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Briefing Paper

The cost of poor housing in the European Union

Simon Nicol, Mike Roys, David Ormandy[1] and Veronique Ezratty[2]

1 University of Warwick
2 EDF

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Executive Summary

In early 2015, the European Foundation for Living and Working Conditions (Eurofound), having reviewed earlier BRE Trust publications on the cost of poor housing in the UK, contracted BRE to devise a methodology for quantifying the cost of poor housing across the 28 Member States that comprise the European Union. This had never been attempted before. The output of this research was to inform a wider publication entitled Inadequate Housing in Europe: Cost and Consequences, which is published by Eurofound in parallel with this research report. This report discusses how the quantification was possible and what the results show.

The method used took data on the relationship between poor housing and health costs from the English Housing Survey and applied these to 'poor housing' data from all the 28 European Member States, and EU statistics on national housing stock numbers.

The results suggest that poor housing conditions are very unevenly distributed across the EU, with the Baltic States and Romania having the worst reported incidences of poor housing and the Nordic countries having the least. The United Kingdom sits (conveniently for quantification purposes), at the EU average. The costs of rectifying the backlog of problems associated with our definition of poor housing are estimated to be some 295 billion Euros across the EU at 2011 prices.

Problems with keeping homes warm and dry are identified as having the greatest impact on the health of occupants. If such problems were rectified now, it is estimated that the direct medical cost savings would be around 9 billion Euros per year. The total cost to EU society of leaving people living with such housing problems is estimated to be some 194 billion Euros per year.

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1 http://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/ef1604en_0.pdf accessed 19/09/2016

Introduction

Background

In 2010, the BRE Trust published a report entitled "The Real Cost of Poor Housing" (Davidson et al, 2010). This was the culmination of two year's research, which used data from the English Housing Survey and the National Health Service to quantify the effect that living in the poorest housing conditions had on the health of vulnerable people in England. This research was widely read and lead to a series of publications which used the same methodology to quantify: The Cost of Poor Housing in Wales (Davidson et al, 2011); the Cost of Poor Housing in Northern Ireland (Davidson et al, 2012); and the Cost of Poor Housing in London (Garrett, 2014a). In 2014 BRE Trust sponsored an update to the methodology which led to the publication of 'The Cost of Poor Housing to the NHS', in 2015 (Nicol et al, 2015), and The Full Cost of Poor Housing (Roys et al, 2016).

In early 2015, the European Foundation for Living and Working Conditions (Eurofound), having reviewed the earlier BRE Trust publications, contracted BRE to devise a methodology for quantifying the cost of poor housing across the 28 countries that comprise the European Union. This had never been attempted before. The output of this research was to inform a wider publication on the cost of inadequate housing in Europe (Eurofound, 2016), which is published by Eurofound in parallel with this research report. This report discusses how this was made possible and what the results show.

Housing across the European Union

The European Union contains some 235 million homes, which are distributed very unevenly through the 28 Member States (Table 1). The number of homes corresponds closely to the population size of Member States – with Germany having the largest population and the largest housing stock. Italy, the United Kingdom and France follow with similar populations and dwelling stocks, while Luxembourg and Malta have the smallest housing stocks, as would be expected from their populations. The person per dwelling ratio averages 2.17 across the EU, varying from 1.70 in Greece to 2.77 in Luxembourg.

Table 1 Housing in the European Union

EU Member State	Population	Number of dwellings	Persons per dwelling
Austria	8,700,471	4,441,000	1.96
Belgium	11,289,853	5,203,400	2.17
Bulgaria	7,153,784	3,918,200	1.83
Croatia	4,190,669	1,923,522	2.18
Cyprus	848,319	433,212	1.96
Czech Republic	10,553,843	4,101,635	2.57
Denmark	5,707,251	2,762,444	2.07
Estonia	1,315,944	649,700	2.03
Finland	5,487,308	2,906,000	1.89
France	66,661,621	28,077,000	2.37
Germany	82,162,000	40,545,300	2.03
Greece	10,793,526	6,384,000	1.70
Hungary	9,830,485	4,400,000	2.23
Ireland	4,658,530	2,019,000	2.31
Italy	60,665,551	28,863,000	2.10
Latvia	1,968,957	1,018,000	1.93
Lithuania	2,888,558	1,389,000	2.08
Luxembourg	576,249	208,000	2.77
Malta	434,403	223,900	1.94
Netherlands	16,979,120	7,200,000	2.36
Poland	37,967,209	13,853,000	2.74
Portugal	10,341,330	5,878,700	1.76
Romania	19,759,968	8,329,000	2.37
Slovakia	5,426,252	1,994,900	2.72
Slovenia	2,064,188	857,000	2.41
Spain	46,438,422	25,208,000	1.84
Sweden	9,851,017	4,633,678	2.13
UK	65,341,183	27,767,000	2.35
EU28	510,056,011	235,187,591	2.17

With over 40 million homes, Germany has the largest housing stock of EU Member States

With only 208,000 homes, Luxembourg has the smallest housing stock of EU Member States

Greece has the lowest ratio of persons per dwelling in the EU at 1.70

The Netherlands has the highest proportion of social rented housing of EU member states.

Age of construction

The United Kingdom has the oldest housing of EU Member States, with nearly 38% of its homes dating from before 1946 (Table 2). Cyprus has the youngest housing stock, with only 3% of homes dating from before 1946 and with 34% of its homes being built since 2000.

Table 2 Age of construction by EU Member State

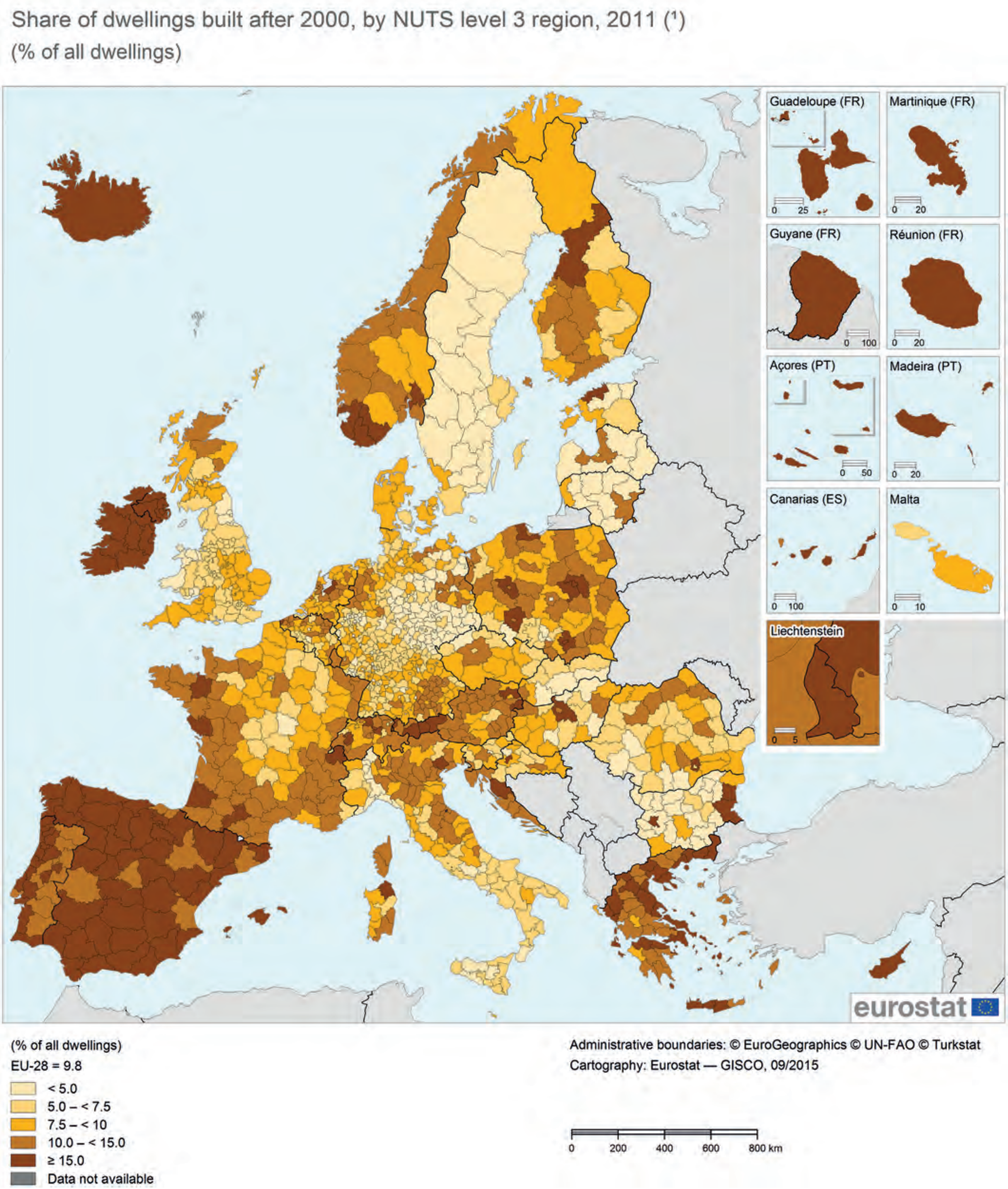
EU Member State	Pre 1946	1946-1980	1980-2000	Post 2000
Austria	25.5	40.1	22.7	11.7
Belgium	37.1	38.2	16.5	8.2
Bulgaria	10.5	55.4	25.5	8.6
Croatia	13.6	42.5	23.6	11.0
Cyprus	3.0	24.6	36.1	34.1
Czech Republic	19.0	37.1	20.5	7.7
Denmark	34.1	44.6	14.0	7.2
Estonia	17.0	47.0	22.8	9.4
Finland	9.6	48.7	29.7	10.7
France	28.7	37.0	23.9	10.4
Germany	24.3	46.5	23.1	6.1
Greece	7.6	47.8	29.1	15.5
Hungary	20.3	48.3	21.7	9.7
Ireland	13.3	22.9	20.7	22.0
Italy	20.7	51.4	19.8	7.9
Latvia	22.7	46.6	24.3	5.1
Lithuania	13.5	49.6	28.9	6.2
Luxembourg	21.8	31.5	21.6	14.0
Malta	13.0	23.2	23.4	8.7
Netherlands	18.9	41.9	26.4	9.5
Poland	19.1	43.0	22.7	11.4
Portugal	10.7	37.1	36.0	16.3
Romania	11.2	59.1	19.0	8.0
Slovakia	8.2	52.6	21.5	5.8
Slovenia	21.3	45.0	25.0	8.7
Spain	11.1	43.0	24.7	18.5
Sweden	24.3	47.7	12.3	4.6
UK	37.8	39.7	15.6	6.9
EU28	22.3	44.1	22.1	9.8

Source: EUROSTAT, EU-SILC 2015. Note: percentages do not all add up to 100

The UK has the oldest housing stock in Europe. This Victorian terraced home was built some 150 years ago. Individually owned older terraced houses are popular and difficult to replace.

Cyprus has the newest housing stock in the EU. Many new homes are built for the holiday market

Figure 1 Homes built since 2000 across EU Member States

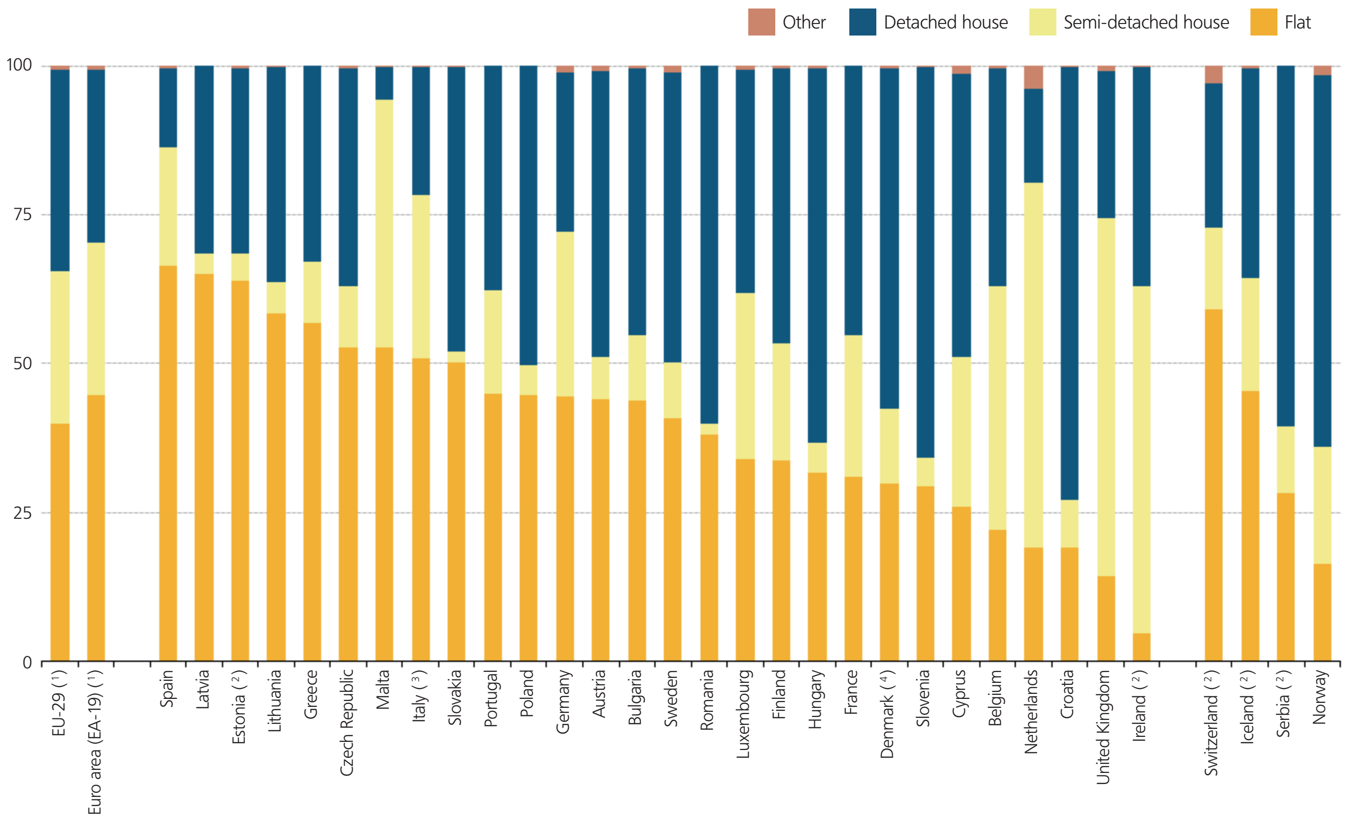


(¹) Regions in the United Kingdom: low reliability.
Source: Eurostat (Census hub HC53)

Type and size of dwellings

Households in Ireland and the United Kingdom are the most likely to live in houses rather than flats, although these houses are more likely to be semi-detached or in terraces than elsewhere in Europe (Figure 2). The countries of southern and eastern Europe are most likely to house people in flats. Some 65% of Spanish households live in a flat compared to just 5% in Ireland.

Figure 2 Type of dwelling by EU Member State



Source: Eurostat, EU-SILC 2014

(¹) Estimates.
(²) 2013.
(³) Provisional data.
(⁴) 2012.
Source: Eurostat (online data code: ilc_lvho01)

Croatia has the highest proportion of detached houses in the EU

Households in the UK are the most likely to live in terraced houses like these in Liverpool

Spain has the largest proportion of households who live in flats, like these in Madrid

The housing stock of Eastern Europe is dominated by the huge social housing developments that were built during the post 1945 communist era. These are typically large concrete blocks of walk up flats with one or two bedrooms. These are small compared to dwellings elsewhere in Europe, as shown by the proportion of households who live in homes of less than 50 m² (Table 3). Over 63% of homes in Romania are less than 50 m², compared to less than 5% in the Netherlands, Spain, Denmark and Luxembourg. Luxembourg and Denmark also have the greatest proportion living in large houses.

