The Real Cost of Poor Housing

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Abstract: Poor housing = poor health. But can we quantify this, in terms of the money that it is costing the National Health Service to treat housing related health problems? This paper reports on a BRE Trust research project which aims to: identify hazards in the home; measure their impact on the health and safety of the occupants; quantify the costs and benefits of reducing these hazards to an acceptable level. The research is possible because health and safety risk data have become available from the English Housing Survey, which can be combined with treatment cost data from the National Health Service.

The worst housing risk to health in England is a cold home, followed by fall hazards due to the design or condition of the dwelling. Some 4.8 million homes have such hazards and the cost of remedial action is estimated to be some £18bn. If they were all improved immediately, it is estimated that they would save the NHS some £600m per year in direct treatment costs. An output of the research is a 'calculator', which is being used by housing authorities to promote effective home improvements to vulnerable people and then measure their cost-benefit.

Key words: = housing, health, vulnerable, cost, benefit

1. INTRODUCTION

This paper summarises the results of a research project commissioned by the BRE Trust to develop a method of quantifying the cost of poor housing, and the cost-benefit of interventions to improve such housing. The full results are found in **The Real Cost of Poor Housing**[1].

Since the publication of The Real Cost of Poor Housing, which relates to England, the methodology has been used to quantify the cost of poor housing in Wales and Northern Ireland. It has also been used widely to establish the impact of real housing interventions by local authorities and social landlords. This paper provides feedback on some of the early practical uses of the research and, in particular, on how it has been used to quantify the health benefits of energy efficiency measures which improve homes well beyond the average for their age and type.

2. BACKGROUND

There is a long established, recognised relationship between poor housing and poor health. In Victorian England diseases such as tuberculosis, cholera, and typhus were known to be associated with unsanitary, cold, damp and overcrowded housing and this led to various public health and housing acts designed to improve housing conditions. The problems of disease associated with 'slum' living have now largely been eradicated but there remains a significant number of health and safety hazards in the home, compounded by the fact that England has one of the oldest housing stocks in the developed world and one of the lowest rates of housing replacement.

Many studies have investigated the relationship between housing and health but, because of the number of intervening variables, it has been difficult to demonstrate clear and measurable cause/effect relationships. Nevertheless, there is a large and growing body of evidence linking systematically adverse health effects with poor housing conditions.

BRE and the University of Warwick have been involved in the development of the Housing Health and Safety Rating System (HHSRS), which has since 2006 been the minimum standard of housing in England[2]. The HHSRS produces scores for dwellings based on the statistical risk of 29 health and safety hazards, in particular to vulnerable people.

Through the English Housing Condition Survey (EHCS), which now measures the presence of HHSRS hazards in the home, we are able to quantify the national risk of poor housing and also the cost of remedial action[3]. However, up until this research project we have not had the ability to link this information to medical and social costs to estimate the 'cost to society' of poor housing.

3. METHOD

In summary, our approach was to:

1. Define poor housing.
2. Quantify the number and type of poor homes in England.
3. Quantify the cost of improving these poor homes to an acceptable level.
4. Quantify the costs to society of people living in these poor homes.
5. Develop a cost-benefit tool which will quantify the health impact of different housing interventions.

4. DEFINING POOR HOUSING

'Poor housing' can be defined in a number of different ways. However, for the purpose of this research it has been defined as that which fails to meet the current minimum standard of housing in England, which is ***a home that has one or more Category 1 HHSRS hazards***. Unlike other measures of poor housing this focuses on health outcomes and its development was informed by a large body of research and statistics on the links between housing and health. It also has the advantage that it is now measured through the EHCS and so can be measured at detailed and national level.

5. THE HOUSING HEALTH AND SAFETY RATING SYSTEM (HHSRS)

The HHSRS is a means of identifying defects in dwellings and evaluating the potential effect of any defects on the health and safety of occupants, visitors, neighbours and passers-by. The system provides a means of rating the seriousness of any hazard, so that it is possible to differentiate between minor hazards and those where there is an immediate threat of major harm, or even death. The emphasis is placed on the potential effect of any defects on the health and safety of people, particularly those who might be regarded as 'vulnerable'. There are 29 potential HHSRS hazards identified, which fall into four groups: (Table 1).

