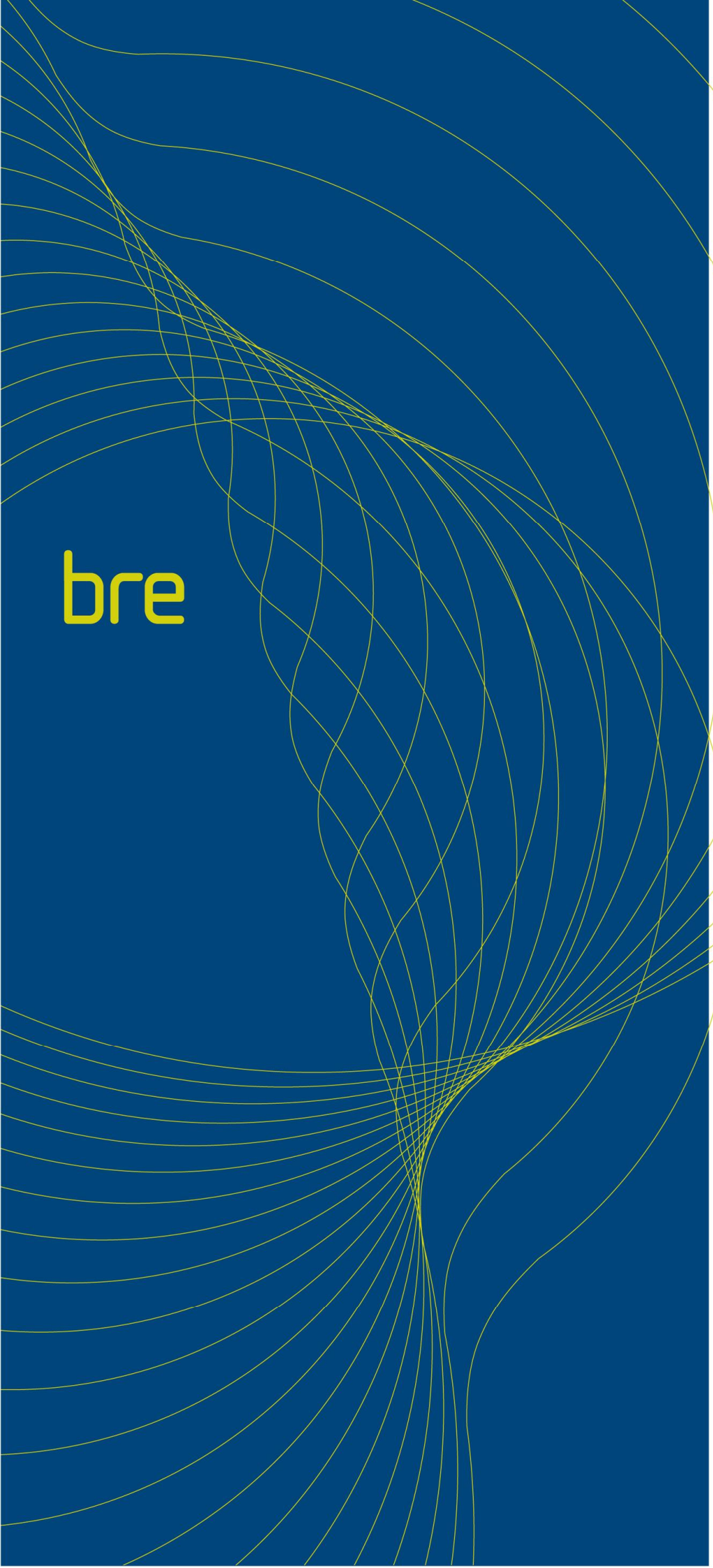

The Health Costs of cold dwellings

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Client report number ED2792

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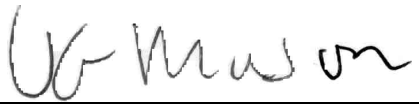
Signature 

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Executive Summary

This short report considers the numbers of dwellings within the English housing stock where the energy efficiency rating is considered poor. The associated estimated cost to the NHS of poor health as a result of these dwellings is calculated using the CIEH HHSRS calculator as a total of £192 million. £35 million of which is within the private rented sector. A comparable figure for the cost to the NHS of private rented sector using the BRE Category 1 calculator puts this figure as somewhere between £37 million and £674 million dependent on the exact SAP rating and actual occupancy. The limitations of the CIEH HHSRS calculator are explained as this calculator is only effective where the housing stock is average. The relationship between Energy Efficiency Rating (EER) bands F and G and Category 1 Excess cold hazards estimates 870,392 dwellings within band F are not included within stock totals as having Category 1 Excess cold hazards. The health effects of Excess cold are far reaching and it is estimated that up to 40,000 deaths per year are can be attributed to the hazard of Excess cold.