Table 3 Size of homes by EU Member State

	Proportion having < 50m² of useful floor space			Proportion having ≥ 150m² of useful floor space		
	Region with highest share		National average	Region with highest share		National average
EU (²)	Brăila (Romania)	77.1	14.5	Midden-Limburg (the Netherlands)	33.8	10.4
Czech Republic	**Hlavní město Praha**	25.4	20.5	Moravskoslezský kraj	15.1	12.9
Denmark	**Byen København**	7.6	4.4	Vestjylland	30.7	20.5
Germany	Greifswald, Kreisfreie Stadt	30.8	11.4	Vechta	32.0	10.4
Estonia	Kirde-Eesti	50.0	37.1	Lääne-Eesti	9.1	7.2
Greece	Samos	22.8	9.6	Zakynthos	8.8	6.0
Spain	El Hierro	12.2	3.9	Toledo	19.6	10.0
Italy	Imperia	13.8	6.7	Mantova	22.9	11.3
Latvia	**Rīga**	55.7	44.6	Pierīga	15.5	6.7
Luxembourg		-	4.9		-	25.8
Hungary	**Budapest**	32.8	15.9	Pest	6.7	3.9
Netherlands	**Groot-Amsterdam**	13.3	3.5	Midden-Limburg	33.8	17.9
Austria	**Wien**	22.8	12.0	Innviertel	21.1	10.1
Poland	Miasto Łódź	54.3	33.0	Krakowski	19.5	9.6
Portugal	**Grande Lisboa**	13.3	9.9	Baixo Vouga	27.7	17.0
Romania	Brăila	77.1	63.4	Ilfov	6.1	1.3
Slovenia	Zasavska	34.1	21.0	Gorenjska	10.1	7.3
Sweden	**Stockholms län**	15.3	9.5	Kronobergs län	17.6	10.5
Iceland	**Höfudborgarsvædi**	8.4	6.8	**Höfudborgarsvædi**	16.3	16.1
Liechtenstein		-	6.3		-	22.9
Norway	**Oslo**	19.1	7.3	Sogn og Fjordane	46.5	32.9

(¹) Belgium, Bulgaria, Ireland, France, Croatia, Cyprus, Lithuania, Malta, Slovakia, Finland and the United Kingdom: not available. Regions in **bold** typeface are capital city regions.
(²) Average based on those EU Member States for which data are available.
Source: Eurostat (Census hub HC54)

Source: EUROSTAT, EU-SILC 2015

Small concrete panel construction flats, Romania

The majority of Romanians live in small homes

Tenure of dwellings

Romania has the highest rate of owner-occupation in the EU (Table 4) and also the highest proportion of owners who own their home outright (Figure 3). In this respect it is similar to many former Warsaw Pact countries who 'gifted' homes to former tenants at the end of the communist era in the early 1990s (see Lithuania case study). Some of the most developed and affluent Member States have the largest rented sectors, including Sweden, Germany, Austria, Denmark and the Netherlands. Those who do own their own homes in these countries are most likely to still be paying mortgages on them (Figure 3).

Table 4 Tenure of dwellings by EU Member State

	Owner-occupied dwellings			Rented dwellings		
	Region with the highest share		National average	Region with highest share		National average
EU [2]	Sud-Vest Oltenia (Romania)	97.7	64.3	**Wien (Austria)**	75.7	29.4
Belgium	Prov. Limburg	75.0	65.0	**Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest**	61.4	34.1
Bulgaria	Severozapaden	86.7	81.7	**Yugozapaden**	22.7	18.3
Czech Republic	Střední Čechy	66.5	55.9	**Praha**	34.0	22.4
Denmark	Sjælland	61.5	52.5	**Hovedstaden**	43.3	39.0
Germany	Saarland	62.2	45.4	**Berlin**	74.6	49.4
Estonia		-	82.0		-	8.7
Ireland	Border, Midland And Western	72.9	69.7	**Southern And Eastern**	27.6	26.3
Greece	Dytiki Makedonia	80.6	73.2	**Attiki**	26.6	21.7
Spain	País Vasco	84.2	78.9	Ciudad Autónoma de Melilla	24.1	13.5
France	Bretagne	66.6	57.7	**Île de France**	49.3	39.7
Croatia	:	:	:	:	:	:
Italy	Friuli-Venezia Giulia	77.1	71.6	Campania	19.1	13.1
Cyprus		-	69.0		-	18.8
Latvia		-	68.7		-	13.2
Lithuania		-	88.6		-	5.3
Luxembourg		-	62.9		-	24.4
Hungary	Észak-Alföld	93.7	91.6	**Közép-Magyarország**	9.2	7.1
Malta		-	60.4		-	19.9
Netherlands	Zeeland	64.5	55.6	**Noord-Holland**	49.3	42.4
Austria	Burgenland	75.7	51.9	**Wien**	75.7	40.0
Poland	Świętokrzyskie	89.0	77.1	Dolnośląskie	24.5	18.0
Portugal	Centro	80.8	72.5	**Lisboa**	27.3	19.9
Romania	Sud-Vest Oltenia	97.7	94.7	**Bucureşti - Ilfov**	5.2	3.2
Slovenia	Vzhodna Slovenija	78.6	78.0	Vzhodna Slovenija	10.4	9.3
Slovakia	Stredné Slovensko	86.6	86.1	Stredné Slovensko	2.7	2.3
Finland	:	:	:	:	:	:
Sweden	Småland med öarna	53.2	42.2	Västsverige	36.9	34.4
United Kingdom	Cheshire	73.1	64.3	**Inner London**	63.1	34.3
Iceland		-	71.3		-	14.1
Liechtenstein		-	51.1		-	47.2
Norway	Agder og Rogaland	71.5	62.8	**Oslo og Akershus**	25.2	22.8
Switzerland	Ostschweiz	43.3	36.3	Zürich	62.4	56.2

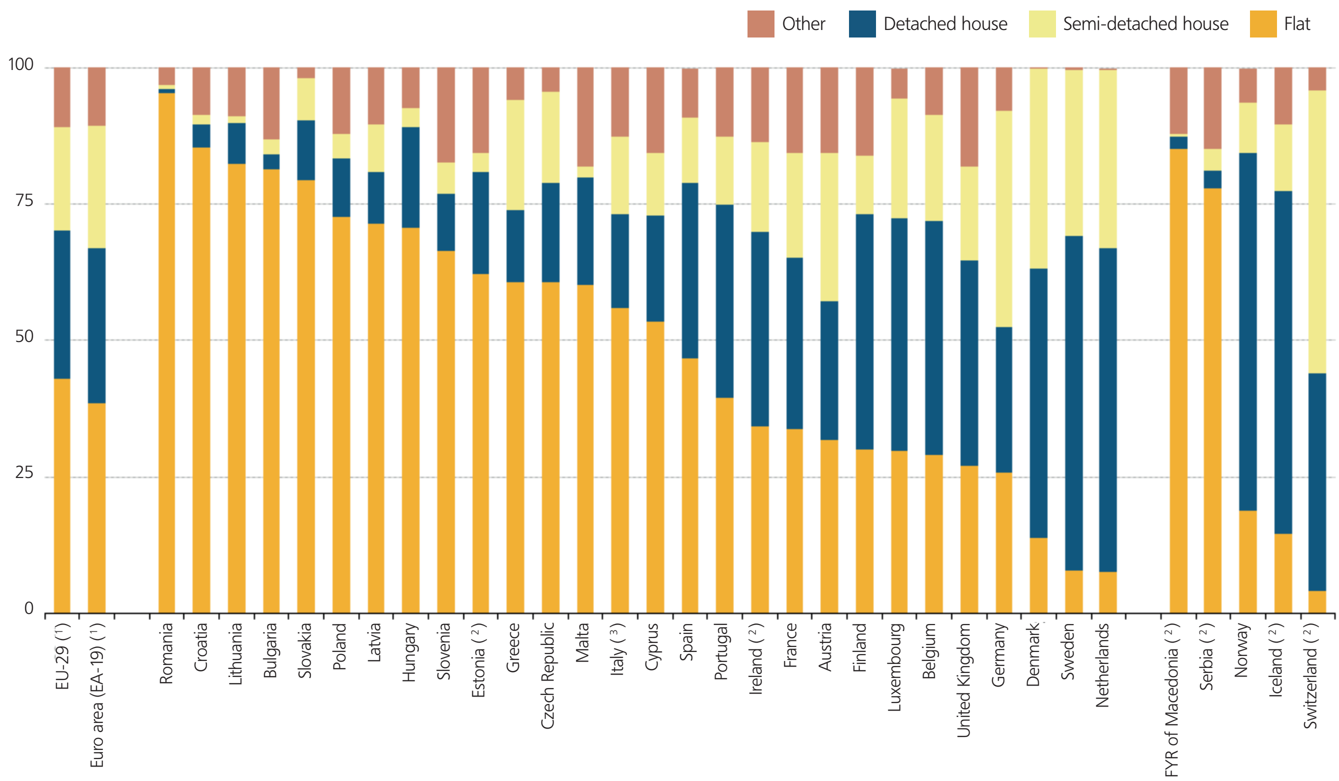
[1] Note that other ownership models exist in some countries (cooperative ownership or other types of ownership). Regions in **bold** typeface are capital city regions.
[2] Excluding Croatia and Finland.
Source: Eurostat (Census hub HC41)

Source: EUROSTAT, EU-SILC 2015

Social rented housing, Denmark

Former social housing, now privately owned, Lithuania

Figure 3 Tenure by EU Member State

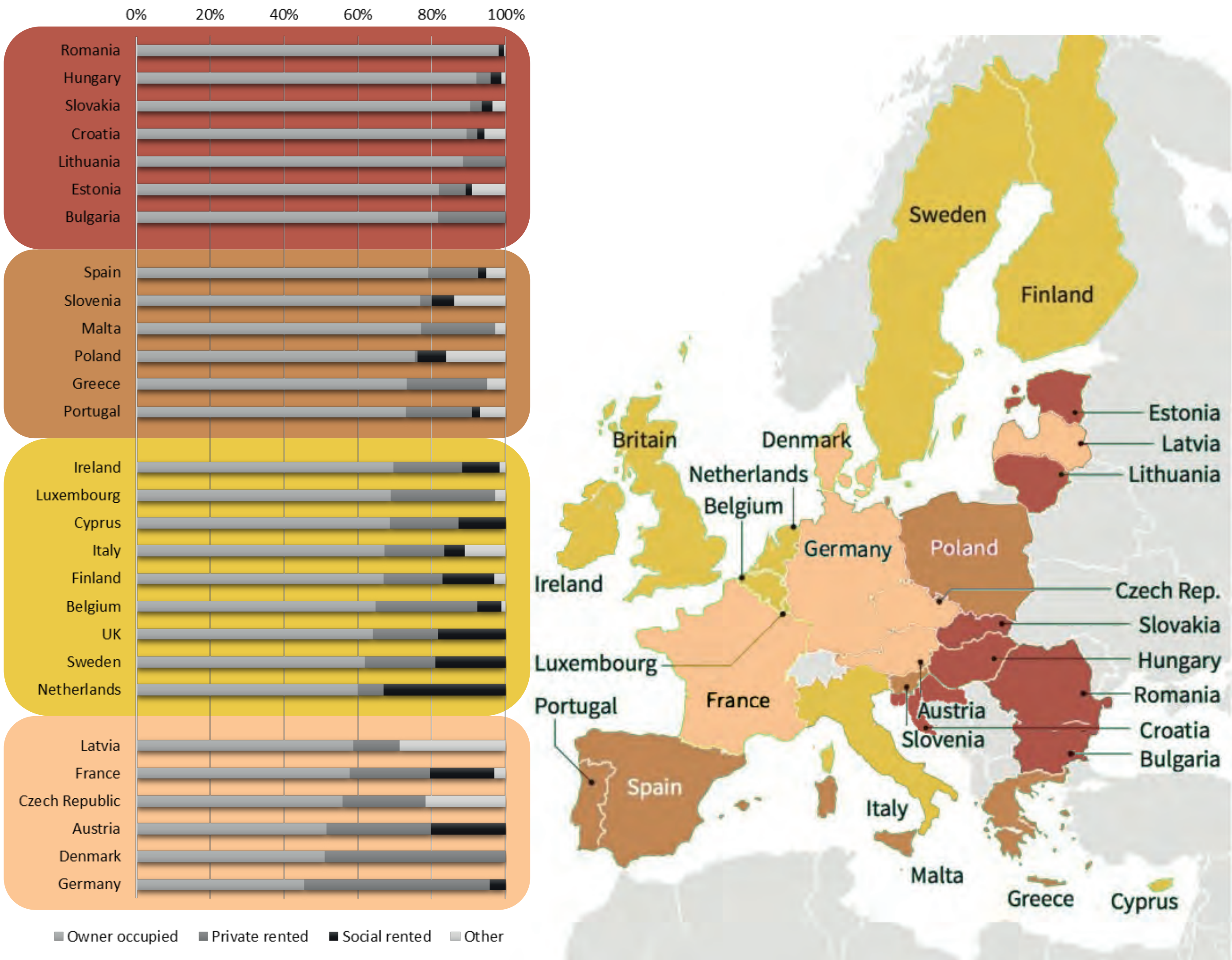


Source: Eurostat. EU-SILC 2015

(¹) Estimates.
(²) 2013.
(³) Provisional data.
Source: Eurostat (online data code: ilc_lvho02)

The state of housing in the EU 2015 report (Pittini, 2015) breaks down tenure to include the proportion of rental and social housing in each of 28 Member States, as illustrated in Figure 4 below.

Figure 4 The distribution of housing tenure across the EU



Housing conditions, and identifiers of 'inadequate' housing, are closely related to the age, type and tenure of the housing stock, as outlined above. Other factors – such as the material of construction, location (in particular whether urban or rural), planning requirements and controls, and the ability of the owners to maintain and improve their homes are other important factors.

Assessing housing in relation to health

Before considering the importance of 'house', 'home', and 'housing' and the relationship these have with 'health' and 'wellbeing', some explanation of their meanings is necessary. The World Health Organization, Europe (WHO) has adopted a definition of housing as a broad concept involving four interrelated elements:

- the house (or dwelling)
- the home
- the immediate environment (or neighbourhood)
- and the community

It is worth noting that the words house and home are often used as if they are synonymous, but clearly in this definition they are seen as separate elements.

The house or dwelling is the physical structure providing shelter with the necessary space, facilities and amenities for the actual or intended occupants. A house is also a financial asset, mainly a personal, individual asset, but a national asset as well. As an asset, there will be a psychological significance to the owner (or person purchasing, perhaps through a mortgage), but the degree of this significance will vary depending on whether the house is intended to provide accommodation for personal occupation, or for renting.

The primary purpose of a house or dwelling is that of providing somewhere to establish a home. It should be designed, constructed and maintained to provide a safe and healthy environment for the occupants and any visitors. It is not possible to provide a dwelling that is completely safe and healthy; many hazards such as electricity, stairs, cooking facilities, windows and doors are necessary and unavoidable. All hazards should be controlled to be as safe as possible.

A dwelling should provide protection from the local climate, it should allow for the normal day-to-day activities of the occupants throughout the year without problems, and its condition should be such that it does not interfere with the occupants establishing a home. It should have sufficient space to allow for the inter-relationship between the members of the household and also allow individuals the opportunity for privacy. It should be affordable, both in terms of the rent or mortgage repayment and in terms of the 'running costs', including the costs of local taxes, energy, water, and of maintenance.

The home is the social, cultural and economic structure created by the individual or the household. It is the structure that gives refuge from the outside world, enables the development of a sense of identity and, for a household, a sense of attachment. The home creates an environment where one can be, and develop, oneself.

The immediate environment or neighbourhood is the locality where the house or dwelling is situated. It includes the adjacent dwellings, the walkways and roads, the public services, the shops, the schools, the places for worship, the places for entertainment, and other amenities such as green space and playgrounds. It should be planned and maintained to be safe for pedestrians, and cyclists as well as being used by private and public transport. There should be ready access to the immediate environment for residents, with easy connections to other areas.

The community is the social, cultural and economic structure established by those living and working within a neighbourhood.

The WHO definition of health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity (WHO, 1948). The term wellbeing or quality of life includes feelings of comfort and contentment and so goes beyond what would be considered clinically healthy.

Housing as a social determinant of health

The 'social determinants of health' are the sum of the conditions in which we grow up, live, work and age. All of these have an impact on our physical and mental health. Social determinants of health include the quality of our early years and education, the presence of employment and market income, but also the often neglected environment in which we live. Housing is, therefore, a key social determinant of health.

Each of the individual elements of housing has the potential to have a direct or indirect impact on health and wellbeing, including physical, social and mental health. Also, two or more of the interrelated elements can have a combined impact on health or wellbeing.

Any negative health outcomes attributable to housing have impacts on the individual, the household, and society generally. The health outcome, to a greater or lesser extent, causes suffering to the individual, it can result in days off work, or days off school (affecting educational attainment), both of which can have a negative effect on the economy of the household, the local area, and the nation (immediately and in the future) and the contribution, the household makes to local and national society.

Over the last four or five decades there has been a growing interest in collecting and strengthening evidence on the relationship between housing conditions and the health of occupants. The evidence base is extensive and includes reviews on the relationship (Ranson, 1991; Burridge and Ormandy, 1993; Ineichen, 1993; AJPH, 2003; Howden-Chapman and Carroll, 2004; RenvH, 2004), several conferences demonstrating the wealth of international studies (University of Warwick, 1986 to 2006; WHO, 2002, 2004), and analyses of data sources (Marmot et al, 1991; Sandel et al, 1999; Attanasio and Emmerson, 2001; Ormandy, 2009; Ridge, 2009).

However, the number of intervening and confounding variables (such as life-style, and working conditions) often makes it difficult to demonstrate clearly and measureable "cause-and-effect" relationships (Thompson et al, 2002). Nevertheless, there is a wide range of other evidence (so called 'grey evidence') relating the condition of buildings (including houses) to health and safety (DCLG, 2008). In addition, many practical developments are accepted as being beneficial without the need for research or proof, such as child safety locks for windows, and cut-off devices for gas appliances.