5.1 Table 1: The 29 HHSRS hazards.

Physiological Requirements
Damp and mould growth etc
Excessive cold
Excessive heat
Asbestos etc
Biocides
CO and fuel combustion productions
Lead
Radiation
Uncombusted fuel gas
Volatile organic compounds

Psychological Requirements
Crowding and Space
Entry by intruders
Lighting
Noise

Protection Against Infection
Domestic hygiene, pests and refuse
Food safety
Personal hygiene, sanitation and drainage
Water supply

Protection Against Accidents
Falls associated with baths etc
Falling on level surfaces
Falling on stairs etc
Falling between levels
Electrical hazards
Fire
Flames, hot surfaces etc
Collision and entrapment
Explosions
Position and operability of amenities etc
Structural collapse and falling elements

The HHSRS scoring procedure uses a formula to generate a numerical score for each of the hazards identified at a property. The higher the score, the greater is the severity of the hazard. Potential hazards are assessed in relation to the most vulnerable class of person who might typically occupy or visit the dwelling. For example, for falls on stairs the vulnerable group is the elderly (60+ years) while for falls between levels it is children under 5 years old.

The hazard score formula requires an inspector to make two judgements:

- The likelihood of an occurrence, which could result in a harm to a vulnerable person over the following 12 month period (the likelihood is to be given as a ratio – eg 1 in 10, 1 in 500).
- The likely health outcome, or harms, that would result from the occurrence.

From any occurrence there may be a most likely outcome, and other possible ones which may be more or less severe. For example, a fall from a second floor window could result in a 60% chance of severe concussion, but there may also be a 30% chance of a more serious injury, and a 10% chance of something less serious. The four classes of harms and their associated weightings are listed in Table 2.

5.2 Table 2 Classes of HHSRS harms.

Class	Examples	Weightings
Class 1	Death, permanent paralysis below the neck, malignant lung tumour, regular severe pneumonia, permanent loss of consciousness, 80% burn injuries	10,000
Class 2	Chronic confusion, mild strokes, regular severe fever, loss of hand or foot, serious fractures, very serious burns, loss of consciousness for days	1,000
Class 3	Chronic severe stress, mild heart attack, regular and persistent dermatitis, malignant but treatable skin cancer, loss of a finger, fractured skull, severe concussion, serious puncture wounds to head or body, severe burns to hands, serious strain or sprain injuries, regular and severe migraine	300
Class 4	Occasional severe discomfort, chronic or regular skin irritation, benign tumours, occasional mild pneumonia, a broken finger, sprained hip, slight concussion, moderate cuts to face or body, severe bruising to body, 10% burns, regular serious coughs and colds.	10

From the judgements made by the surveyor, a hazard score can be generated for each hazard as illustrated in Table 3, using the example of falling between levels.

5.3 Table 3 Example hazard score for falls between levels.

Class	Weighting	Likelihood (1 in)	Spread of harm	Hazard score
Class 1	10,000	100	0	0
Class 2	1,000	100	30	300
Class 3	300	100	60	180
Class 4	10	100	10	1
All classes				**481**

Using this approach, hazard scores can range from 1 (very safe) to over 5,000 (very dangerous). ***A score of 1,000 or more is considered to be a Category 1 hazard*** and it is this we have taken to be our definition of poor, or unhealthy, housing.

6. QUANTIFYING POOR HOUSING

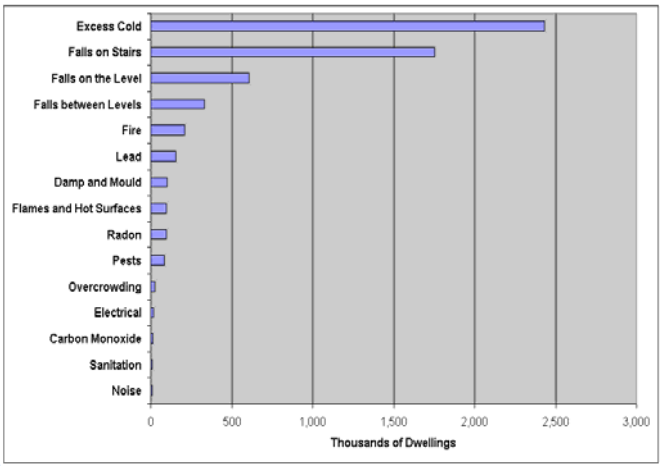
The HHSRS is now measured through the EHCS, which is a national survey of housing conditions and energy efficiency carried out by the Government department responsible for the development and monitoring of housing policies. The first 5 yearly EHCS was undertaken in 1971 and it has been continuous since 2001, with an annual sample of 8,000 homes taken randomly from across the housing stock of all types and tenures. In 2008 the EHCS merged with the Survey of English Housing (SEH) to become the English Housing Survey (EHS) and enable it to collect comprehensive information on households as well as the homes they live in.