Additional work to clarify and refine the figures using The Real Costs of Poor Housing[1] puts the cost to the NHS of not improving these dwellings to the average SAP level at least £**145 million** per annum.

[1] The real cost of poor housing. M Davidson et al HIS BRE Press February 2010

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Introduction

This short piece of research has been commissioned by Chartered Institute of Environmental Health (CIEH) to help support a paper being prepared to lobby Government to legislate in favour of reducing the number of privately rented dwellings with poor energy efficiency.

Description of the project

The initial project was designed to produce a series of figures calculated using the Chartered Institute Environmental Health (CIEH) HHSRS[2] calculator[3] which is designed to show potential costs to the NHS associated with housing. In this instant the calculator is used to show the costs associated with dwellings with an energy efficiency band (measured in accordance with the Standard Assessment Process (SAP) of F or G. The dwellings will be divided regionally and those privately rented will be separately assessed. The estimated numbers will be drawn from EHS 2008[4] data. The CIEH is aware of both the usefulness and drawbacks of using this approach and an explanation of using this approach will follow the calculations. A general statement explaining the limitations of the CIEH calculator will be included for publication on CIEH web site. This will allow future users of the calculator to understand it's purpose.

The relationship between SAP rated dwellings F and G and Category 1 Excess cold hazards is discussed. Following this the common health impacts of Excess cold as included within the HHSRS operating guidance are considered.

Further work was commissioned which more clearly defines the estimated costs to the NHS of Excess cold hazards in private rented dwellings and states these costs by Region. This work uses the BRE HHSRS Category 1 spreadsheet developed as part of the Real cost of poor housing research[5] .

[2] Housing Health and Safety Rating System assessments carried out in accordance with Housing Health and Safety Rating System Operating Guidance ODPM 2006

[3] Good Housing Leads to Good Health CIEH September 2008

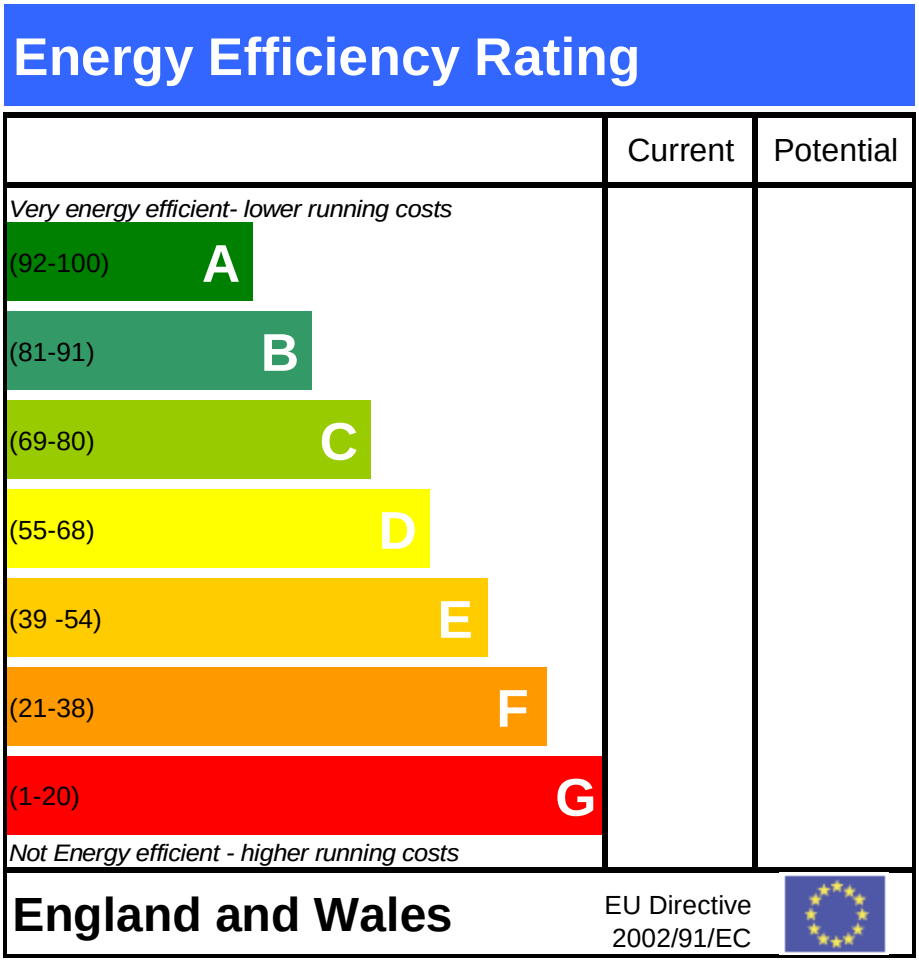
[4] English Housing Survey (EHS) Bulletin issue 2 CLG 27 October 2010