Housing conditions that can have an effect on health and/or safety include:

- Dampness and mould growth that can exacerbate respiratory conditions such as asthma and bronchitis,
- Inadequate ventilation reducing indoor air quality and allowing a build-up of pollutants,
- Energy inefficiency resulting in low indoor temperatures (cold homes),
- Poor sound attenuation allowing noise to penetrate,
- Poor design making it difficult to maintain a clean and healthy indoor environment,
- Features that increase the likelihood of accidents such as falls,
- Poor design and layout of kitchens increasing the possibility of accidents with hot liquids and
- Equipment, and increased likelihood of a fire starting and spreading.

Ideally, it should be possible to carry out the normal day-to-day household activities without unwanted and potentially harmful side effects. The US National Centre for Healthy Housing (NCHH, web page) for example proposes seven principles for a Healthy Home which describe that a habitation has to be:

- Dry: Damp dwellings provide an optimum environment for mites, cockroaches, rodents and moulds, each of which are associated with asthma and allergies;
- Clean: Clean homes reduce the possibility of pest infestations and exposure to contaminants;
- Pest-free: Studies have shown a causal relationship between exposure to mice and cockroaches and asthma in children. However, inappropriate treatment can exacerbate health problems as pesticides residues can pose a risk of neurological damage and cancer;
- Safe: The majority of children's physical injuries occur in the home. Falls are the most frequent cause, followed by injuries from objects, burns and poisonings;
- Contaminate-Free: Exposures include lead, radon, pesticides, volatile organic compounds (VOCs including formaldehyde), carbon monoxide, oxides of nitrogen, and second hand tobacco smoke;
- Ventilated: Studies have shown that a supply of fresh air improves respiratory health;
- Maintained: Poorly maintained dwellings are at risk from moisture and pests.

In 2002/3, the World Health Organization, European Office, organised and coordinated the Large Analysis and Review of European housing and health Status study (LARES) (Ormandy, 2009). It obtained data from 8,519 individual residents in 3,373 dwellings in eight European cities: Angers (France), Bonn (Germany), Bratislava (Slovakia), Budapest (Hungary), Ferreira do Alentejo (Portugal), Forlì (Italy), Genève (Switzerland), and Vilnius (Lithuania). This study made a major contribution to the evidence on the links between housing conditions and the health and wellbeing of the occupants through the unique cross-disciplinary approach to the data analyses.

This preliminary LARES report (Ormandy, 2009) provided evidence of the relationships between health and indoor air quality, dampness, thermal comfort, mental health, noise, and domestic accidents. As well as informing policies at local level, the findings on each topic have been used by the World Health Organization, specialists and academics in their work on those topics.

There is also evidence to suggest that the social cohesion of the community, and the sense of trust and collective worth, depends to some extent on the quality of the immediate environment. In addition, evidence suggests that the quality of urban design and maintenance can have an impact on social, mental and physical health. Poorly planned or badly maintained residential areas, that lack public services, greenery, parks, playgrounds and walking areas, have all been associated with a lack of physical exercise, increased prevalence of obesity, cognitive problems in children, and a loss of the ability to socialise.

Symptoms of neighbourhood decline affect residents through both visual mechanisms (litter, pollution, etc.) and social mechanisms (segregation, loitering, increased insecurity). The urban planning and layout may lead to an increased dependence on individual transportation, resulting in increased pollution and noise exposure, and endangering or isolating those likely to be more susceptible such as the very young, the elderly, and those with functional limitations.

Controls on the condition of housing and associated costs

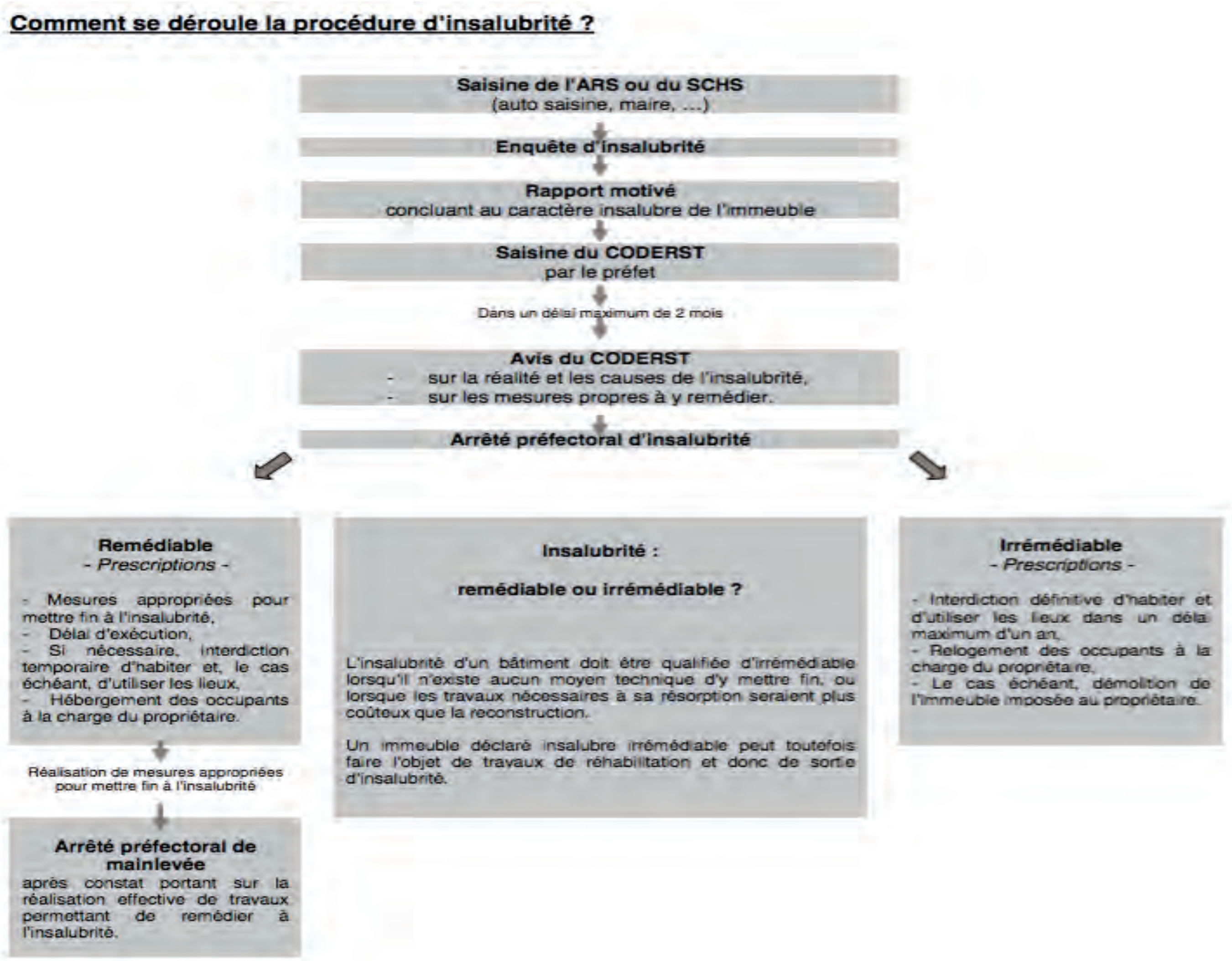
More often than not, health and safety are the principles underlying controls on housing conditions. In England, it was the Ministry of Health that proposed the introduction of a Standard of Fitness for Human Habitation in 1919 (Ministry of Health, 1919), although the standard was not incorporated in the legislation until 1954 (HMSO, 1954). The basis of this Standard was clearly health and safety, although the phrasing focussed on the structure and facilities.

Other historical documents dealing with housing and health include the World Health Organization's The Physiological Basis of Health Standards for Dwellings (WHO, 1968), and the American Public Health Association's Basic Principles of Healthful Housing (APHA, 1938). This latter document was superseded in 1986 by Housing and Health: Recommended Minimum Housing Standards (APHA, 1986) and then the National Healthy Housing Standard (APHA, 2014) issued in 2014.

In France, dwellings are assessed against a checklist to determine whether action is necessary to deal with insalubrity (unhealthy conditions) – Grille de visite des immeubles susceptible d'être déclarés insalubres (Conseil Supérieur d'Hygiène Publique de France, 2003). This checklist covers the assessment of the condition of the dwelling; and where the dwelling is an apartment it covers the assessment of the condition of the whole block. The checklist is comprehensive and includes the local environment, whether there are any potential nuisances, the state of the physical structure, and the presence of any risks to health. The surveyor is required to assess whether each aspect is good, satisfactory, bad, very bad, or, in some cases, dangerous, Figure 5.

EDF (Électricité de France) has been given access to the national study completed in 2013, Phébus, by the Ministère de l'Ecologie, du Développement Durable et de l'Energie. The Phébus survey includes data on housing energy using the French Diagnostic de performance énergétique (DPE) methodology. As is the case with other European countries, the DPE does not equate to the English energy efficiency measurement, the Standard Assessment Procedure (SAP). To be able to find a threshold so as to identify the number and percentage of energy inefficient dwellings in France, the EDF team have to convert the French DPE data so that it can be compared with the English SAP. This work involves a series of complex computations to match the two scales and so find the French equivalent to the SAP used in England to define energy inefficiency.

Figure 5 The assessment of unhealthy conditions procedure



Policy intervention examples

National and local governments have been intervening to improve housing conditions for hundreds of years. At one end of the scale are the building regulations that aim to ensure that new homes are not constructed with inadequacies. For example, following the Great Fire of London in 1666, new construction in the City could not be of wood, thatch would not be permitted as a roof covering and dividing walls between properties had to extend to the apex of the roof to reduce the risk of the spread to other properties. At the other end of the scale are the huge social housing projects that followed the Second World War (see Lithuania case study), and the national housing improvement schemes which have been undertaken in many European municipalities more recently (see Decent Homes programme, below), all undertaken to specific standards.

Policy interventions fall broadly into the following categories:

- Building regulations for new build and some improvements
- Identifying inadequacies in the existing stock, through research and surveys
- Providing guidance and information
- Implementation and funding of interventions
- Enforcement

Building regulation

We can help to prevent housing inadequacies and ensure good quality housing for the future by introducing, maintaining and updating appropriate building regulations. Such regulations exist in all European countries, often with differences in emphasis that reflect local building practices and materials, culture, history and priorities. While applied at municipal or international level, building regulations might cover individual dwellings and developments.

While the focus of this study is the existing housing stock, good regulation will also be appropriate for significant improvements to existing homes, for example, an extension to provide WC and bathroom amenities. There will be a cost to central government for the development and maintenance of such regulations and a cost to the municipality for policing them.

Included in these costs are those related to the home improvement industry regulating itself; for example, the training and registering of approved suppliers and installers.

Identifying inadequacies

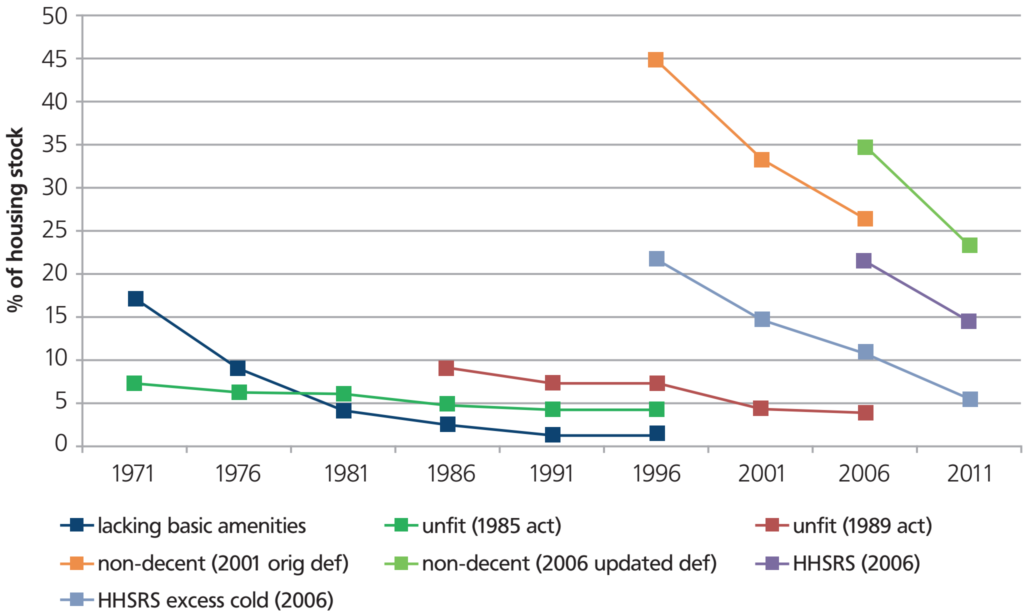
To develop, apply and monitor policies for the improvement of the housing stock requires good information and research to ensure that the most appropriate work is being undertaken and the best value to society is being achieved. Countries and municipalities will compile their own data sources, typically from national censuses and from targeted surveys.

Since 1967, the UK has undertaken regular sample national housing surveys to identify inadequacies in the housing stock and quantify the costs of work required to improve them. The English Housing Survey is used by several Government Departments to help develop and monitor their housing and domestic energy policies. It is also used by universities, research organisations and others to promote the case for investment in housing based on good evidence.

Currently the English Housing Survey includes an annual sample of some 13,200 interviews and 6,200 physical surveys in a random selection of homes of all tenures, which are weighted to the national housing stock.

Figure 6 shows how some key policies have been monitored over time through the EHS, and then replaced by higher standards once their targets have been achieved. The problem of missing amenities (affecting some 17% of the housing stock in 1971) has now been largely eradicated and the focus is on monitoring the decent homes standard (2006 updated definition).

Figure 6 English Housing Stock: Changes over time



Other countries and municipalities also undertake housing and energy surveys. Until recently, it was an Audit Commission requirement for UK municipalities to undertake a housing survey every 5 years to inform their housing strategies (it is now allowed for them to use extrapolations from the national surveys, linked to other data sources). Various French government departments run their own regular surveys of the aspects of housing that fall under their control. The Netherlands ran a national survey in the 1980s and 90s, one has recently been undertaken in Flanders, the WHO instigated LARES housing and health survey was undertaken in 8 European cities in 2003/04 (Ormandy, 2009). Lithuania has also undertaken a survey of indoor housing environments and health.

Apart from surveys, considerable sums of money are spent on understanding housing inadequacies and their impact on health and other costs to society. Such costs are borne by Government (often through granting bodies), universities, and charitable trusts, etc. It can be argued that this Eurofound study represents a cost, which is the result of an acknowledged problem of housing inadequacies and inequalities across Europe and a determination to do something about them.

Providing guidance and information

Policy interventions will need to be properly researched, developed and tested before they are introduced. There will be periods of consultation and engagement with the recipients of the interventions. Policy launches will require accompanying guidance, publicity material, press briefings etc. Staff will be required to answer queries and explain how the policy works, whether people are eligible for participation and so on. All this can cost a considerable amount of money.

Sometimes the policy will be one of dissemination of knowledge and education, to help people improve their own homes. At one level, this might be for builders, suppliers, project managers, architects, installers. At another level it will be for owners to help them procure the best possible service.

Organisations like the Consumer Associations spend a significant proportion of their time advising households over home improvement activities and dealing with complaints against tradesmen. Lack of trust in the construction trades is one of the biggest blockers to self-initiated home improvement. Some knowledge and advice is provided by DIY stores, who recognise an opportunity in the market, particularly for self-improvers.

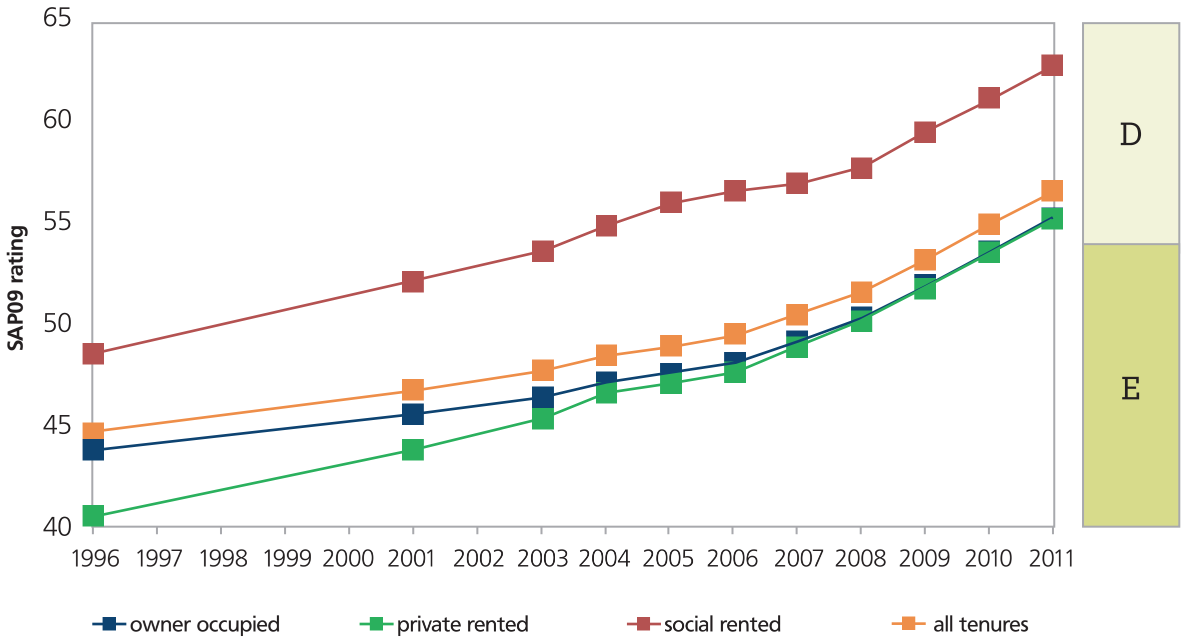
The main brief of the Energy Savings Trust is to provide the public with knowledge and guidance to help them procure appropriate energy efficiency improvements. Such organisations spend a considerable part of their budgets on advertising the benefits of home improvements and of living healthily and safely in the home. The fire services also spend a significant amount of time on educating people to prevent fires in their homes, often giving out and installing smoke detectors to households. The gas industry promotes the regular servicing of boilers and the installation of carbon monoxide detectors and, in some cases, supplies them at no cost to households. In New Zealand, the national government has produced educational advertisements, shown on television, to warn people of the dangers of home accidents and presenting advice on how to avoid them.