The EHCS/EHS collects information on the presence of 26 of the 29 HHSRS hazards for each home sampled (the 3 hazards not collected; asbestos, biocides; volatile organic compounds are uncommon in their extreme form and cannot be deduced from a non-intrusive survey).

7. RESULTS OF THE 2006 EHCS

At the time of this research, the latest EHCS results available were from the 2006 survey. Some 4.8 million (22%) of England's 22 million homes were identified as having a Category 1 HHSRS hazard and thus by our definition were deemed to be 'poor housing'. Over half of these homes were considered to be poor because of the exposure of the household to a Category 1 risk from excess cold (Fig 1). The great majority of the remaining Category 1 hazards relate to 'falls' while some of the 29 hazards hardly figure at all in their extreme form.

7.1 Figure 1: The frequency of HHSRS Category 1 hazards (EHCS 2006)

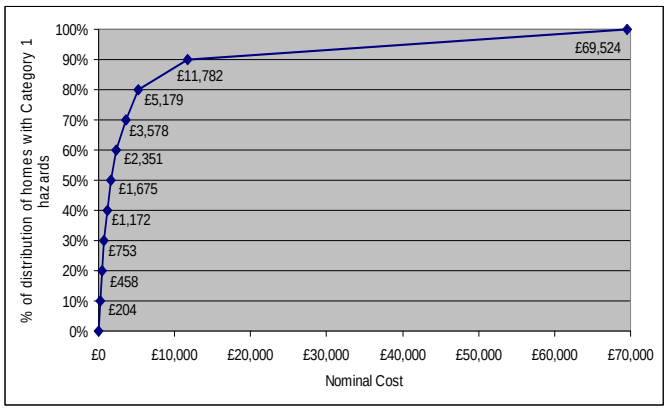


Note: Homes can have more than one HHSRS hazard, so the table above will not add up to the total number of homes with Cat 1 hazards (4.8 million)

8. THE COST OF IMPROVING THESE HOMES TO AN ACCEPTABLE LEVEL

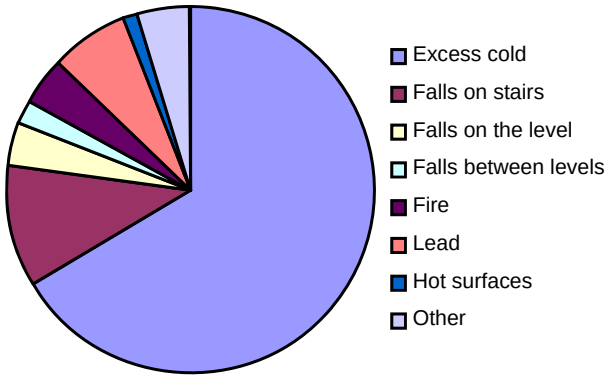
The EHCS also collects the costs of remedial work when a HHSRS hazard has been identified. These costs are not for the eradication of the hazard altogether, but to reduce it to an acceptable level – this level usually being the average for the type of dwelling. The range of HHSRS costs is presented in Fig 2. This demonstrates that in many cases the costs of remedial work is not that high – with around a quarter of all Cat 1 hazards being made acceptable for a cost of less than £600. ***The average cost for making Cat 1 hazards acceptable is £3,710.***

8.1 Figure 2: Distribution of costs for remedial action on HHSRS Cat 1 hazards



The total cost of dealing with HHSRS Category 1 hazards is some £17.6 billion. The costs are dominated by those for making cold homes more comfortable, work which includes updating heating systems and providing insulation (Figure 3).

8.2 Figure 3: The cost of dealing with HHSRS Cat 1 hazards (EHCS 2006)



9. QUANTIFYING THE COST TO SOCIETY OF POOR HOUSING

Work on the task of measuring the 'exported costs' of poor housing has been developed independently in a number of countries. Lawson (1997) argues that the UK National Health Service (NHS) spends about one fifth of its clinical budget on trying to cure illness that is actually caused by unemployment, poverty, bad housing and environmental pollution[4]. More specifically, the costs to the NHS of treating ill-health resulting from sub-standard housing have been estimated at £2.4 billion per year (National Housing Federation, 1997)[5].