[5] The real cost of poor housing. M Davidson et al HIS BRE Press February 2010

Methodology

The Standard Assessment Process (SAP) is a method of measuring energy efficiency used throughout the sector. SAP calculations produce an Energy Efficiency Rating (EER) in accordance with **Figure 1**. Bands F and G being the least energy efficient

Figure 1 Energy Efficiency Rating table



The numbers of dwellings rated as SAP band F and G are given in **Table 1** . A second set of figures giving the estimated numbers associated with a SAP less than 35 is also provided, as this corresponds with the Category 1 Excess cold numbers. This is explained in more detail below. These figures have been applied to the CIEH HHSRS calculator

The CIEH HHSRS calculator was delivered as part of the Good Housing leads to Good health project carried out in 2008[6] It is published on the CIEH website. This calculator is intended for use with 'average' stock and produces estimated costs to the NHS as a result of hazards.

Figure 2 A screenshot of the CIEH Calculator

bre

HHSRS Costs calculator

Chartered Institute of Environmental Health

Number of dwellings 655,810

		Hazard	Excess cold	affected group over 65	
	likelihood 1 in …	%	expected number	Annual cost to NHS	
Class I harms	1013	31.6%	648	£	32,400,000
Class II harms	6957	4.6%	94	£	1,880,000
Class III harms	1488	21.5%	441	£	661,500
Class IV harms	757	42.3%	867	£	86,700
Total all harms	320	100.0%	2049	£	35,028,200

Estimated total cost of works where an incident is expected £ 10,230,657

Ratio remedial works costs/NHS annual costs (if >1, need more than 1 year for payback) 0.29

The calculator works by emulating the HHSRS calculation used as part of the assessment process. A surveyor carrying out such an assessment has to judge the likelihood of an incident occurring and the expected spread of harm outcomes. The full calculation also uses a weighting attributed to each of the four classes of harm included. The methodology is complex and to understand and apply the calculator practitioners are expected both to be experienced housing surveyors and to attend a 3 day training course where the assessment process is explained.

The relationship between EER bands and Category 1 Excess cold hazards

There is no direct relationship between the two scales, since the first measures the dwelling in terms of energy efficiency and the second measures the dwelling in terms of the effect of Excess cold on health. The results provided are therefore a best estimate of the assumed relationship between the two scales and have been spread over a range of possible values represented as a sensitivity analysis. SAP calculations range from 1-100. The current average within the English housing stock is 51. The figures are put into EER bands between A and G with A being the best, see **Figure 1**. Bands F and G have SAP scores of between 1 and 38.

[6] Good Housing Leads to Good Health CIEH September 2008

The hazard of Excess cold is measured in accordance with the Operating guidance[7]. This requires a surveyor to assess the extent of insulation in a dwelling; the heating type, controls and operability; ventilation both controls and draughts; dampness and disrepair. This is not a comprehensive list and ability to maintain an indoor temperature and SAP ratings may be included. Where house condition stock surveys are carried out full assessment of Excess cold within dwellings is not possible due to length of time required for the surveyor to complete a full survey and the need to gain access to parts of the building structure that are not easy to observe (like wall cavities where present). In order for Excess cold to be included as an assessment, a proxy of SAP less than 35 is used. This methodology is defined in the Decent Homes guidance.[8] The proxy was based on the earlier version of SAP (2001). Since 2007 SAP has been reported using SAP 2005 methodology which (as shown in **Figure 1**) has changed the band F to include dwellings with a SAP between 21 and 38. There are 870,392 dwellings with a SAP score of 35-38 inclusive, within SAP band F which are not automatically included within the housing stock definition of having a Category 1 Excess cold hazard.