All this will come at a cost and it is difficult to quantify the immediate benefits. But it is accepted wisdom that educating people to improve their own homes and make them more healthy and safe will pay dividends in the long term. For years, expensive advertising campaigns have sought to reduce the smoking rate in European countries. This (combined with other initiatives, such as smoking bans) has helped reduce the rate and the knock-on effects on health, such as the instances of death from lung cancer. We can only speculate what effect similar campaigns to raise awareness of homes health and safety might have.

Examples of policy implementations

Every country will be involved in policies to improve their housing at some level. Sometimes this will be the result of an EU directive, such as that to introduce energy labelling measures for housing transactions, and setting and monitoring targets at a national level. Figure 7 below shows the improvements that have been made in the energy efficiency of the English housing stock, following years of interventions, as monitored through the EHS using the SAP model (which scores energy efficiency on a scale of 0 (worst) to 100 (best). The figure shows that progress is slow but steady – but far off hitting the desired target of an average of SAP 80 in 2015.

Figure 7 Average SAP by Tenure 1996 – 2011: England



Multiple housing policies have been introduced in the UK to help deliver these energy efficiency improvements, including: Warm Homes, ECO, the Green Deal, HEED, and Decent Homes. The investment in the delivery of the policies runs in to many billions of pounds. Some of these (eg ECO) are area based initiatives, which are targeted on clusters of people who are likely to be in fuel poverty. Other counties will have their own list of preventative initiatives.

While energy improvements are perhaps the most widespread of policy initiatives to address individual inadequacies, countries often have their own focuses. The USA has, for example, been providing grants for lead paint removal for many years, based on research which proved the link between lead in paint (very common throughout the older timber housing stock) and childhood health and development (Jacobs et al, 2002).

Energy efficiency improvements are perhaps the most common and widespread of current policy initiatives designed to reduce housing inadequacies in Europe. However, this has not always been the case. Throughout history, municipalities have 'removed' areas of insanitary housing to make way for new projects (it is happening now in places like Brazil). In the 20th century 'slum clearance' projects removed large areas of inadequate housing from European cities. Households were typically re-housed in social housing projects. A summary of the recent history of national housing renewal policy interventions in England (as informed by the English Housing Survey) is presented in the box below. It shows that slum clearance went out of favour in the 1970s as a solution to removing housing inadequacies and was replaced by renovation grants, which aimed at improving the housing of people within their existing communities. This proved very costly and not always worthwhile so the emphasis moved over more to targeted area renewal in the 2000s, which forced authorities to look at housing improvement holistically, alongside employment, education, environmental and infrastructure improvements (the Neighbourhood Renewal Assessment approach) and, as far as possible, use other sources of funding (such as private finance) to deliver the programmes.

Such policy interventions come at a cost. The UK Government was spending over £1 billion a year of direct grants for private sector housing renewal in the 1980s, when such programmes were at their peak. Where housing replacement is agreed to be the only viable option, for example following a cost-benefit analysis, the full costs can be £100,000 per unit. Even higher sums were spent on the Estates Action programmes, which were designed to turn around failing social housing estates through an injection of capital works funding.

National housing renewal policy interventions in England

1960-67 Post war clearance programme slows and focus moves towards renovation of the existing housing stock.

1967 First national housing surveys in England and Wales reveal many more sub-standard dwellings than originally thought.

1969 Housing Act: boost to grants as complement to clearance; area renewal via General Improvement Areas (GIAs).

1974 Housing Act: grants for repair introduced; Housing Action Areas (HAAs) as an alternative to clearance; capital grant (HAG) to Housing Associations to finance acquisition and rehabilitation.

1979 Introduction of Priority Estates Project in England to target funds on poor public sector estates.

1980 Housing Act: extension of repair grants to all pre-1919 dwellings, following results of 1976 EHCS.

1982-84 Boom in grant take-up due to increase in grant percentages; Enveloping introduced (publically financed block renovation of private sector housing).

1985 Review of policy proposes targeting grants via a means test and introduction of equity sharing loans; launch of Estates Action programme to target resources on poor public sector estates.

1987 Further consultation papers; government funding for experimental home improvement agencies to help older owners with home repair and improvement.

1989 Local Government and Housing Act, informed by 1986 EHCS: new renovation, disabled facilities and minor works grants; means testing of grant aid; new fitness standard; GIAs and HAAs replaced by Renewal Areas; reduction in Government subsidy for grant payments.

1991 Longer term funding for 120 home improvement agencies.

1993 Review of 1989 Act, informed by 1991 EHCS; publication of consultation papers.

1996 Housing Grants, Construction and Renovation Act providing for abolition of mandatory renovation grants, replacement of MWA with Home Repair Grant, and introduction of Relocation Grant to stimulate clearance of homes which were uneconomic to repair.

1997-2000 Development of HHSRS and dissemination of HHSRS Guidance Version 1 for consultation.

1997-2000 Development of the Major Repairs Allowance (MRA) to distribute money to local authorities for major repairs and replacements.

1997 Kyoto agreement (ratified in 2001) pledges to reduce carbon emissions among signatory nations, including UK. England's targets and progress informed by EHCS analysis.

2000 Comprehensive Spending Review makes provision for significant additional funding to improve homes in this sector following EHCS evidence on deterioration of local authority housing between 1996 and 2001.

2000 Urban White paper published that used analysis of EHCS data to increase resources and initiatives to improve the quality of homes and neighbourhoods in urban areas.

2000-2001 Development of Decent Homes programme, launched in 2001, with the aim of making all public sector housing 'decent' within 10 years.

2001 EHCS benchmarks Decent Homes and measures HHSRS at national level using Version 1 guidance. Housing Quality Indicators are introduced by the Housing Corporation to promote better social housing.

2002 Comprehensive Spending Review introduces new target to increase the proportion of vulnerable private sector households living in Decent Homes

National housing renewal policy interventions in England cont…

2004 Public Consultation on a new method for allocating resources to local authorities for housing management and day to day maintenance (M and M)

2004 Index of Local Deprivation uses EHCS based measure of non-decent homes as indicator of poor condition housing.

2004 Housing Act Introduces a new definition of an HMO and introduces provisions for Mandatory and Additional Licensing of HMOS and also for Selective Licensing of other private sector properties

2005 Version 2 of HHSRS guidance issued following consultation.

2006 HHSRS introduced in legislation as basic standard for housing, replacing the fitness standard. Decent Homes definition revised to include HHSRS instead of unfitness as indicator of poor condition housing.

2002-2008 Progress in making all social sector homes meet the Decent Homes standard monitored through EHCS.

2007 Energy Performance Certificates introduced as part of the Home Information Pack. EHCS measures RdSAP which underpins the EPC and measures progress at national level.

2008 EHCS merged with SEH to become the English Housing Survey and gains National Statistics accreditation.

2009 Parliamentary Select Committee review of the Decent Homes programme. EHS demonstrates that progress is slowing due to the residual group of 'hard to make decent' homes and the fact that homes are still becoming non-decent.

2010 Local authority financing arrangements overhauled to introduce self-financing and get rid of the old system of rent pooling and central allocation of allowances based on need determined by indicators.

With such high costs associated with area renewal, current policies in the UK are now reduced to enforcement activity in the private rented sector (supported by HHSRS inspections) and Decent Homes improvements in the social sector. Support for private owners with housing inadequacies is now largely through energy improvements and charitable support for vulnerable people.

Policy evaluations

Finally, at various stages of policy interventions and certainly at the end of large programmes, there will be evaluations of their perceived success and value. These will, of course, carry a cost. The most comprehensive of evaluations will attempt to quantify the benefits that have accrued. A good example of a substantial policy initiative to address the problem of inadequate housing is the English Decent Homes programme.

The UK Decent Homes programme

Informed by data from the EHS and other sources, in 2001 the UK Government introduced a programme to make all of England's four million social housing dwellings 'decent' by 2021. The definition of non-decency includes those homes with any HHSRS Category 1 inadequacies, as well as those which have aged bathroom/WC/ kitchen amenities/services or significant disrepair (DCLG). By 2001, social housing providers (with assistance from Government) had spent some £37 billion on the programme, removing the majority of inadequacies from the social housing stock. Various evaluations of the programme have taken place to determine its value. A study by the BRE Trust (Garrett, 2014b), estimated that the health cost benefit of removing/reducing inadequacies through the decent homes programme amounted to some £392 million and would continue to accrue benefits at the rate of some £71 million per annum. This evaluation assessed the impact of the Decent Homes programme as long term 'preventative medicine'. Evaluations which track the actual health of populations before and after housing interventions are less conclusive, particularly when mental health is tracked. It is likely that benefits are greatest when people grow up in healthy housing and that there is no quick 'cure' when the environment is changed for those who have already been disadvantaged.

Defining poor (inadequate) housing

Overview

Living in inadequate housing increases the health and safety risk and negatively affects well-being. If the risk is realised there will be costs of medical care, which may vary with the type of treatment. Sickness and disablement will mean that school or work days are lost, which has an impact on personal income and also economic output. Work on the task of measuring the 'exported costs' of inadequate housing has been developed independently in a number of countries. However, very little data is available on the cost of inadequate housing, some examples from around the world are shown in the box below.

Some studies on the relationship between housing and health

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. The UK Audit Commission (2009) stated that 'Every £1 spend on providing housing support for vulnerable people can save nearly £2 in reduced costs of health services, tenancy failure, crime and residential care'.

More specifically, the costs to the UK NHS of treating ill-health resulting from sub-standard housing have been estimated at £2.4 billion per year (National Housing Federation, 1997). This compares with the range of £2.3 billion to £3.3 billion quoted for the annual impact of smoking to the UK NHS.

The issue of quantifying the effect of poor housing has also been taken up in Australia 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'. Further, 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.

For the Netherlands, calculations have been made for the medical costs of all physical injuries (not just accidental home injuries), giving the total as €1.15 billion (£0.8 billion) or 3.7% of the total health care costs for 1999 (Meerding et al, 2006).

One study in England (Davidson et al, 2010) has looked in detail at the health costs associated with poor housing, and the potential cost of mitigating this risk through repairs. This following section considers how the English data and methodology might be applied across the 28 EU Member States by using the EQLS inadequate housing data as a starting point. It is noted that England is not necessarily representative of every Member State, both in terms of the cost to repair problems and in the cost of health issues arising from these problems. However, through the use of cost comparator indices, it is possible to provide a credible first attempt at pricing the burden of inadequate housing across Europe.

Defining and measuring inadequate (unhealthy) housing

Outlining the requirements

Housing costs represent the biggest expenditure item for most Europeans, with housing exclusion and homelessness being seen as one of the most salient problems of the coming years. Calls for targeted action to improve access to affordable and decent housing and prevention of inadequate housing can become more effective if they employ evidence to demonstrate costs and potential gains involved.

There are three common themes running through the literature: lack of basic facilities; structural problems and lack of space; however, the particular indicators used vary greatly (Eurofound, 2016). The contributors to definitions of housing inadequacy have generally been driven by the availability of data, typically from social surveys, rather than being designed in advance and measured through bespoke inspections by trained professionals. How housing condition could be assessed is outlined below.

What is required is an estimate of the cost associated with living in inadequate conditions. Some indication of the cost required to mitigate these costs should enable policy decisions to be made regarding where best to invest in order to reduce the burden of inadequate housing.

This cost to the health services, and potentially the cost to society, only remains if the health and safety risk is not mitigated. Therefore, making improvements and repairs to housing has the potential to turn these annual costs into a benefit. The cost of repair should be included in any assessment of the cost of inadequate housing.

In summary, in order to apply these costs to housing it is essential to know what condition the dwelling is in, what problems exist and whether these can be mitigated. In addition, an assessment of costs would need to determine how much it would cost if nothing gets done and how much it would cost to reduce or remove these problems.

Assessing housing conditions

There are two approaches to the assessment of housing conditions: the detailed assessment of an individual dwelling through an inspection or physical survey, and a local or national sample survey of the housing stock.

Individual inspections or physical surveys

Individual inspections are used to determine the state and condition of the individual dwelling and whether its condition requires remedial action or improvement. The detail, focus, and approach of the survey will depend on the reason for the assessment. For example, an individual dwelling can be assessed to determining its financial value or whether it is providing a safe and healthy environment for the occupying household or potential occupants. Most assessments will focus on any applicable controls, for example building codes, other legal standards, or requirements.

Sample surveys

Sample surveys are geared to providing information to inform policies and strategies. They provide data on local or national housing conditions and can be used to monitor the effectiveness of housing programmes. Where the surveys collect the same (or at least, comparable) information, the data from local surveys can be combined to give a national picture, and national data can be combined to give a wider picture, for example, that for Europe. Sample surveys are not intended to provide information suitable for action in respect of an individual dwelling. However, they can be used for investigating the relationship between housing conditions and the social and economic cost to society attributable to the risks posed, and the cost of removing, or at least reducing, those risks.

The Housing Act (HMSO, 2004) introduced the HHSRS, see box below, as the basis for local authority action to address housing conditions in its area. It was brought into effect in April 2006 so that the HHSRS became the prescribed method to be used for assessing housing conditions, and the precursor to determining whether local authorities should exercise their duties and powers to deal with unsatisfactory housing conditions. At the same time, the HHSRS was incorporated into the English Housing Survey (EHS), so providing data on the general state of the housing stock to inform policies, and to monitor the effectiveness of those policies. As well as being used to determine the severity of threats to health and safety, the HHSRS also can be used to judge the effectiveness of remedial action by the assessment of the condition after the completion of remedial action. These two assessments, the pre-remedial and post-remedial action assessments, form the basis of any HHSRS based cost-benefit analysis.

The English Housing Health & Safety Rating System (HHSRS)

Following several studies into the effectiveness of the existing statutory standard for housing, in 1998 the UK Government commissioned the development of a new approach. The underlying concept was to focus on the potential threats to health and safety posed by the characteristics and condition of a dwelling. The development started with an extensive literature review of medical, architectural, engineering and building related sources.

This produced a list of 29 potential hazards, partially or completely attributable to the condition of a dwelling.