The issue of quantifying the effect of poor housing in Australia has been taken up by Berry (2002) who comments that "sufficient evidence exists to suggest that by seriously attacking the issue of insufficient affordable housing … government can materially alleviate a range of economic and social problems, while reducing the cost to tax payers, in the longer term"[6]. A paper on home injuries in the USA (Zaloshnja et al, 2005) calculated the medical costs of home injuries to be some £11.8 billion per annum, of which some 16% could be attributed to falls on stairs and steps[7].

10. WHAT COSTS SHOULD BE INCLUDED?

This is a key question as some types of cost can be estimated or modelled more reliably than others. One of the most comprehensive reviews of poor housing (Ambrose, 2001) provides a matrix of costs, categorising them in terms of their measurability – costs that can be quantified (H); costs that could be quantified given better data (M); and costs that exist but are probably non-quantifiable (NQ) (Table 5)[8].

Following a review of data sources and attempt to cost up all of these factors and link them directly to hazards in the home, it was decided that we should focus on the National Health Service (NHS) treatment costs alone (highlighted in the table above). This is because:

- It is a transparent method of selecting a typical outcome for each level of harm of each hazard;
- Robust data is available to estimate the medical and care costs for the above;
- We cannot be accused of overstating the case by making heroic assumptions.

However, our studies have enabled us to conclude that ***the annual cost to the NHS of treating Category 1 HHSRS hazards accounts for a maximum of 40% of the total cost to society.***

Having determined this methodology, our next step was to provide descriptions of the NHS treatments for the different outcomes for the different hazards. These could then be costed up, using NHS data (Table 6).

10.1 Table 5: The costs to society of poor housing

Residents costs	External costs
Annual loss of asset value if owned (H)	Annual loss of asset value if rented (H)
Poor physical health (H)	Higher health service treatment cost (H)
Poor mental health (M)	Higher health service treatment cost (H)
Social isolation (NQ)	Higher care service treatment cost (M)
Higher home fuel bills (H)	Higher building heating costs (H)
Higher insurance premiums (H)	Higher external insurance premiums (NQ)
Uninsured content losses (M)	Uninsured external losses (M)
Under achievement at school (NQ)	Extra school costs/homework classes (H)
Loss of future earnings (M)	Loss of talents to society (NQ)
Personal insecurity (NQ)	High policing cost (H)
More accidents (M)	High emergency service costs (H)
Poor hygienic conditions (NQ)	High environmental health costs (H)
Costs of moving (M)	Disruption to service providers (M)
Adopting self-harming habits (M)	Special health care responses (H)
	Government and EU programmes (H)

10.2 Table 6: Typical outcomes and first year treatment cost for selected HHSRS hazards

Hazard	Class 1	Class 2	Class 3	Class 4
Damp and mould growth	Not applicable -	Type 1 allergy *(£1,998)*	Severe asthma *(£1,120)*	Mild asthma *(£180)*
Excess cold	Heart attack, care, death *(£19,851)*	Heart attack *(£22,295)**	Respiratory condition *(£519)*	Mild pneumonia *(£84)*
Radon (radiation)	Lung cancer, then death *(£13,247)*	Lung cancer, survival *(£13,247)**	Not applicable -	Not applicable -
Falls on the level	Quadraplegic *(£59,246)**	Femur fracture *(£25,424)**	Wrist fracture *(£745)*	Treated cut or bruise *(£67)*
Falls on stairs and steps	Quadraplegic *(£59,246)**	Femur fracture *(£25,424)**	Wrist fracture *(£745)*	Treated cut or bruise *(£67)*
Falls between levels	Quadraplegic *(£59,246)**	Head injury *(£6,464)**	Serious hand wound *(£1,693)*	Treated cut or bruise *(£67)*
Fire	Burn ,smoke, care, death *(£11,754)**	Burn, smoke, Care *(£7,878)**	Serious burn to hand *(£2,188)*	Burn to hand *(£107)*
Hot surfaces and materials	Not applicable -	Serious burns *(£4,652)*	Minor burn *(£1,234)*	Treated very minor burn *(£107)*
Collision and entrapment	Not applicable -	Not applicable -	Punctured lung -	Treated cut or bruise -

Not applicable = HHSRS class very rare or non existent
*Costs after 1 year are likely to occur, these are not modelled

11. THE TOTAL COST OF POOR HOUSING

Earlier, we calculated that the total cost of reducing the Category 1 hazards in English homes to an acceptable level (the average for their age and type) was some £17.6 billion. For the hazards that were fully measured through the EHCS, we have a 'likelihood' score for all homes with a Category 1 hazard, and we have an average likelihood score for the same home for its age and type. Using the difference between the actual score and the average for the whole stock, an estimate for the total annual treatment cost to the NHS can be calculated, which in this case is just over ***£600 million per year*** if the homes are left unimproved (Table 7). Using this information, the direct payback period for all hazards can be calculated at 29 years, if the repairs are all made up front.