Where surveyors are required to carry out surveys for enforcement purposes a dwelling with a SAP over 35 maybe considered to have a Category 1 hazard (a dwelling with a particularly exposed north facing wall is an example) or where the SAP is less than 35 it may not be considered to be presenting a Category 1 Excess cold hazard (sheltered terrace dwelling with particularly high insulation but poor heating could be such an example).

Taking these pieces of information together it can be said that F and G banded dwellings are ***likely*** to present a Category 1 Excess cold hazard.

Health effects of Excess cold

A healthy indoor temperature is around 21°C, although cold is not generally perceived until the temperature drops below 18°C. A small risk of adverse health effects begins once the temperature falls below 19°C. Serious health risks occur below 16°C with a substantially increased risk of respiratory and cardiovascular conditions. Below 10°C the risk of hypothermia becomes appreciable, especially for the elderly.

There are approximately 40,000 more deaths between December and March than expected from the death rates in other months of the year. This seasonal fluctuation, Excess Winter Deaths, is greater in Britain than in most other countries of continental Europe and Scandinavia.

Cardiovascular conditions (e.g. heart attacks and stroke) account for half the excess winter deaths, and respiratory diseases (e.g. influenza, pneumonia and bronchitis), account for another third. The increase in deaths from heart attacks occurs about 2 days following the onset of a cold spell, the delay is about 5 days for deaths from stroke, and about 12 days for respiratory deaths.

Although there is some excess winter deaths in all age groups, it becomes significant for those in the 45+ age group. The risk increases with age in a roughly linear pattern up to the 85+ age group, after which there is a marked increased risk.

[7] Housing Health and Safety Rating System assessments carried out in accordance with Housing Health and Safety Rating System Operating Guidance ODPM 2006

[8] A Decent Home: Definition and guidance for implementation June 2006 – update Department for Communities and Local Government

The main causal factor for excess winter deaths appears to be changes in ambient (outdoor) temperature, but seasonal infections, and changes in behavioural patterns, air pollution levels and micronutrient intake may also account for some of the seasonal pattern.

The extent to which housing contributes is not clearly known, but the indication is that people living in dwellings that are poorly heated are at significantly greater risk. There is less evidence on the relationship between housing characteristics and health other than mortality. However, it is very probable that the findings in relation to cold-related mortality can be extended in broad terms to cardio-respiratory morbidity and health related quality of life.

Low temperatures can impair the thermoregulatory system of the elderly, and the very young whose thermoregulatory system is immature. Both these groups may spend a greater time indoors in cold weather and both will not move about as much as other groups in the cold.

Cold air streams may affect the respiratory tract and can slow the heart temporarily, increasing cardiovascular strain. When the whole body is cooled, blood pressure increases. The effect of cold air on the bronchial lining and immune system can reduce resistance to infection. Thus, sleeping in cold bedrooms has been shown to substantially increase the health risk.

The symptoms of rheumatoid arthritis can be worsened by cold. Low temperatures also aggravate sickle cell anaemia and the related thalassaemia, and can affect the healing of leg skin ulcers.

Results

Table 1 Percentage of Dwellings with an EER band of F or G and Percentage of Dwellings with a Category 1 Excess cold hazard (SAP of less than 35)

Region	Percentage of dwellings with an EER banded F or G	Percentage of dwellings with a SAP less than 35. or having a Category 1 Excess cold hazard
North East	10	7.7
Yorkshire and The Humber	14.6	11.2
North West	12.6	9.6
East Midlands	19.5	15.1
West Midlands	18.9	14.2
South West	22.2	18.1
East of England	18	12
South East	16.5	12.8
London	12.5	8.9
Total	**16.2**	**12.3**
Privately rented dwellings	19.9	16.9

Table 2 Estimated numbers of dwellings with an EER rating of band F or G and associated health costs

Region	Total number of dwellings with an EER band F or G	Estimated costs to NHS using CIEH HHSRS Calculator
North East	115,027	£6,170,700
Yorkshire and The Humber	345,871	£18,493,700
North West	390,000	£20,814,600
East Midlands	379,351	£20,282,600
West Midlands	442,474	£23,634,000
South West	509,520	£27,190,400
East of England	437,767	£23,358,900
South East	580,537	£30,971,700
London	393,382	£20,988,000
Total	**3,593,929**	**£191,887,600**
Privately rented dwellings	655,810	£35,028,200

Table 2 shows predicted health costs of F and G SAP rated dwellings using the CIEH calculator. However, these costs are based on national averages and not simply on the worst cases. The health costs shown are all of those that can be applied to Excess cold. If all dwellings were brought up to an average SAP level there would still be health costs associated with Excess cold from occupier behaviour.