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

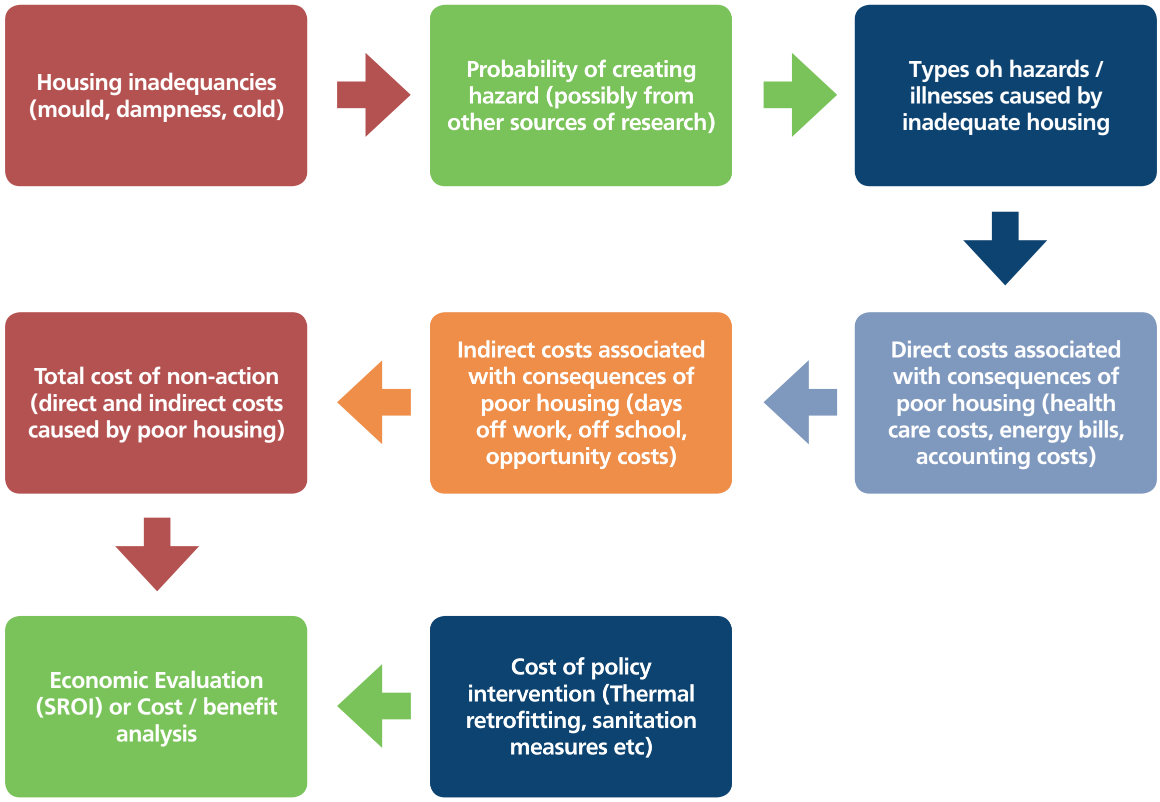
Falls associated with baths etc.
Falling on level surfaces
Falling on stairs etc.
Falling between levels
Electrical hazards
Fire
Flames, hot surfaces etc.
Collision and entrapment
Explosions
Position and operability of amenities etc.
Structural collapse and falling elements

The review also provided details of the potential health outcomes from each of these hazards, summarised in Appendix B. The wide range of differing health outcomes, were grouped into four Classes of harm. This differentiation was based on the degree of incapacity caused irrespective of whether the outcome was an injury, health condition, or illness (Raw et al, 2000). Only outcomes serious enough that the victim would (or should) seek medical attention were used, as only these provide evidential data. A methodology was developed to allow the comparison of the likelihood and severity of harm from these 29 hazards.

One of the core questions remaining, however, is how to relate housing deficiencies or inadequacies to health issues. The cause of these poor health outcomes is difficult to establish; as well as the inadequacy of the housing, many other factors, such as poverty, deprivation, unemployment, drug and alcohol abuse, etc. could lead to similar outcomes. However, where housing inadequacies have been tackled through repairs there is growing evidence that the predicted reduction in risk follows.

Improving housing inadequacies will come at a cost but will also deliver savings which can be regarded as benefits and a comparison of the costs against benefits can give an appreciation of returns to social investment. The relationship between the various steps (and inputs) of cost analysis can be summarised in the flow diagram below (Figure 8).

Figure 8 Total appreciation of costs and benefit relationships



How to cost inadequate housing

One of the most comprehensive reviews of inadequate housing (Ambrose, 1996) provides a matrix of costs, categorising them in terms of their impact on individual households and society, and their measurability. These costs might also be classified further in a number of ways such as: social or economic; direct or indirect; quantifiable or un-quantifiable; borne by the resident or borne by others; applicable to an individual home or applicable to housing environments, the community or society etc. Such heuristics and definitions necessarily overlap and there is no agreed approach to their application to housing inadequacies. In Table 5, it is suggested that there are a considerable range of costs which might be associated with inadequate housing, independent of the way it might be defined.

Table 5 The costs associated with inadequate housing

Category	Resident's costs	External costs
Can be quantified	Annual loss of asset value if owned Poor physical health Higher home fuel bills Higher insurance premiums	Annual loss of asset value if rented Higher health service treatment cost Higher building heating costs Extra school costs/homework classes High policing cost High emergency service costs High environmental health costs Special health care responses Government and EU programmes
Could be quantified given better data	Poor mental health Uninsured content losses Loss of future earnings More accidents Costs of moving Adopting self-harming habits	Higher care service treatment cost Uninsured external losses Disruption to service providers
Probably not quantifiable	Social isolation Under achievement at school Personal insecurity Poor hygienic conditions	Loss of talents to society Higher external insurance premiums

Direct economic costs are those that occur directly and can be measured in monetary terms. They are by nature directly related to the housing inadequacy, such as medical treatment for accidents in the home, chronical illnesses related to poor housing conditions etc. Some of the costs will be borne by households themselves, others by the emergency services, care services, charities, housing authorities, landlords and municipalities. These are often referred to as the 'economic' costs of poor housing, 'hard costs' or the direct costs of 'inaction'. Such costs include: the medical and care costs after hazards, higher than necessary energy bills, higher insurance premiums in problematic areas, higher maintenance costs of dilapidated buildings, the extra cost for policing and law enforcement in dangerous areas, the extra cost of fire services and paramedics, and pressure on charities. Table 6 provides estimates for these costs.

Table 6 Inadequate housing in England – estimated direct costs of inaction, 2011

Additional cost category	Annual direct cost (£ Million)	Confidence	Evidence
Health Category 1 hazards*	1,400	Good	EHS costs based on HHSRS risk
Energy	1,300	Good	EHS predicted, not actual, energy costs
Insurance	340	Fair	Assumes cost x 2 for inadequate homes
Maintenance	320	Fair	EHS backlog spread over 5 years
Policing	360	Poor	EHS Cat 1 hazards in run down areas
Fire	100	Fair	EHS risk + call-out costs
Paramedics	100	Fair	EHS risk + call-out costs
Enforcement	225	Fair	Assumes all enforcement dwelling related
Housing	225	Very Poor	Costs impossible to disaggregate
Charities	30	Poor	Assumes proportion is dwelling related
Total	**4,400**		

*these medical cost are just for HHSRS Category 1 hazards in England. When the net is increased to include all housing with lessor inadequacies across the UK, the cost rise to the £2.5 billion

Ambrose (1996) further suggests that there are three types of direct health costs associated with inadequate housing:

- Higher health service treatment costs
- Higher mental health service treatment costs
- Higher care service treatment costs

These costs have been well researched, particularly in the UK where the good quality data available from the National Health Service has been linked to the HHSRS, as measured through the national house condition surveys. While each hazard (inadequacy) has potentially different health outcomes, and hence different costs to the health service, the real cost of poor housing methodology has been simplified to only include representative costs at different levels of harm. These costs represent the range of potential cost from a number of health outcome scenarios, with greater costs associated with the treatment of more serious health outcomes.

Beyond the measurable direct costs of inadequate housing, living and growing up in inadequate housing can have consequences for people's life chances. This will ultimately have a knock on effect to the development and performance of countries. These might be considered to be the 'social' (or 'soft') consequences of poor housing, although they will also have an economic impact at some stage. The impact is inextricably linked with other social and economic development issues, such as: education, training, employment, family, culture. Indirect costs which can be linked to inadequate housing include:

- Under performance at school;
- Lost working days;
- Lost business opportunities;
- Lost property value;
- Lack of wellbeing.

It is very difficult to put a price tag on some of these long-term consequences of inadequate housing, although Housing Associations' Charitable Trust (HACT) do provide a valuable approach (D. Fujiwara, 2013). In terms of health outcomes, the societal costs might be considered to be the value of a person's life and health and their potential output/income. Loss of output has been estimated for both serious and slight injuries. For serious injuries, data has been classified into recovery periods based on injury type, length of stay in hospital and outcome. For slight injuries it is assumed that 95% recover in less than one year and the remainder recover in one to three years. It is also assumed that young non-fatal casualties recovering in three years or less do not contribute to loss of output.

The value of avoidance of injury is defined to be relative to the value of saving a fatality, as a willingness-to-pay calculation. Essentially, it might be the compensation that a person (or their family) might expect to receive if their life chances were curtailed due to the fault of a third party. This principle is applied to other health effects as well as accidents, so that, for example, a person who might die young of respiratory problems associated with a cold home might be attributed the same costs as one who had fallen down a stair.

Estimating the cost of inadequate housing

To estimate the cost of inadequate housing, a numerical scoring system has been developed, to enable the widely differing hazards and the health outcomes to be compared, where the higher the score, the greater the risk. To generate a score, a formula was devised using three sets of figures:

- A cost weighting for each Class of Harm to reflect the severity for each health outcome.
- The likelihood of a hazardous occurrence over the next twelve months, expressed as a ratio. The twelve-month period takes account of the differences between an event and a period of exposure, and also of the effect the seasons will have on certain hazards (such as Dampness and Excess Cold). Likelihoods are estimated by trained surveyors as part of the EHS data collection process, although average likelihoods are provided in the HHSRS guidance (ODPM, 2006).
- The spread of harm resulting from an occurrence, expressed as a percentage for each of the four Classes of Harm, the highest percentage being given to the most probable outcome. In most cases the spread of harm outcomes will be based on the HHSRS guidance (ODPM, 2006) however, where the surveyor believes the spread of harms might be influenced by the specific environmental factors they may change this spread accordingly.

Since the remedial work does not completely remove the hazard, but instead brings the risk down to an acceptable level, the medical costs are similarly considered as the difference in costs associated with inadequate housing and the costs associated with average housing.

When the costs are applied to the HHSRS, as measured through the EHS in 2011, they suggest that the total cost to health of leaving such inadequacies un-remedied amounts to some £2.5 billion per annum for the UK, in first year treatment costs alone. This is very similar to the estimate commissioned by the NHF (Friedman, 2010), which approached the quantification from a different angle, in this case looking at all NHS expenditure on treating ailments which might be housing related.

The cost associated to any particular health hazard is determined by considering the probability of harm occurring in one given year if they were living in the dwelling. This probability is multiplied by the representative cost values at each level of harm, in proportion to the likelihood that each harm outcome might occur. The representative cost values used for analysis of the English data are shown in Table 7.

Table 7 Representative health cost weightings across the harm levels

Harm levels	HHSRS Weighting	Direct representative health costs (£)	Societal representative health costs (£)
Class 1	10,000	90,000	1,788,654
Class 2	1,000	30,000	50,616
Class 3	300	1,800	9,213
Class 4	10	120	222

This can be formulated as:

$$\sum_{Class\ 1}^{Class\ 4} \frac{Cost\ Weighting_{(Class)} * Spread\ of\ harm_{(Class)}}{Likelihood_{(before)} - Likelihood_{(after)}}$$

The average cost to the health service of treating the harms caused by lack of hygiene, is therefore much smaller than the cost of treating multiple fractures caused by a fall out of a building window. Using our damp and mould growth example in the above formula the results of the calculation can be seen in Table 8. The likelihoods and harm levels are estimates from surveyors and the guidance on the HHSRS (ODPM, 2006), the direct health costs are based on numbers provided in the cost of hazards to the NHS report (Roys et al, 2016).

Table 8 The direct health cost of damp and mould growth example

Harm levels	Spread of harm (a)	Likelihood		Direct health cost weighting (d)	Direct health cost before (a)*(d)/(b)	Direct health cost after (a)*(d) /(c)	Direct health cost of inadequacy
		Before (b)	After (c)				
Class 1	0.0	6	446	£90,000	£ -	£ -	£ -
Class 2	1.0	6	446	£30,000	£5,000.00	£67.26	£ 4,932.74
Class 3	10.0	6	446	£1,800	£3,000.00	£40.36	£ 2,959.64
Class 4	89.0	6	446	£120	£1,780.00	£23.95	£ 1,756.05
Total	100.0	6	446		£9,780.00	£131.57	£ 9,648.43

The benefits of housing improvement

So far we have considered the health costs, both direct and societal, associated with exposure to hazards related to inadequate housing. By also considering the cost of repair we start to understand what benefits society can achieve by addressing them. Such an understanding can help drive the policies to promote improvements to housing standards.

For example, Denmark has promoted the building and continued improvement of a high quality housing stock over many years and thus prevents many of the costs from occurring in the first place. If problems occur, there is likely to be available funding to deal with them. By contrast, a country like Romania that has problems that have been accumulating over many years will not only have inherited an, often, obsolete housing stock but will pay more in the way of cost consequences and have little available funding for improvement.

When improvements are undertaken, many of the consequential health costs will be removed and will thus now be viewed as benefits. The UK National Health Service refers to such prevention as 'upstream investment', which suggests that 'downstream' there will perhaps be less cost to pay for treatments, new hospital buildings, emergency services, aftercare and so on.

Some of the benefits will not just be a removal of potential costs, but added benefits to households, the economy and society. These will be particularly apparent when large schemes and initiatives are involved. They include: an improvement in wellbeing, an improvement in socio-economic status, increased employment opportunities, better performance for individuals and housing areas, and the stimulation of the local economy.

Many intervention studies have demonstrated that general wellbeing improves when housing is improved (e.g. Howden-Chapman et al, 2007). This is particularly the case when areas are turned around and people subsequently feel valued, where previously there was apathy or embarrassment. Every home improvement scheme will create employment and might even boost the general economy. Some renewal schemes have purposely provided training and jobs for local unemployed residents, which ticks many boxes. With new confidence comes an increase in investment in the local economy.

Cost of repair

The English Housing Survey quantifies the cost of repair, and the types of improvement required, to the national housing stock and reports on a range of costs using a national specification of quantities. This includes the cost to reduce HHSRS Category 1 hazards to an acceptable level. It is the latter set of costs which are most useful for this study because they are directly related to housing inadequacies.

Every intervention will be unique and the work undertaken will depend on: the problem being addressed, the specification of work, who is doing the work, availability of labour, to what standard, whether it is a one-off job or part of a scheme, who is paying for it, where it is, etc. The work may be undertaken by the household themselves, the landlord, the municipality, the state or some other agency.

The average cost for each inadequacy will be made up from many different jobs, depending on the situation. Many inadequacies can be dealt with for a relatively small cost, for example, installing handrails in the homes of elderly people living with dangerous stairs. While others, such as energy improvements, space problems and the eradication of dampness are more expensive, on average.

Based on the example from the UK, some typical costs for jobs of work which inform the averages are:

Low cost work includes:

- Re-locate cooker (£157)
- Install 2 wired smoke detectors (£194)
- Install handrail to staircase (£295)

Medium cost work includes:

- Replace lead piping (£1,890)
- Rewire house (£3,657)
- Redesign staircase (£4,325)

High cost work includes:

- Re-fit kitchen (£7,000)
- Damp remedial works (£10,940)
- Solid wall insulation (£20,000)

There are countless examples across Europe of the costs of individual projects and schemes. The Lithuania case study presents one example whereby a block of some 100 flats has received energy improvements, including external insulation and district heating replacement at an average cost of €500 per unit. The costs for improvements vary greatly across Europe and are strongly linked to wage differentials and the price of material needed. Timber may be more expensive in Cyprus then in Poland while the wage for a builder is much lower in Portugal than in Ireland. Therefore we need to take such price differences into consideration. The PPP Construction indicator shows that costs vary significantly across Europe. The same job in Sweden will, on average, cost 1.6 times more than the EU average and 4.2 times more than in Romania.

Implementation of a model to produce cost estimates

The cost and benefit calculations suggested above can be applied quite successfully when adequate data is available, and this has been the case in the UK. However, the same level of data, particularly hazard assessment using trained surveyors, is not available in other Member States. Eventually it may be possible to apply a similar methodology for data collection elsewhere across Europe, but until then it is necessary to try and model such differences across Europe using the best data available.

Quantifying poor housing in Europe

The EQLS survey

After reviewing a number of options, a model was therefore developed that has, at its core, the EQLS data set and a series of measurements of housing inadequacies. We have to make some assumptions here which do come with caveats, advantages and limitations; Table 9 highlights these in a systematic way.

