, and may also be of value to service users.

Centre for Housing Policy. University of York.

<http://www.york.ac.uk/inst/chp/hcc.htm>

The Centre for Housing Policy at the University of York (CHP) was established in 1990 with the support of the Joseph Rowntree Foundation. It was designed to become a leader in policy relevant research and is one of the leading centres of housing and social policy research in the UK.

Faculty of Public Health, Royal College of Physicians

http://www.fphm.org.uk/policy_communication/network_groups/network_groups_current_list.asp

This faculty has network groups on both Child Public Health and Housing and Homelessness.

NCH

<http://www.nch.org.uk/>

The NCH is a charity which seeks to provide services to support vulnerable and excluded children and young people.

Shelter

<http://england.shelter.org.uk/home/index.cfm>

Shelter is a registered charity which provides advice and support on housing issues. It also supports research into the housing situation in the UK.

WHO. Children's Environmental Health

<http://www.who.int/ceh/en/>

This website also includes a section on housing and its impact on children's health.

Acknowledgements

Thank you to the experts and service users for their contributions to this briefing.

References

1 **Pawson R., Boaz A., Grayson L., Long A., Barnes C.** (2003). Types and Quality of Knowledge in Social Care. Knowledge Review 3. Social Care Institute for Excellence (SCIE). **Title link:**
<http://www.scie.org.uk/publications/knowledge.asp> [Accessed 22 December 2005].

This document analyses and defines the different types of knowledge and information which may inform social care research and practice.

2 **Minton A., Jones S.** (2005). Generation Squalor. Shelter's National Investigation into the Housing Crisis. Shelter. **Title link:**
<http://england.shelter.org.uk/policy/policy-825.cfm/plitem/169> [Accessed 22 December 2005].

This document summarizes the findings of an investigation into people's experiences of bad housing in England.

3 **Shelter** (2004). Toying with their Future. The hidden cost of the housing crisis. Shelter. **Title link:**
<http://england.shelter.org.uk/files/seealsodocs/3337/Toyingfuture%2Epdf> [Accessed 22 December 2005].

This report gives an overview of the effects of bad housing on the lives of children.

4 **Office of the Deputy Prime Minister** (2004). Survey of English Housing 2002-2003. Office of the Deputy Prime Minister. **Title link:**
<http://www.odpm.gov.uk/index.asp?id=1154759> [Accessed 22 December 2005].

This survey offers a statistical breakdown of the housing situation in England.

5 **Department of Work and Pensions** (2005). Opportunity for All. Seventh Report. DWP. **Title link:**
<http://www.official-documents.co.uk/document/cm66/6673/6673.asp> [Accessed 22 December 2005].

This Government policy document outlines Government targets in relation to poverty and social disadvantage and poverty, including decent housing.

6 **Chaudhuri N.** (2004). Interventions to improve children's health by improving the housing environment. Reviews on Environmental Health, 19 (3-4), 197-222.

This paper reviews factors that have been shown to mediate the relationship between housing and health, and provides examples of interventions to improve child health with reference to housing.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15742671&query_hl=6&itool=pubmed_docsum

7 Somerville M., Mackenzie I., Owen P., Miles D. (2000). Housing and health: does installing heating in their homes improve the health of children with asthma? *Public Health*, 114 (6), 434-439.

This study aims to evaluate the use of NHS money to improve the health of children by improving housing conditions.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11114752&dopt=Abstract

8 Venn A.J., Cooper M., Antoniak M., Laughlin C., Britton J., Lewis S.A. (2003). Effects of volatile organic compounds, damp, and other environmental exposures in the home on wheezing illness in children. *Thorax*, 58 (11), 955-960.

The aim of this study is to determine the independent effects of common environmental exposures in the home on the risk and severity of persistent wheezing illness in children.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14586048

9 Emond A.M., Howat P., Evans J.A., Hunt L. (1997). The effects of housing on the health of preterm infants. *Paediatric and Perinatal Epidemiology*, 11 (2), 228-239.