General Statement regarding use of the CIEH HHSRS calculator

The calculator is based on an average stock and designed to be used as a tool to bring to attention to the cost to health from the housing stock. It should not be used where the stock is not average unless the likelihood figures are available. Cost of hazard mitigation is only applied to those dwellings assumed to be

at risk, which are unknown without a stock model assessment. The model assumes that no risk remains within the dwellings when brought up to the average standard of the stock, which is known to be false.

Estimated Real Health costs

The new model for estimating the real cost of poor housing[9] can be applied to the 655,810 private rented dwellings in EER bands F and G.

Table 3 show the results. It is likely that the average likelihood of harm for dwellings in these bands will be higher than the average used in the CIEH HHSRS Calculator (1 in 320). Depending on what likelihood band is used the total estimated cost to the NHS ranges from £37 million to £674 million per annum.

Unlike the CIEH hazard calculator, the cost of repair is applied to all the dwellings where a Category 1 hazard is assumed to occur. In addition, it is assumed that there is still some inherent risk in the dwellings where the hazard is mitigated. The cost to repair is assumed to be all up front, with a value of £5,433 per dwelling or a total of £3.56 billion. Using these assumptions payback (without net present value correction) would range from 5 years to 142 years.

Table 3 Estimated cost and benefits of improving private rented band F and G dwellings.

Likelihood ratios	Cost to NHS on average	Total cost to NHS*	HHSRS band	Hazard Score	difference in risk to SAP 50 (benefit)	cost to repair/improve	Payback years
18	£1,028.44	£ 674 million	A	19,546	£ 662 million	£3.56 billion	5.4
32	£ 578.50	£ 379 million	A	10,994	£ 366 million	£3.56 billion	9.7
100	£ 185.12	£ 121 million	B	3,518	£ 108 million	£3.56 billion	32.8
180	£ 102.84	£ 67 million	C	1,955	£ 55 million	£3.56 billion	65.3
320	£ 57.85	£ 37 million	C	1,099	£ 25 million	£3.56 billion	142.2

* if all 655,810 private rented band F and G dwellings at this likelihood.

[9] Nicol, et al. BRE Information Paper 16/10 Quantifying the cost of poor housing. Oct 2010

Improved estimates

The initial estimates provide a very wide band of possibilities. A better estimate can be calculated if the EER band G and band F properties are considered separately. The scale of likelihood ratios used in

Table 3 above cover the full range of likely dwelling conditions from a SAP of 1 through to a SAP of 38. It is reasonable to assume that those in Band G (SAP 1 to 20) will have a higher likelihood of harm than those in Band F (SAP 21-38). A sensitivity risk matrix has therefore been assumed as shown in

Table 4.

Table 4 Likelihood sensitivity risk matrix

	High Risk	Medium Risk	Low Risk
Band G likelihood ratios	18	32	100
Band F likelihood ratios	100	180	320

The average cost to improve band F and G dwellings to an average SAP value was calculated to be £5,433 and this value can be applied to each of the 655,810 dwellings. However it is highly likely that the cost to improve band G dwellings will be higher than the cost to improve band F dwellings. Estimates from the EHS data suggest that the cost to improve band G dwellings might be nearer £7,918, and to improve band F dwellings about £2,465. It is also likely that some dwellings cannot be cost effectively improved to a SAP of 50, although this calculation assumes all dwellings can be brought up to SAP 50 for this average cost.

If we apply this average cost, across each of these three levels of risk, to the private rented dwellings in each region (see **Table 5**) the average payback is estimated to be 18.3 years, with a range of 9.9 years to 54.0 years. The combined benefit of bringing all of these properties up to a SAP score of 50 (roughly average for England) is likely to be £145 million per annum. Even if the risk was lower than expected, by splitting the data into these two groups the benefits are estimated to be around £50 million a year. Using this method there is very little difference in the payback periods across regions. The North East has the shortest payback period, estimated at 17.0 years, and the North West has the longest estimated at 21.2 years, when using the medium risk assessment for benefit.