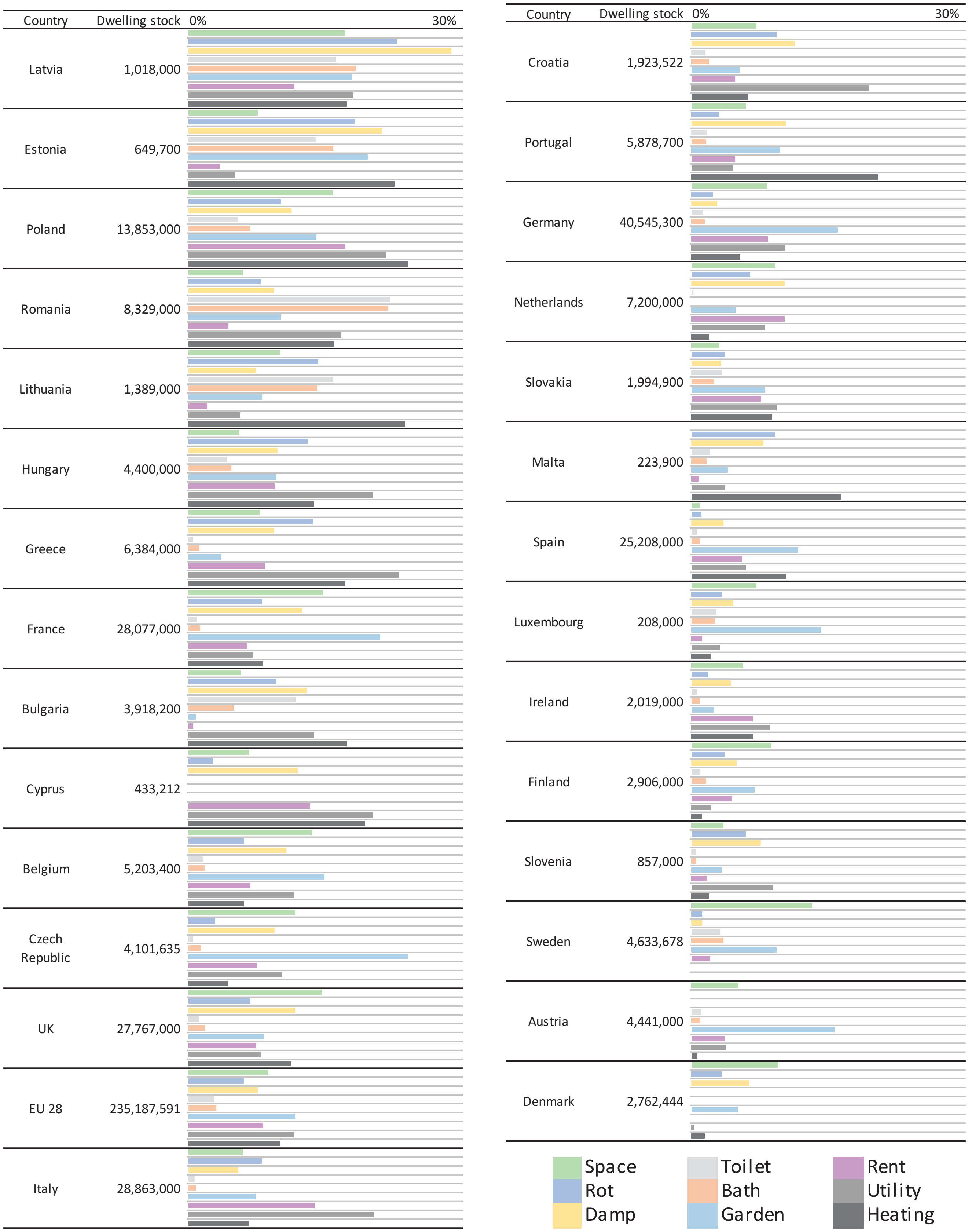
Table 9 Assessment of the input data: the EQLS

Advantages	Limitations
External validity: The data can be followed up by a procedure to estimate how many homes are likely to have defined inadequacies, how much it will cost to improve the homes to reduce the inadequacies, and how much it will cost in health, social and economic terms if the housing problems are not rectified	**Internal validity:** The inadequacies are based on simple yes/no questions. There is no indication of the scale (or cost) of the problem. Some of the inadequacies are not housing problems but economic problems such as the inability to pay utility bills and the ability to pay the rent/ mortgage
Simultaneity of measurement: The same definition is applied to 28 Member States of the EU and at the same point in time. Assuming the questions are interpreted by the respondents in the same way this allows a direct comparison of responses across Member States	**Validation:** Work so far suggests that self-reported inadequacy over-reports real housing problems. Also some responses to questions may vary as to when, in the year, they were asked, if data collection is delayed
Improvement potential: This exercise gives the opportunity to improve the source questionnaire in the future by collecting additional relevant information such as dwelling age and type, ability to keep home cool, home accidents, safety, furnishings etc.	**Reliability:** The analysis is retrospective and the definition of inadequacies is not complete. A limited number of housing inadequacies are registered (9 are reviewed when building this model) while the HHSRS identifies 29 hazards. The inadequacy questions are self-reported and not inspected by a professional on a consistent basis
National weighting: The EQLS reflects responses from randomly selected adults and the results are reported as such. It is complex to re-weight the survey to reflect households and dwellings, but this is possible	**Causality assumption:** There is no indication of whether the inadequacy will lead to a health outcome or to the severity of these health outcomes

In addition, it should be pointed out that there is useful information in the EQLS which is not currently used to inform an indicator. For example, environmental noise is collected at Q50a, quality of drinking water is collected at Q50c, crime, violence and vandalism is collected at Q50d. In principle, these could be added to the broader assessment of housing inadequacies, as they are covered by the HHSRS for their impact on the health and safety of the dwelling occupants.

Percentage of households reporting problems in the EQLS

Figure 9 Percentage of households reporting each problem in the EQLS by Member State



The number of dwellings in each Member State, from Housing Europe (Pittini, 2015), and the revised proportion of households are shown in Figure 9, ordered by the proportion of households reporting problems. Households in Finland, Slovenia, Sweden, Austria and Denmark reported the fewest problems; whereas households in Latvia, Estonia, Poland, Romania and Lithuania reported the most problems. Households in the UK and Italy were the closest to the overall EU value, in terms of proportion of problems.

- The largest proportion of households reporting problems with space are found in Poland (18.3%), France (17.4%) and the UK (17.3%)
- Damp and rot problems are reported the most in Latvia (23.4%, 29.1%) and Estonia (19.1% 22.4%)
- In Romania one in five households lack an indoor toilet (22.2%) or bath (22.0%)
- The affordability of rent appears to be a problem for more households in Poland (18.0%)
- Paying utility bills is an issue in Greece (23.8%), Poland (18.0%), Hungry (21.2%), Italy (21.4%) and Cyprus (21.2%)
- Heating problems are reported in more households in Poland (24.4%), Lithuania (24.1%), Estonia (23.0%) and Portugal (20.9%)

Overlap with HHSRS

To put price tags to housing inadequacies we need to link different types of information from different sources. The estimation procedure matches the EQLS inadequacy prevalence information with cost to repair information from the English Housing Survey health cost information from the UK National Health Service and estimates of the cost of harm to society. The aim is to augment the EQLS information, above, with information from the English Housing Survey. The advantages of the EHS are:

- It is a weighted sample survey (currently of 6,200 homes per annum) which collects detailed information on the design, amenities and condition of the home and its impact on the health and safety of occupiers. The data is collected by trained inspectors rather than households themselves and it is available for 2011, the same as the latest EQLS data.
- Out of the 29 HHSRS hazards 26 are identified and quantified, and the cost of remedial action is recorded. Extensive work has been undertaken using these data to estimate the cost to health and society of leaving people living in homes with HHSRS problems.
- Housing inadequacies in the UK measured through the EQLS data set can be validated against similar (much more accurately measured) data from the EHS, and other UK national surveys.

However, there are also limitations due to the following:

- HHSRS and its associated definition of 'Poor Housing' are only measured in the United Kingdom with its atypical housing structure (and for UK estimates, even Scotland has to be extrapolated from the other 3 UK nations.
- The costs are based on UK prices.
- The reported health costs are based on first year treatment costs from the UK National Health Service. No other EU Member State has a comparable organisation for sourcing the comprehensive information on health costs.
- The overlap between the HHSRS and information on 'housing inadequacies' from the EQLS is rather tenuous for some hazards.

Table 10 Overlap between the nine Eurofound inadequacies and the 29 HHSRS hazards

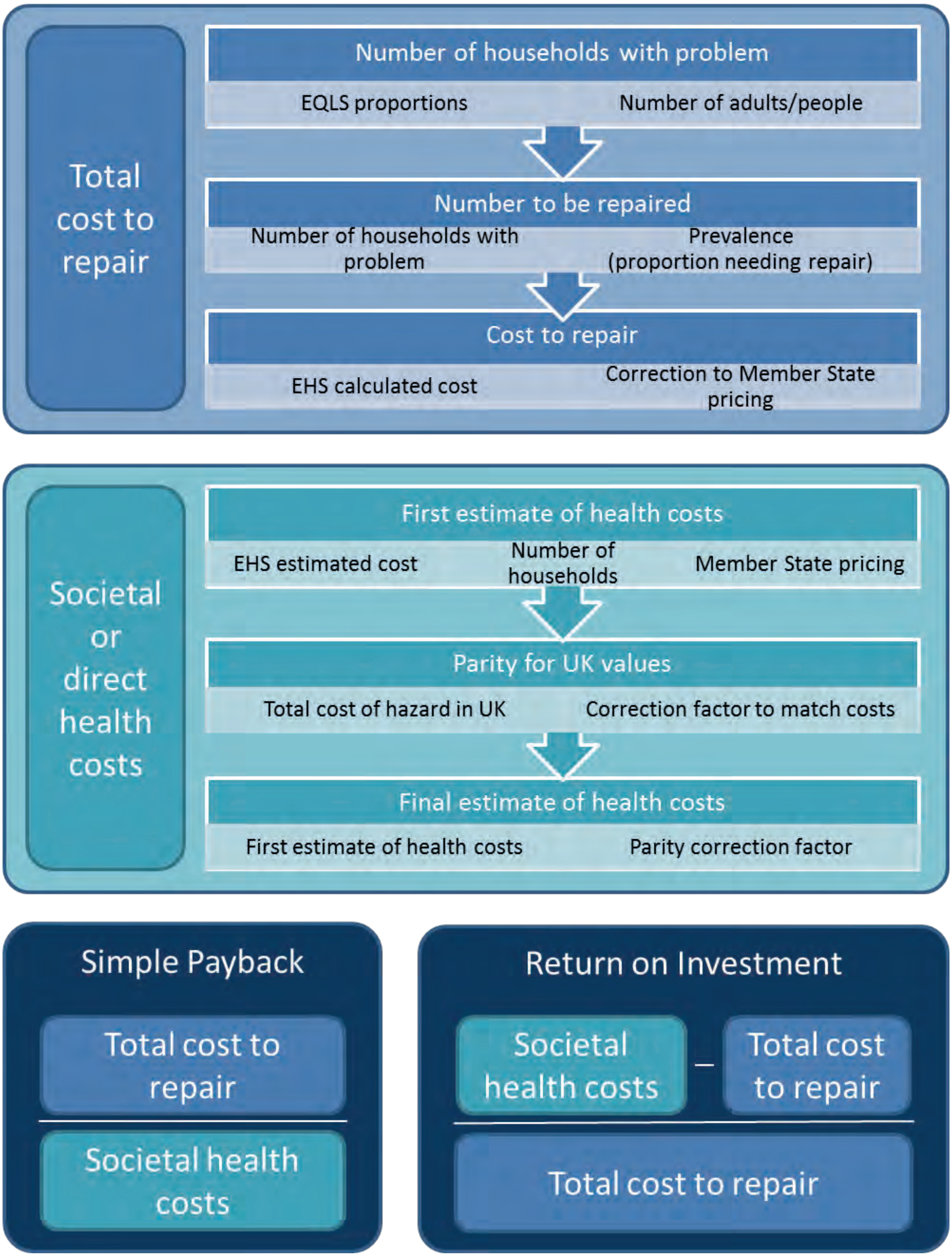
Eurofound	HHSRS	Cost base	Notes
Housing inadequacies, which it will not be possible to cost at this time, because there is no comparable information from the EHS/HHSRS			
No private garden/space			Not included in HHSRS
Cannot afford rent/mortgage			An economic rather than a housing indicator
Cannot afford utility bills			An economic rather than a housing indicator
Hazards covered by both definitions and for which there is reasonable comparative information			
Not enough space	Crowding and space	EHS proportion	EQLS includes overcrowding and aspiration for space
Cannot afford to heat home	Excess cold	EHS proportion	EQLS is part poor heating and part economic
Home suffers from rot	Structural stability+	EHS mean	There is no generic HHSRS disrepair indicator
Home suffers from damp	Dampness	EHS proportion	EQLS includes all damp, not just Cat 1
Home does not have indoor WC	Personal hygiene	EHS mean	Assume no indoor WC = Cat 1 HHSRS
Home does not have indoor bath	Personal hygiene	EHS mean	Assume no bath = Cat 1 HHSRS
HHSRS hazards measured in the EQLS which could be included as Eurofound inadequacies			
	Water supply	EHS mean	EQLS includes quality of water supply
	Entry by intruders	EHS mean	EQLS includes area crime, violence, vandalism
	Noise	EHS mean	EQLS includes environmental noise
HHSRS hazards not measured in the EQLS			
	Falls on stairs	EHS mean	EU assumptions from accident statistics
	Falls on level	EHS mean	
	Falls between levels	EHS mean	
	Falls assoc. with baths	EHS mean	
	Electrical hazards	EHS mean	
	Hot surfaces	EHS mean	
	Collision & entrapment	EHS mean	
	Fire	EHS mean	
	Radon	EHS mean	EU assumptions from radon maps
	Excess heat	EHS mean	No comparable EU data. May be some local data
	CO2 and combustion	EHS mean	
	Food safety	EHS mean	
	Domestic hygiene	EHS mean	
	Lead	EHS mean	
HHSRS hazards that are so small in their impact on health that they have little impact on the overall numbers and costs			
	Un-combusted fuel gas	EHS mean	No data
	Ergonomics	EHS mean	
	Explosions	EHS mean	
	Asbestos		
	Biocides		
	VOCs		

Despite the limitations of both the EQLS and the EHS, these data sources are at the moment an optimal way available to estimate a cost associated with mitigating inadequacies, and the potential benefit associated with these mitigations. Table 10 sets out the overlap between the Eurofound housing inadequacies and the HHSRS hazards measured by the EHS. The table suggests that there is only a modest overlap between the two main data sets. However, it is believed that a common definition can be found for an 'adequate' home which is warm, dry, contains basic amenities and services, and is suitable for the needs of the occupants for whom it is designed.

Measuring inadequate housing

Figure 10 below provides an overview of the model and the processes involved in generating national and EU based repair costs and the benefits to society.

Figure 10 Simplified flowchart of model process



Cost to repair

The average repair costs for the HHSRS hazards relating to each of the inadequacies used in the model, see Table 10, can be first estimated using the UK average repair costs. For example, for the WC and Bath inadequacies, the cost related to installing suitable amenities within the house in UK is provided, but this value assumes that space for these amenities in the house is available. The corresponding average values to alleviate each inadequacy, converted to Euros, are presented in Table 11.

The number of households where this cost is applied can be corrected using a prevalence factor for each inadequacy. This correction is necessary since in reality, for many who state they have a problem on some inadequacies the size of the problem is not really sufficient to warrant a costly repair. For example, it is assumed that only 33% of the damp inadequacies actually need repairing, with the rest being a minor inadequacy that could be mitigated with a mould cleaner. In the case of rot, there is no alternative to fixing it, e.g. the structures have to be replaced; same applies to WC and the bath that may need to be installed or constructed. The corrections for space and heating are also applied.

Inadequacy	Mean repair cost	Prevalence
Rot	€901	100%
Damp	€2,313	33%
WC	€11,440	100%
Bath	€12,899	100%
Space	€17,600	17%
Heating	€5,031	50%

Using the UK costs to repair will overestimate the cost to some Member States, and underestimate the costs in other Member States. A further correction is therefore required to normalise the costs of repairs in other countries. The model allows for indexed corrections based on published relative construction values and relative values for residential buildings, see Table 12. The UK values can then be corrected by multiplying the UK cost of repair by the ratio of National correction factor over the UK correction factor. This makes the cost to repair much cheaper in Romania (42% of UK costs), and more expensive in Sweden (177% of UK costs).

Table 12 PPP Correction factors across Member States

Country	No correction factor	PPP Construction correction factor	PPP Residential buildings correction factor
Austria	100	120	118
Belgium	100	98	98
Bulgaria	100	54	39
Croatia	100	53	46
Cyprus	100	70	64
Czech Republic	100	70	60
Denmark	100	141	147
Estonia	100	74	72
Finland	100	129	125
France	100	127	117
Germany	100	133	135
Greece	100	71	68
Hungary	100	54	48
Ireland	100	79	78
Italy	100	83	80
Latvia	100	74	57
Lithuania	100	65	59
Luxembourg	100	122	120
Malta	100	61	53
Netherlands	100	106	120
Poland	100	72	56
Portugal	100	56	53
Romania	100	41	35
Slovakia	100	74	63
Slovenia	100	68	58
Spain	100	74	71
Sweden	100	172	171
UK	100	97	83
EU28	100	106	106

To calculate the total cost of repair for each Member State, the UK costs, corrected for prevalence and PPP construction, are multiplied by the number of households reporting this problem, see Figure 9.

Societal or direct health benefits

The differences for the inadequacies discussed are shown in Table 13. The cost weightings used for each class of harm are described in the Table 7 above. The savings to society include both direct and indirect savings. The final column is an estimate of the direct proportion of these savings.

Table 13 Average savings by hazard

Hazard	Savings to Society (€)	Estimated Savings to health service (€)
Structural collapse	1,022	95
Damp	813	321
Personal Hygiene	339	128
Excess cold	12,541	704
Overcrowding	1,694	106

Note: lack of both an indoor WC and of a bath are both linked to the personal hygiene hazard.

Parity for UK values and final estimate of health costs

It is clear that the presence of self-reported inadequacies overestimates the cost to society of these hazards, as not all households who report problems with damp will actually suffer health consequences caused by the damp, for example. The values for England associated with each of these hazards is known from the cost of poor housing research (Roys et al, 2016), which can be used to provide an estimate for the whole of the UK. The ratio between these two values can be used as a correction factor for each of the costs to society calculations, Table 14.