This is a prospective case-control study investigating the effects of housing on the health of very preterm infants during the first year of life.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9131713&dopt=Abstract

10 Wehler C., Goldberg R., Gundersen C., Hosmer D., Huntington N., Scott R. et al. (2004). Risk and protective factors for adult and child hunger among low-income housed and homeless female-headed families. *American Journal of Public Health*, 94 (1), 109-115.

The aim of this study is to identify factors associated with adult or child hunger.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=14713707&dopt=Abstract

11 **Marsh A., Gordon D., Pantazis C., Heslop P.** (2000). Home Sweet Home? The Impact of Poor Housing on Health. Bristol, Policy Press.

This study provides an analysis of the National Child Development Survey (NCDS) with regard to the impact on housing conditions on health.

12 **Breyse P., Farr N., Galke W., Lanphear B., Morley R., Bergofsky L.** (2004). The relationship between housing and health: children at risk. *Environmental Health Perspectives*, 112 (15), 1583-1588.

This paper summarises the findings of a US workshop on the relationship between housing and health in children.

13 **Andriessen J.W., Brunekreef B., Roemer W.** (1998). Home dampness and respiratory health status in European children. *Clinical & Experimental Allergy*, 28 (10), 1191-1200.

This study examines the association between home dampness and Peak Flow (PEF) variability, frequency of respiratory symptoms and relief medication use by children.

Abstract available

http://eutils.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9824385

14 **Evans G.W., Saltzman H., Cooperman J.L.** (2001). Housing quality and children's socioemotional health. *Environment and Behavior*, 33 (3), 389-399.

This US study examines the relationship between children's psychological health and the quality of housing.

15 **Thomson H., Petticrew M., Morrison D.** (2001). Health effects of housing improvement: systematic review of intervention studies. *British Medical Journal*, 323 (7306), 187-190.

This is a systematic review of studies examining the effects of improved housing conditions on the health of people living in poor quality housing.

Full text <http://bmj.bmjournals.com/content/vol323/issue7306/>

16 **Cuijpers C.E.J., Swaen G.M.H., Wessling G., Sturmans F., Wouters E.F.M.** (1995). Adverse effects of the indoor environment on respiratory health in primary school children. *Environmental Research*, 68, 11-23.

This Dutch study examines the relationship between living conditions and respiratory symptoms in young children.

17 **Williamson I.J., Martin C.J., MacGill G., Monic R.D.R., Fennerty A.G.** (1997). Damp housing and asthma: a case-control study. *Thorax*, 52 (3), 229-

234.

This study looks at the prevalence of respiratory symptoms in children living in damp housing.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=9093337

18 **Peat J.K., Dickerson J., Li J.** (1998). Effects of damp and mould in the home on respiratory health: a review of the literature. *Allergy*, 53 (2), 120-128.

This Australian review examines the direct or indirect relationship between respiratory health and damp or mould in the home.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9534909&dopt=Abstract

19 **Verhoeff A.P., Vanstrien R.T., Vanwijnen J.H., et al** (1995). Damp housing and childhood respiratory symptoms: the role of sensitization to dust mites and molds. *American Journal of Epidemiology*, 141 (2), 103-110.

This Dutch study examines the association between damp housing, childhood respiratory symptoms, and sensitization to house dust mites and mold allergens.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=7817966&dopt=Abstract

20 **Bornehag C.G., Sundell J., Hagerhed-Engman L., Sigsggard T., Janson S., Aberg N. et al.** (2005). 'Dampness' at home and its association with airway, nose, and skin symptoms among 10,851 preschool children in Sweden: a cross-sectional study. *Indoor Air*, 15 (S10), 48-55.

This study looks at moisture-related problems in buildings as a risk factor for asthma and allergic symptoms among preschool children.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15926944&query_hl=11

21 **Nicolai T., Illi S., von Mutius E.** (1998). Effect of dampness at home in childhood on bronchial hyperreactivity in adolescence. *Thorax*, 53 (12), 1035-1040.