Table 5 Cost-benefit analysis for privately rented dwellings in each Region

			Band F likelihood	100	180	320	£ 2,465				
			Band G likelihood	18	32	100	£ 7,918				
SAP 50				High risk	Medium Risk	Low Risk	Average cost	High risk	Medium Risk	Low Risk	
Region	**Band F**	**Band G**	**F and G**	Combined benefit			**Cost to repair**	**Payback**			
North East	9,000	9,000	17,000	£ 10,055,000	£ 5,497,000	£ 1,745,000	£ 93,447,000	9.3	17.0	53.6	
Yorkshire and The Humber	49,000	18,000	66,000	£ 25,957,000	£ 13,968,000	£ 4,795,000	£ 263,309,000	10.1	18.9	54.9	
North West	55,000	11,000	66,000	£ 19,789,000	£ 10,493,000	£ 3,859,000	£ 222,673,000	11.3	21.2	57.7	
East Midlands	53,000	14,000	67,000	£ 22,605,000	£ 12,073,000	£ 4,295,000	£ 241,497,000	10.7	20.0	56.2	
West Midlands	49,000	16,000	65,000	£ 23,900,000	£ 12,823,000	£ 4,464,000	£ 247,473,000	10.4	19.3	55.4	
South West	62,000	35,000	97,000	£ 45,562,000	£ 24,717,000	£ 8,156,000	£ 429,960,000	9.4	17.4	52.7	
East of England	49,000	19,000	68,000	£ 27,266,000	£ 14,690,000	£ 5,014,000	£ 271,227,000	9.9	18.5	54.1	
South East	82,000	45,000	128,000	£ 59,381,000	£ 32,197,000	£ 10,652,000	£ 558,440,000	9.4	17.3	52.4	
London	57,000	25,000	82,000	£ 34,945,000	£ 18,878,000	£ 6,360,000	£ 338,455,000	9.7	17.9	53.2	
All Privately rented dwellings	465,000	192,000	656,000	£ 269,460,000	£ 145,335,000	£ 49,340,000	£ 2,666,481,000	9.9	18.3	54.0	

* Assumes all dwellings will be repairable to a SAP value of 50

Conclusion

This report estimates the likely costs to the NHS of dwellings with F and G SAP bands and associates this, as far as possible with dwellings with Category 1 Excess cold hazards. The associated estimated cost to the NHS of poor health as a result of these dwellings is calculated using the CIEH HHSRS calculator as a total of £192 million. £35 million of which is within the private rented sector. A comparable figure for the cost to the NHS of private rented sector using the BRE Category 1 calculator puts this figure as somewhere between £37 million and £674 million dependent on the exact SAP rating and actual occupancy. The limitations of the CIEH HHSRS calculator are explained as this calculator is only effective where the housing stock is average. Further more accurate figures demonstrating the costs to the NHS from dwellings in the private rented sector are made using the BRE Category 1 cost calculator. The cost to the NHS of Excess cold in the private rented sector, using the BRE Category 1 calculator, puts this figure as somewhere between £50 million and £270 million dependent on the combination of risk likelihoods used. It is reasonable to assume that the cost to the NHS for not improving these dwellings to the average SAP level will be at least £**145 million** per annum. This is shown in **Table 6** which also gives the numbers of dwellings in each English region.

Table 6 Summary Table

Region	Number of Privately Rented Dwellings estimated to be Associated with Excess cold	Cost to the NHS of **NOT** improving these dwellings
North East	17,000	£5,497,000
Yorkshire and Humber	66,000	£13,968,000
North West	66,000	£10,493,000
East Midlands	67,000	£12,073,000
West Midlands	65,000	£12,823,000
South West	97,000	£24,717,000
East of England	68,000	£14,690,000
South East	128,000	£32,197,000
London	82,000	£18,878,000
All privately rented dwellings	656,000	£145,335,000

NOTE

There are 99,857 privately rented dwellings within the Energy Efficiency Rating (EER) band F with a SAP score above 35, which would not automatically be included within stock totals as having a Category 1 Excess cold hazard. These dwellings represent 15% of all band F and G dwellings