11.1 Table 7: The costs, and benefits to the NHS, of reducing HHSRS Category 1 hazards to an acceptable level

	No. Cat 1 HHSRS	Average cost per dwelling £	total cost £	Savings to the NHS pa if hazard fixed
Falls between levels	332,000	£1,276	£423,715,000	£36,059,696
Excess cold	2,346,500	£4,994	£11,717,151,475	£21,433,443
Carbon monoxide	12,000	£1,000	£12,000,000	£970,923
Overcrowding	23,000	£700	£16,100,000	£21,815,546
Dampness	99,000	£5,000	£495,000,000	£8,794,064
Electrical problems	15,000	£4,000	£60,000,000	£2,264,248
Fire	210,000	£1,756	£368,900,000	£25,391,915
Flames, hot surfaces	98,000	£2,200	£215,551,000	£8,967,969
Lead	154,000	£8,000	£1,232,000,000	£21,815,546
Noise	9,000	£4,000	£36,000,000	£1,270,750
Falls on the level	607,000	£1,050	£634,673,130	£85,144,902
Domestic hygiene	82,000	£1,400	£114,800,000	£7,902,858
Radon	96,000	£800	£76,800,000	£7,605,943
Falls on stairs	1,755,000	£1,084	£1,902,420,000	£371,049,778
Personal hygiene	9,000	£1,300	12,600,000	1,208,064
Any	**4,752,000**	**£3,710**	**£17,644,252,905**	**£601,888,565**

It should be remembered that the direct cost to the NHS used in this calculation, at best, only account for 40% of the total cost to society. By multiplying this saving up to 100%, the total cost to society is estimated at some ***£1.5 billion per year*** and the payback period for all hazards would be reduced from 29 years to 12 years.

12. THE HEALTH COST-BENEFITS OF ENERGY IMPROVEMENTS

Using this methodology, the benefits to the NHS of bringing homes with excess cold hazards back to an acceptable level (the average for the age and type of the dwelling) are disappointing (Table 7) and do not appear to be cost-effective. This is because the averages (the 'acceptable level') used in the HHSRS guidance are historically low and do not reflect either the current average or the standards that energy efficiency improvements are now achieving. Further research commissioned by the BRE Trust suggests that if all of the English housing stock with a SAP below the historic average of 41 is brought up to at least the current average of 51 through heating and insulation improvements, the health cost-benefit to the NHS would be some ***£750 million per annum***.

13. THE COST OF POOR HOUSING IN THE UNITED KINGDOM

The methodology reported here has also been used to estimate the cost to the NHS of leaving people in the poorest housing in Wales and Northern Ireland, as HHSRS data was collected through their respective national housing surveys in 2008/2009.

Wales has proportionately more poor homes than England, largely due to the fact that its housing stock is older. It is estimated that it would save the NHS some ***£67 million per annum*** if these homes were improved to an acceptable level. [9]

Northern Ireland has a more modern housing stock in comparison to England and Wales. But it is still estimated that some ***£33 million per annum*** could be saved from the NHS budget each year if its poor homes were improved.[10]

The Scottish Housing Survey does not collect data on the HHSRS. However, using a simple extrapolation method which models the likelihood of health and safety hazards in the housing stock of Scotland from similar dwellings in the rest of the UK, it is estimated that some ***£760 million per annum*** could be saved from the UK NHS budget each year if the poorest homes were improved to an acceptable level.

14. THE HEALTH COST BENEFIT OF HOUSING INTERVENTIONS

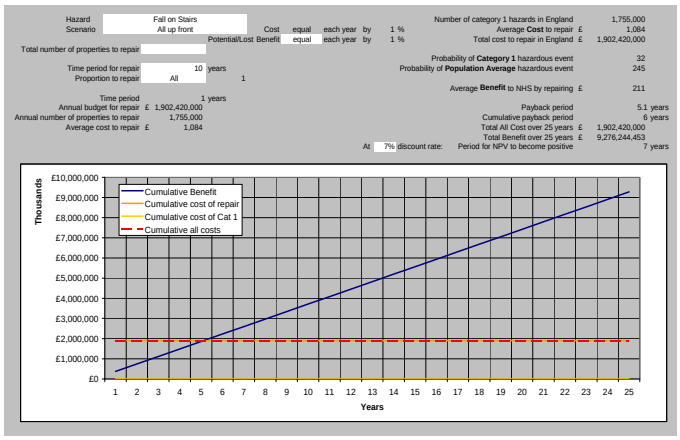
Clearly we cannot afford £17.6 billion to go out and fix every HHSRS Cat 1 hazard in England immediately. But the assumptions and outputs of this research have enabled us to design a cost-benefit spreadsheet to inform strategies for dealing with poor housing, and target improvement works