Table 14 England to UK correction factor

Total cost of all hazards in England	Total estimated cost of all hazards in the UK	Correction factor
£602 million	£760 million	1.26

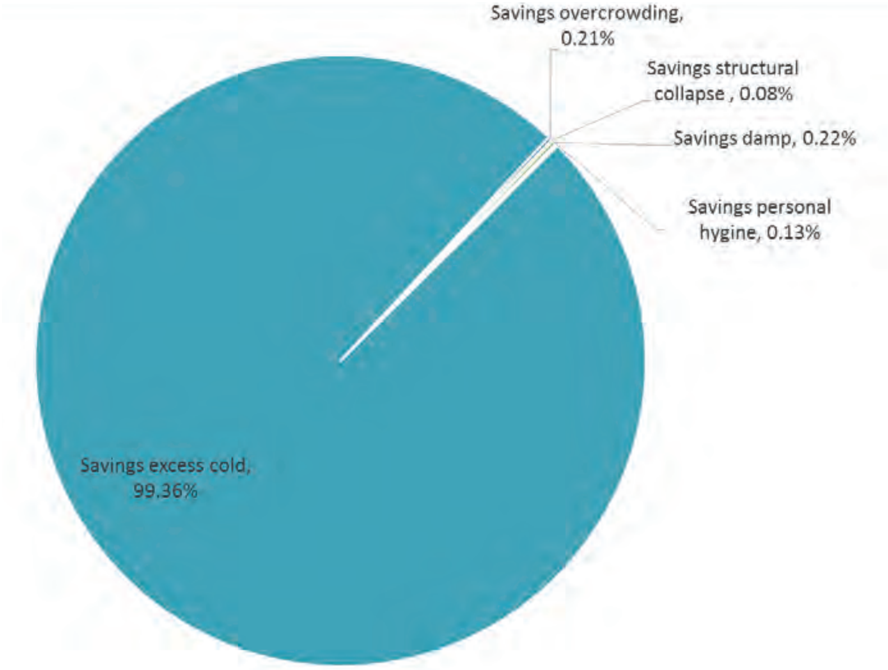
Since the total cost to society for each of the hazards in the UK is now known, this can be compared to the costs calculated using the EQLS estimates of households with each inadequacy. Using an iterative process the proportion or the EQLS households that would provide the same overall cost to society for these hazards can be determined, Table 15.

Table 15 Correction between number of EQLS inadequate households and the expected number of HHSRS households that are likely to lead to harm in the next 12 months

Hazard	Rounded Correction factor	Overestimation Multiplier
Structural collapse	0.008	125
Damp	0.022	45
Personal Hygiene	0.063	16
Excess cold	0.63	2
Overcrowding	0.008	125

The correction factors highlight the degree of overestimation for these hazards, with all but excess cold being overestimated by 15 times or more; excess cold accounts for 99.4% of the total societal health related costs once corrected, see Figure 11.

Figure 11 Breakdown of savings by hazard



For overcrowding and structural collapse the overestimate is 125 times. These correction factors can be applied to other nations, assuming that the degree of overestimation in the self-reporting of inadequacies likely to affect health and safety are the same in each Member State. These correction values can be applied to generate the final estimate of health costs. Further cost corrections can be applied by Member State, as for construction costs, but the current model assumes all costs are equal.

Cost benefit calculation

The calculations derived from the model, see Table 16, based on the assumptions outlined above, suggests that the overall cost of repair across the EU would be €295 billion, with an overall estimated saving to society if implemented of €194 billion per annum. Estimated payback on the huge investment is less than two years. For some Member States: Cyprus, Portugal, Malta, Spain, Greece and Hungary, the model suggests that paybacks would be less than one year, resulting in a positive first year return on investment. For all these and for Ireland, Croatia, Poland, Italy, Bulgarian, Slovakia and the UK the payback, and hence return on investment, is better than the EU average. For four Member States, Luxembourg, Austria, Finland and Sweden, the payback estimate is more than five years.

Table 16 Summary of the costs and benefits to society for six modelled EQLS inadequacies

EU Member State	Dwelling stock	Average cost of repair	Total Cost of Repair	Annual Direct Medical Savings	Annual Indirect Medical Savings	Annual Total Societal Medical Savings	Payback	First year ROI
		€	€ millions				years	
Cyprus	433,212	3,348	303.174	30.579	650.227	680.806	0.45	125%
Portugal	5,878,700	3,236	4,648.127	437.337	9,289.699	9,727.036	0.48	109%
Malta	223,900	2,816	172.310	13.555	287.431	300.986	0.57	75%
Spain	25,208,000	4,116	13,890.859	1,004.494	21,345.457	22,349.951	0.62	61%
Greece	6,384,000	2,875	5,727.292	402.415	8,542.901	8,945.316	0.64	56%
Hungary	4,400,000	3,035	4,806.011	228.544	4,798.360	5,026.904	0.96	5%
Ireland	2,019,000	4,710	1,244.640	55.843	1,179.260	1,235.103	1.01	-1%
Croatia	1,923,522	2,565	1,192.817	51.090	1,059.377	1,110.467	1.07	-7%
Poland	13,853,000	4,883	29,441.165	1,208.896	25,548.628	26,757.524	1.10	-9%
Italy	28,863,000	3,640	20,446.841	793.741	16,709.084	17,502.825	1.17	-14%
Bulgaria	3,918,200	3,795	6,462.532	254.676	5,323.439	5,578.115	1.16	-14%
Slovakia	1,994,900	4,977	1,926.007	69.339	1,460.844	1,530.183	1.26	-21%
UK	27,767,000	5,567	38,793.613	1,209.984	25,444.741	26,654.725	1.46	-31%
Czech Republic	4,101,635	4,344	2,824.092	82.114	1,699.237	1,781.351	1.59	-37%
Slovenia	857,000	2,755	353.949	10.001	203.628	213.629	1.66	-40%
Lithuania	1,389,000	5,175	4,530.039	121.346	2,538.965	2,660.311	1.70	-41%
Romania	8,329,000	3,928	22,093.431	514.865	10,497.212	11,012.077	2.01	-50%
Estonia	649,700	5,370	2,437.639	54.621	1,133.034	1,187.655	2.05	-51%
France	28,077,000	6,586	44,583.984	930.427	19,444.533	20,374.960	2.19	-54%
Belgium	5,203,400	5,832	6,590.226	133.221	2,762.613	2,895.834	2.28	-56%
Germany	40,545,300	9,066	52,652.715	943.858	19,849.699	20,793.557	2.53	-61%
Netherlands	7,200,000	4,450	5,180.915	84.262	1,703.448	1,787.710	2.90	-65%
Latvia	1,018,000	5,439	4,421.745	68.099	1,385.795	1,453.894	3.04	-67%
Denmark	2,762,444	7,123	2,297.609	27.062	551.947	579.009	3.97	-75%
Luxembourg	208,000	8,815	301.650	2.627	53.275	55.902	5.40	-81%
Austria	4,441,000	9,926	3,460.576	29.484	603.007	632.491	5.47	-82%
Finland	2,906,000	8,180	3,290.242	25.204	505.377	530.581	6.20	-84%
Sweden	4,633,678	16,759	11,400.835	24.070	453.533	477.603	23.87	-96%
EU28	235,187,591	5,127	295,475.035	8,811.754	185,024.751	193,836.505	1.52	-34%

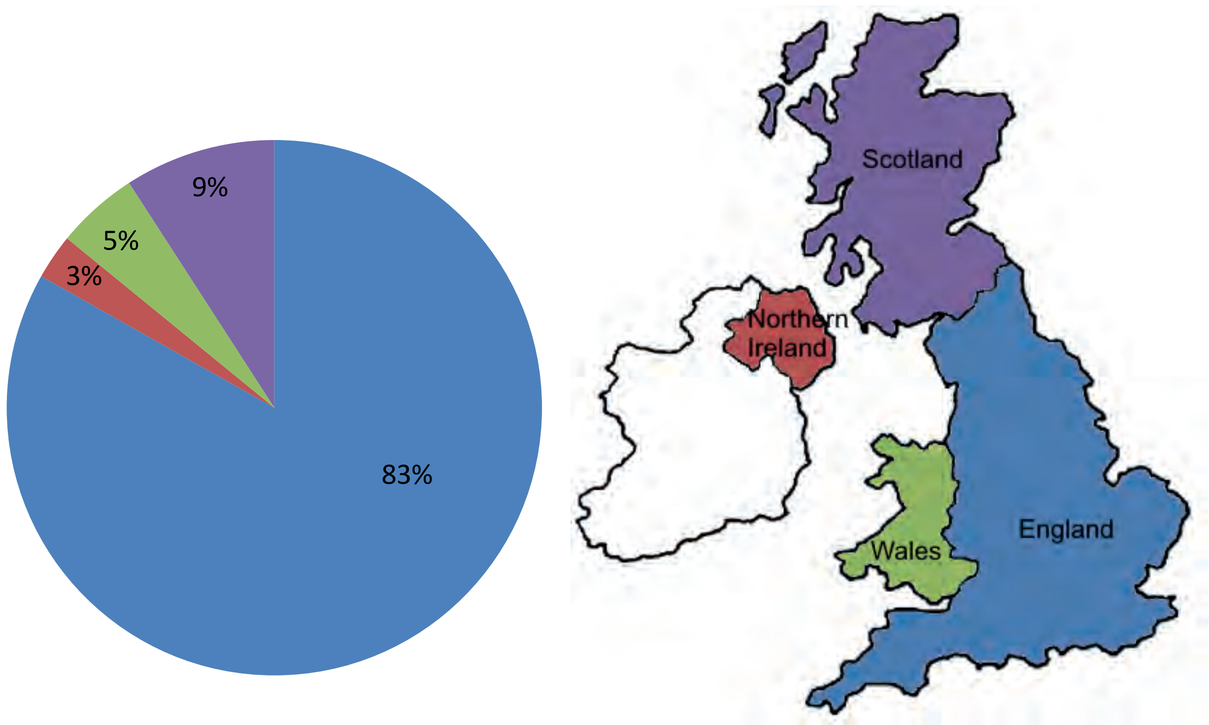
Examples of housing inadequacies in Europe

Case studies from the UK

Description of housing in the United Kingdom

Housing statistics are collected separately for the four nations of the United Kingdom, which all have their separate standards and housing surveys. In all, there are some 26 million homes in the UK with 83% of these being found in England, Figure 12.

Figure 12 Distribution of UK housing



The housing stock of the UK is similar in size to France, Table 17. The amount of floor-space available to each person in the UK is similar to that in France or Germany but about 60% of that available to an average citizen of the USA. The UK housing stock is significantly older than comparative countries and consists largely of owner-occupied houses. Heating is mainly provided from piped natural gas and not electricity, which is common in the USA and France.

Table 17 Comparative housing stock statistics for UK and selected countries

	UK (2008)	Germany (2009)	France (2009)	USA (2009)
Population (millions)	62	82	64	283
Occupied Dwellings (millions)	26	37.5	26	112
Persons per dwelling	2.3	2.4	2.3	2.5
Mean floor area per dwelling	85 m2	83 m2	85 m2	152 m2
Mean floor area per person	37 m2	35 m2	37 m2	61 m2
Dwelling age				
Pre 1940	37%	24%	30%	16%
Post 1940	63%	76%	70%	84%
Dwelling type				
House	81%	39%	59%	77%
Flat	19%	61%	41%	23%
Tenure				
Owned	68%	41%	58%	68%
Rented	32%	59%	42%	32%
Main fuel for heating				
Gas (piped)	82%	35%	34%	50%
Oil (+ kerosene, bottled gas)	7%	35%	24%	13%
Solid (coal, wood)	1%	4%	4%	2%
Electricity	9%	16%	28%	35%
District	1%	10%	10%	-

The characteristics of the UK housing stock are a product of their age, type of construction and size. These have been used to develop the typology of the UK housing stock presented in Figure 13. Some types are much more common than others, Table 18.

Figure 13 Typology of the UK housing stock

Table 18 Age and type profile of the occupied UK housing stock

Dwelling type	Number of dwellings in each age band				
	pre 1919	1919 to 1944	1945 to 1964	post 1964	all ages
Terraced	2,634,477	1,056,543	1,128,053	2,304,929	7,124,002
Semi-detached	802,431	1,783,052	1,942,132	1,998,730	6,526,345
Detached	707,540	483,172	502,020	2,784,289	4,477,021
Bungalow	134,992	255,272	672,314	1,526,417	2,588,995
Converted flat	684,679	75,901	15,420	17,438	793,438
Purpose-built low-rise flat	361,831	362,866	749,498	2,168,936	3,643,131
Purpose-built high-rise flat	11,165	10,460	108,154	234,837	364,616
Total	5,337,115	4,027,266	5,117,591	11,035,576	25,517,548

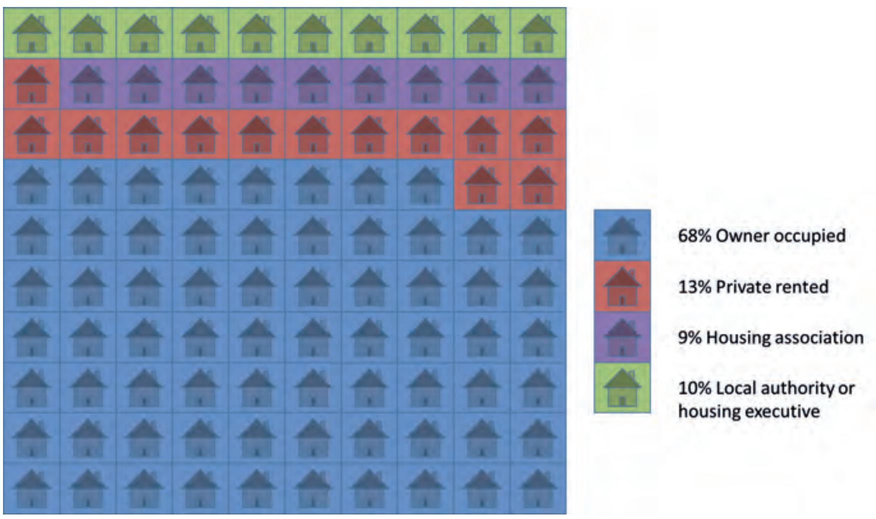
Of particular interest are the five million homes that are over 100 years old. These were typically constructed with solid brick or stone walls, which are difficult to keep warm and dry in the UK's temperate maritime climate. Originally, most would have been built without basic amenities and services but these have been provided in 99% of cases over the years. They are very often built in long terraces and owned by individual households, which presents challenges for refurbishment and replacement.

Concrete panel flats, of the type which prevail across the former Soviet Union EU Member States, are uncommon in the United Kingdom. Some of these were constructed for the social housing sector in the 1950s and 1960s but most have now been replaced, or totally refurbished.

Large panel block (c1965).
These make up less than 1% of the UK housing stock.

Over two thirds of housing in the UK is owner-occupied, Figure 14. The remainder is either privately rented or classified as social housing let at reasonable rents. Social housing splits fairly evely into that which is owned by the local authority or by a housing association.

Figure 14 Tenure profile of housing in the UK



In the UK, Wales had the greatest percentage of owner-occupied dwellings (73%) whereas Scotland had the least (63%). Scotland has the largest share of social rented dwellings (28%).

**Typical row of pre-1919 terraced houses. Note high density and lack of off-street parking.
Each of these homes will be individually owned and improved at different times to different standards.**

Inadequate housing in the United Kingdom

There is a long established, recognised relationship between poor housing and poor health in the UK. In Victorian Britain 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.

Over the years, various standards have been introduced to improve the quality of both the new and the existing housing stock in the UK, but there is no common definition of 'inadequate housing'. The current minimum standard for housing in England and Wales is a home which contains one or more Category1 hazards under the Housing Health and Safety Rating System (HHSRS). For Scotland, the Tolerable Standard (which very few homes fail) still applies, while in Northern Ireland the standard of Fitness for Habitation (replaced in England and Wales in 2006 by the HHSRS) is applied. To meet any of these standards, a home should be reasonably warm and dry, healthy and safe. In addition to these measures, the Decent Homes standard is also applied, particularly to the social rented sector, as a target to which improvements can be aimed. This includes the HHSRS but also includes the state of repair and the age of main amenities and services. Fuel Poverty, which is a measure of the cost to heat a dwelling to a reasonable level and the household's ability to meet the cost, is applied across all UK nations.

The HHSRS is the most comprehensive method of measuring housing inadequacies. 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 English Housing Survey (and the Welsh and Northern Ireland housing surveys) and so can be measured at local and national level.

The UK has been measuring housing conditions using national surveys for nearly 50 years. The first national housing survey (covering England and Wales) was undertaken in 1967 and it has been continuous in England since 2001, with an annual sample of 6,200 homes taken randomly from across the housing stock of all types and tenures. In 2008, the English House Condition Survey (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 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).