This German study examines the relationship between home dampness and respiratory problems in children.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10195075

22 **Koskinen O., Husman T., Meklin T.** (1999). Adverse health effects in children associated with moisture and mold observations in houses. *International Journal of Environmental Health Research*, 9 (2), 143-156.

This is a Finnish study of the health effects in children associated with observations of moisture or mold in their homes based on a random sample of 310 houses during the years 1993-1994.

23 **Emenius G., Svartengren M., Korsgaard J., Nordvall L., Pershagen G., Wickman M.** (2004). Building characteristics, indoor air quality and recurrent wheezing in very young children (BAMSE). *Indoor Air*, 1434-42.

This is a Swedish longitudinal study looking at the relationship between household environment and child respiratory health.

24 **Emenius G., Svartengren M., Korsgaard J., Nordvall L., Pershagen G., Wickman M.** (2004). Indoor exposures and recurrent wheezing in infants - a longitudinal study in the BAMSE cohort. *Acta Paediatrica*, 93899-905.

This is a Swedish longitudinal study looking at the relationship between household environment and child respiratory health.

25 **Strachan D.P., Carey I.M.** (1995). Home environment and severe asthma in adolescence: a population-based case-control study. *British Medical Journal*, 311 (7012), 1053-1056.

This study investigates the effects of the home environment on the risk of severe asthma during adolescence.

Full text <http://bmj.bmjournals.com/cgi/content/full/311/7012/1053>

26 **Lindfors A., Wickman M., Hedlin G., Pershagen G., Rietz H., Nordvall S.L.** (1995). Indoor environmental risk factors in young asthmatics: a case-control study. *Archives of Disease in Childhood*, 73 (5), 408-412.

This Swedish study investigates a range of risk factors for asthmatic children.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8554356&dopt=Abstract

27 **Institute of Medicine.** (2000). *Clearing the Air: Asthma and Indoor Air Exposures*. Washington DC, National Academy Press.

This is a US report assessing the relationship between asthma and indoor air quality.

28 **Jarvis D.B., Chinn S., Luczynska C., Burney P.** (1996). Association of respiratory symptoms and lung function in young adults with use of domestic gas

appliances. *The Lancet*, 347 (8999), 426-431.

This study examines whether the use of gas appliances is associated with an increased risk of respiratory symptoms.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8618483&dopt=Abstract

29 **Pocock S.J., Smith M., Baghurst P.** (1994). Environmental lead and children's intelligence: a systematic review of the epidemiological evidence. *British Medical Journal*, 309 (6369), 1189-1197.

This systematic review aims to quantify the magnitude of the relationship between full scale IQ in children aged 5 or more and their body burden of lead.

Full text

http://bmj.bmjournals.com/cgi/content/abstract/309/6963/1189?ijkey=d704bf6dbc968c4506e3dff513310bdccb990230&keytype2=tf_ipsecsha

30 **Meyer PA, Staley F, Staley P, Curtis J, Blanton C, Brown MJ** (2005). Improving strategies to prevent childhood lead poisoning using local data. *International Journal of Hygiene & Environmental Health*, 208 (1-2), 15-20.

This US study investigates public health policies for testing children at risk of lead poisoning due to their housing.

Abstract available

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15881974&query_hl=1

31 **Office of the Deputy Prime Minister** (2004). The Impact of Overcrowding on Health and Education: A review of the evidence and literature. Office of the Deputy Prime Minister. **Title link:**
<http://www.odpm.gov.uk/index.asp?id=1155484>.

This is a review commissioned by the Office of the Deputy Prime Minister on the evidence concerning overcrowding and its impact on the health and well-being of children and adults.

32 **Hopton J., Hunt S.** (1996). The health effects of improvements to housing: a longitudinal study. *Housing Studies*, 11 (2), 271-286.

This is a UK study examining whether changes to housing does positively affect health.

33 **Sandel M., Phelan K., Wright R., Hynes H.P., Lanphear B.P.** (2004). The effects of housing interventions on child health. *Pediatric Annals*, 33 (7), 474-481.

This is a review of tested interventions to address the hazards in housing that may impact on children's health.