The example spreadsheet shown in Figure 5 has been developed in Excel and uses the EHCS derived data for 'falls on stairs' and the other assumptions of this research. It is very flexible and can be used to calculate the health costs benefit of a number of different scenarios since it is possible to change the following:

- The hazard to be considered
- The scenario to be applied (all up front, annual payment, no change)
- The number of properties to be improved
- The proportion of properties to improve (all, cheapest 20%, cheapest 50%)
- Flexibility in value of costs and benefits
- Different discount rates for Net Present Value (NPV) calculations.

In Figure 5 the scenario 'all up front' has been applied. This shows that if all of the £1.9 billion required to reduce the Category 1 HHSRS stair hazards in England was spent now, the treatment costs to the NHS would be recouped within 5 years, and there would be a cumulative benefit of over £9 billion in 25 years.

14.1 Figure 5: Example cost-benefit spreadsheet for falls on stairs



These spreadsheets have now been developed for a number of HHSRS hazards and are being used to demonstrate to English local authorities the health cost-benefits of their interventions to improve poor housing. All that is required is the HHSRS assessment of homes prior to improvement, the condition following improvement, and the cost of the work. While the spreadsheet above has been applied to the national housing stock, it can equally be applied to individual home improvements. For example, the EHCS estimates that it would cost £3,829 to re-design a dangerous staircase such as that below left, while the payback period in savings to the NHS would be 4.4 years. The cost of repairing the staircase and replacing the balustrading (below right) would be £314, with a payback period of 2.2 years.

The University of Warwick and the Building Research Establishment were recently commissioned by the Regional Leaders Board of the North West of England, 4NW, to investigate the health impact of housing interventions in six pilot authorities, using the methodology and Excel spreadsheets from this research[11]. In one authority it was estimated that the annual benefit to the health service of works undertaken to reduce the hazards in 30 sample homes was £34,900 against a total one-off cost of £310,000. This means that the payback period (the period when the cost of these housing interventions will be recovered) would be 9 years. Some of the pilot authorities had lower payback periods than this because of the highly targeted nature of the works. The single lowest cost was £10 to address a 'falling on level surfaces' (trip) hazard; and in this case the benefit to the NHS was £21 per year with a payback period of just 6 months. Other low cost mitigation works dealt with 'falls associated with baths' and 'entry by intruders'. The longest payback periods were for the hazards of 'fire', 'damp and mould growth' and 'food safety'.

15. CONCLUSIONS

Because of the way that information on the HHSRS is now collected through the EHCS, and the availability of good quality data from the NHS on the costs of treating the outcomes of HHSRS hazards, it has been possible for the first time to quantify the cost to society of poor housing in England. The total cost is some £600 million per year in terms of the savings in the first year of treatment costs to the NHS if the hazards were removed, or at least reduced to an acceptable level (£760 million for the UK). The full cost to society is estimated to be some £1.5 billion per year.

These costs may actually seem quite low when compared to some of the heroic estimates that have been made in the past. However, it should be stressed that this research has focussed on reducing the effect of the 'worst' hazards, rather than eradicating them altogether or raising the standard of all housing to an optimum level. This pragmatic 'sticking plaster' approach has the earliest payback period in terms of cost savings, although some may regard it to be un-ambitious in the longer term where we should be aiming for ever higher housing standards.

This research, in particular, has shown that simple home safety improvements – handrails on dangerous stairs, hard wired smoke detectors, better home security, etc are very cost-effective. Energy improvements are at their most cost-effective when they take a household out of an HHSRS Category 1 situation (SAP below 35) and well beyond this to create a comfortable, affordable home with a SAP of at least 50

The cost benefit tool is a real practical outcome of this research and it is already helping local authorities to justify expenditure on private sector housing renewal and to target the most cost-effective improvements on vulnerable people in unhealthy housing.

Finally, this research is being used to present a more informed case to Government for investment in housing, on the basis that it not only improves people's health and life chances but that it makes sound economic sense and can actually save public money in the longer term.

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