Examples of inadequate housing, UK

Inability to keep home warm (excess cold)

Rot in the floor of a c1910 semi-detached house

Cold, damp and rot in c1850 end terrace house

Dampness in a top floor bedroom of this house

Overcrowded house in multiple occupation (HMO)

Outside toilet in rural cottage

Case studies

Case Study 1

This house is a mid-terraced, owner-occupied house in the London area, constructed c1900. The home is partially modernised, is in a reasonable state of repair and has all basic amenities. It has one housing inadequacy (HHSRS Category 1 excess cold hazard). The elderly household is on a low income and is considered to be in fuel poverty.

Table 19 Upgrades applicable to this dwelling

Upgrade	SAP	Cost of upgrade £ (2009)	Fuel cost £ pa	CO2 emissions kg pa	HHSRS Band	HH in fuel poverty	Savings to NHS £ pa	Payback to NHS years
Current	22	-	965	9,000	A	Yes	-	-
Basic energy improvements	59	3,528	461	4,700	F	No	528	6.7
Basic + solid wall insulation	69	9,199	355	3,400	H	No	533	17.3

Current = Solid, un-insulated 9" (230 mm) brick walls, double glazing; small amount of roof insulation; heating by storage radiators (off-peak electricity); water heating by electric immersion.

Basic improvements = condensing gas boiler and radiators for space and water heating. Top up loft insulation.

Basic + solid wall insulation = Basic improvements plus internal insulation to front and rear elevations.

The case study shows that improving energy efficiency measures not only reduces the cost burden to the NHS, Table 19, but it also has a measurable improvement on the carbon emissions of the dwelling and reduces the running costs. However, the health cost-benefit of additional energy works (solid wall insulation) takes much longer to pay back.

Case Study 2

This is a housing association property, the previous tenant removed the balustrading and handrail from the staircase to create a more "open plan feel" to the circulation space. This has created an increased risk of a HHSRS Category 1 hazard for a vulnerable person, in this case a small child, who might use the staircase over the next year. Such a situation is considered to be a housing inadequacy in the UK (through HHSRS falls between levels). It may not be considered to be an inadequacy under the EQLS definition, unless the new tenant mentioned it when asked if the home had any rot (disrepair) to floors.

Cost of works to reinstate the balustrading and repair staircase = £314

Annual benefit to the NHS = £146

Pay-back period = £2.1 years

Conclusions for UK housing

- The United Kingdom has the oldest housing in Europe and a very slow rate of housing replacement. It has a long history of policy interventions to improve conditions in the existing housing stock. Some problems, such as the lack of basic amenities, water supply, sanitation and drainage, have nearly been eradicated but many more remain.
- The EHS and the other UK national housing surveys provide the basis for identifying and quantifying inadequacies. Such surveys are expensive, but not in relation to the value they offer for policy development, delivery, monitoring and evaluation. Other EU Member States should consider following this lead.
- The HHSRS is a useful tool for measuring the impact of housing conditions on health. Policies to reduce HHSRS hazards will reduce costs to the health services and have multiple benefits to people's life chances.
- Both the EHS and Eurofound study based estimates suggest that the greatest housing risk to people's health in the UK is from excess cold. This is a major concern and there have been a succession of policies in place to deal with this. Progress is slow, particularly in the private sector and there is a still a considerable backlog of work to undertake to reduce this to an acceptable level.
- There are significant risks from other inadequacies that are identified in the EHS but not from other data sources, such as the EQLS. These include: the risk from accidents in the home (in particular fall hazards), which is a mainly a problem for elderly and vulnerable people. UK policy support to deal with such inadequacies is currently small scale and patchy (largely relying in Disabled Facilities Grants and charitable support).
- This study suggests that the UK will have the third largest repair bill in the EU for undertaking the backlog of work to reduce the six inadequacies measured through the Eurofound study to an acceptable level (37 billion Euros). However, if all the work was to be undertaken there would be an annual benefit to society of some 21 billion Euros per annum. The latter figure compares with that of £18 billion for England from the EHS, which covers a wider range of inadequacies. These figures are broadly aligned.
- While good data and statistics already exist for the United Kingdom, this study is the first to attempt to compare housing inadequacies in the UK with other EU Member States. As such, it will be a useful tool to engage with politicians and other agencies that are looking to deliver policies to reduce housing inadequacies and inequalities across Europe.

Case studies from Lithuania

Description of housing in Lithuania

There is no regular national housing survey in Lithuania, although some statistics are available from the 2011 national census, Eurostat, and from government departments (Statistics Department of Lithuania; Certification Centre of Building Products). The national census shows that: Lithuania has a population of 3,019,444 people living in 1,389,059 dwellings (Statistics Lithuania, 2013).

Table 20 shows that Lithuanian households are of a similar size (2.5 persons per dwelling on average) compared to the UK, France and Germany, but the homes themselves are considerably smaller. This is largely because the majority of Lithuanians live in small flats rather than houses.

The characteristics of the Lithuanian housing stock are a product of their age, type of construction and location. History also plays a major part in the design and typology of Lithuanian housing (Figure 15).

Table 20 Comparative housing stock statistics for Lithuania and selected countries

	Lithuania (2009)	UK (2008)	Germany (2009)	France (2009)	USA (2009)
Population (millions)	3	62	82	64	283
Occupied Dwellings (millions)	1.3	26	37.5	26	112
Persons per dwelling	2.5	2.3	2.4	2.3	2.5
Mean floor area per dwelling	66 m2	85 m2	83 m2	85 m2	152 m2
Mean floor area per person	26 m2	37 m2	35 m2	37 m2	61 m2
Dwelling age					
Pre 1940	14%	37%	24%	30%	16%
Post 1940	86%	63%	76%	70%	84%
Dwelling type					
House	36%	81%	39%	59%	77%
Flat	64%	19%	61%	41%	23%
Tenure					
Owned	89%	68%	41%	58%	68%
Rented	11%	32%	59%	42%	32%
Main fuel for heating					
Gas (piped)	9%	82%	35%	34%	50%
Oil (+ kerosene, bottled gas)	3%	7%	35%	24%	13%
Solid (coal, wood)	23%	1%	4%	4%	2%
Electricity	12%	9%	16%	28%	35%
District	53%	1%	10%	10%	-

Figure 15 Typology of the Lithuanian housing stock

Rural/house (19%) Urban/flat (81%)

Pre 1940 (13.5%)

1940-1990 (71.5%)

Post 1990 (15.0%)

Historically, very little housing remains from before 1850. At this time most people lived in rural cottages made of wood, which have long since been replaced. During the late 19th century and early 20th century there was a boom in urban building. Many of these attractive art deco buildings have painted stucco elevations dating from this period, and are particularly found in the main cities. There was another boom in independent Lithuania between the wars in both urban and rural areas, while the post WWII period is characterised by large Soviet pre-fabricated flatted blocks for the population making up 50% of the housing stock. Since succession from the Soviet Union in 1990, speculative builders have delivered higher specification homes for aspirational professionals. Along with most of Europe, there was a property building boom which came to a sudden end in 2008, although construction is starting to pick up again, post-recession.

Prior to the post WWII 'Sovietisation', over 80% of Lithuanians lived rural lives. As a local proverb goes, 'nearly everyone is a 3rd generation from a plough'. Currently, only one third of Lithuanians live in rural areas (Error! Reference source not found. 21) and the migration to towns and cities continues. However, many urban Lithuanians still retain family homes in their villages.

Those still living rural lives tend to live in detached family houses made of wood, which are heated with local wood sourced from the forest. These rural homes tend to be larger than average and the household sizes tend to be greater. Urban Lithuanians, by contrast, usually live in apartments. Nearly half of the total population lives in pre-fabricated concrete panel blocks built during the Soviet era of 1945-1990.

Table 21 Urban versus rural housing in Lithuania

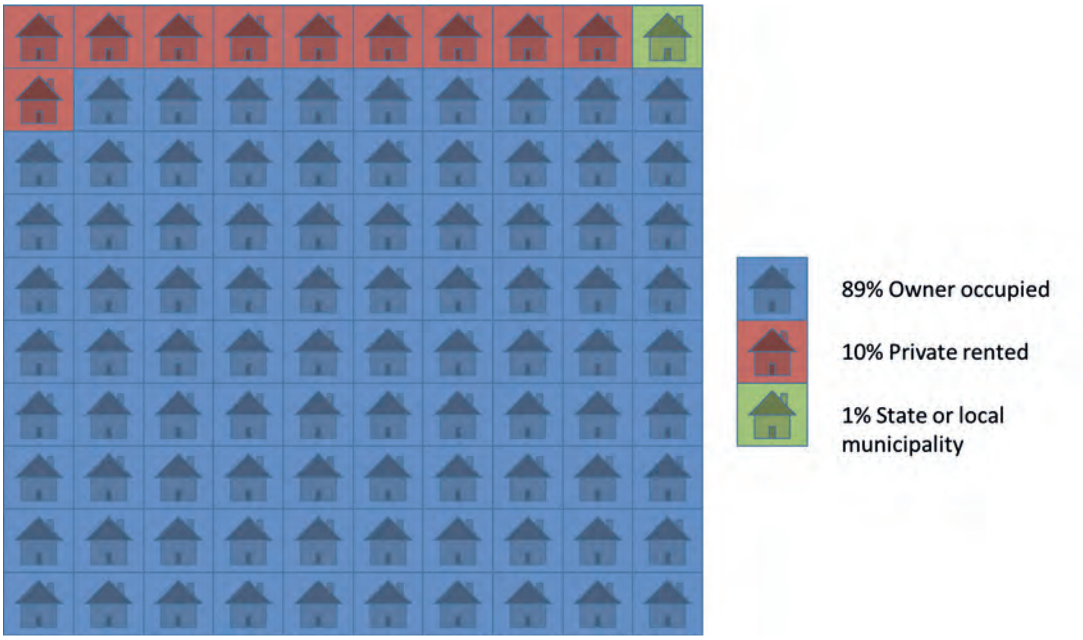
	Urban	Rural	All housing
Population	67%	33%	100%
Dwellings	81%	19%	100%
Living in houses	15%	78%	36%
Average size of dwelling (m^2)	59.9	78.7	65.6
Persons per dwelling	2.4	2.8	2.5
Average floor area per person (m^2)	25.2	28.3	26.4

Typical rural housing scene

Large urban panel blocks (c1970)

Most Lithuanian households (89%) own their own homes and move house infrequently, Figure 16. The remainder either rent privately or live with family or friends. The great majority of urban housing was owned by the state prior to 1990 but this was either given to tenants on independence or sold at very heavy discounts. Less than 1% of homes are now 'social housing' - owned by the state or municipality.

Figure 16 Tenure profile of housing in the Lithuania



Many dwellings are owned but not occupied, due to de-population and disrepair. The 2011 census shows that 15% of homes were vacant, particularly in rural areas.

Vacant dwelling in popular village, awaiting refurbishment

Construction

Older (pre 1940) houses are typically built of wood, while modern houses are built of bricks and blocks. Pre 1940 flats are typically of brick construction, often rendered with stucco. Flats built between 1960 and 1990 are typically constructed from pre-fabricated concrete slabs. Large modern blocks of flats tend to be built in monolithic (in-situ) concrete form.

Pre 1940 'stucco' city apartments

New housing

There is a surplus of housing in Lithuania (particularly in rural areas due to migration and de-population) but there is a lack of good quality, spacious housing in urban areas. Modern construction, therefore, is focussing on building good quality, energy efficient housing for the future. The free market has enabled wealthier home owners to invest in new spacious detached houses in rural and suburban areas, while new apartments have been constructed in urban areas. Some older homes have been completely refurbished or replaced, while old style, refurbished apartments in the city centres are sought after.

Replacement brick/block detached house on the plot of an old wooden home

Showpiece new mixed residential and commercial development, Vilnius

Inadequate housing in Lithuania

There is no overall definition of 'inadequate housing' applied in Lithuania. However, it is accepted that housing inadequacies exist and that these can lead to higher risks of a variety of health outcomes. These inadequacies are dealt with in different ways by different ministries and municipalities.

The different health outcomes include:

- The risk of asthma, rhinitis, bronchitis, colds from living in a damp home
- The risks of circulatory and respiratory problems from living in a cold home
- Mental stress and depression from living in a home where you fear being broken into or going outside, and from excessive noise or poor lighting
- Poisoning from combustion products, radiation, electric shock
- Infections from insanitary or missing conveniences
- Falls due to the design and condition of dwellings and their environments

Rural housing has typically evolved in an ad-hoc way but standards have been applied to new urban housing developments for many years. Indeed, when the large-scale Soviet housing schemes were constructed between the 1960s and the 1980s they were designed to provide warm, dry, safe homes with all amenities for everyone. It will have been very exciting for the first households moving in to these homes to be allocated their own apartments with new kitchens, bathrooms, piped water and district heating. The problem is that they were not built to last forever and now present huge problems in terms of maintenance, repair and suitability for the future.

Inadequacies in housing conveniences are measured through the Lithuanian National Census (Table 22). Comparison between the 2001 and 2011 Census' show that improvements have been made but Lithuania is still some way behind western European countries in the provision of conveniences. This is particularly the case in rural areas.

Table 22 Conveniences 2001 verses 2011

Conveniences	% 2001	% 2011
Hot water	65.2	74.4
Bath/shower	69.5	76.0
Flush toilet	68.6	75.9
Piped water	76.4	85.8
Sewerage	73.9	85.6

While there is no national survey of housing conditions, the Lithuanian Environment Health Division worked with WHO Europe in the 2001/02 to undertake a study of 'housing conditions and health status' in a sample of panel block dwellings in Vilnius. This was followed up in 2003 by a sample survey of 684 homes of all types in Vilnius, to collect information on the relationship between housing conditions and health, as part of the LARES project.

Data from the eight European cities that took part in LARES was combined to demonstrate how housing inadequacies impacted on the health of occupants. Significant associations were found between asthma, bronchitis, arthritis, colds, depression and living in a cold/damp home. Some 7% of inspected dwellings in Vilnius were found to contain significant dampness and associated mould growth.

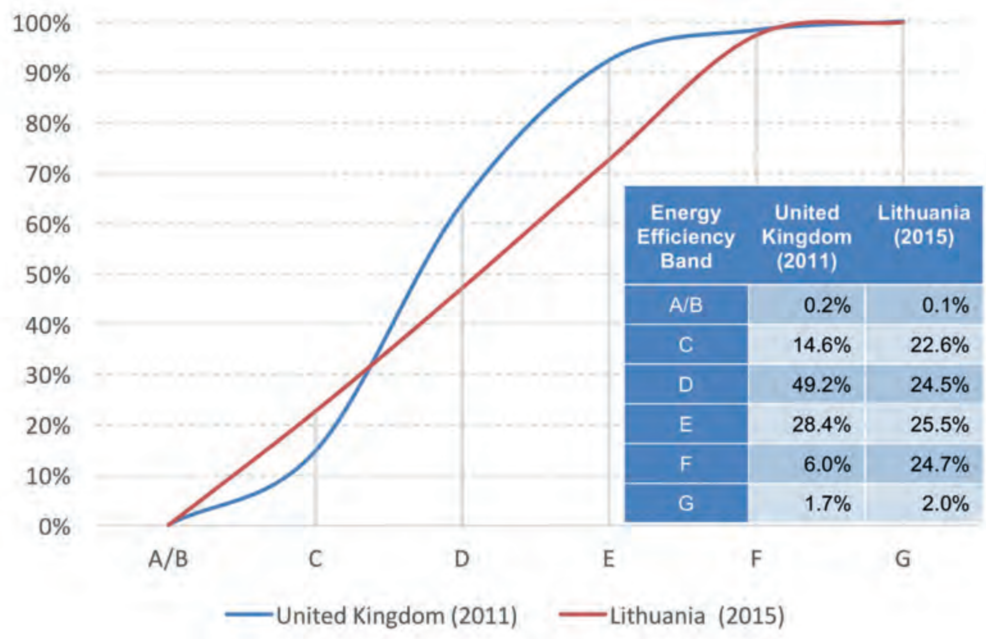
In 2010/11 a national 'sample survey on health environment assessment and housing quality' was undertaken by the National Public Health Surveillance Laboratory (NPHSL) to measure the impact of housing environments on health. Some 5,558 households were visited across Lithuania, with 3,004 taking part in a household questionnaire. This was followed up by a visit from a trained inspector in 2,365 cases, who collected measurements on: dampness, mould, CO2, dust, temperature, humidity and ventilation. The survey showed that 60% of residents were satisfied with their dwellings. Older homes were more likely to meet with dissatisfaction over the indoor environment, thermal comfort and heating, noise and dust. Indoor air was dry and humidity similar for all types of dwelling although, surprisingly, levels of mould were higher in new and renovated dwellings.

The NPHSL has designed a healthy home model based on the experience of other countries, including the English Housing Health and Safety Rating System (HHSRS). The model is designed to fit into the system of Lithuania's practice and legislation governing healthy housing; it is also harmonised with Lithuania's public healthcare procedures, construction technical regulations and other relevant instruments. The system provides information on identifying and delivering healthy housing to both residents and experts. Maps showing exposure to noise and outdoor pollutants in different municipalities are available through the NPHSL web site.

Energy efficiency

It is recognised that the health risk posed by living in a cold home forms a housing inadequacy that needs to be addressed. Domestic energy efficiency is the responsibility of individual municipalities and of the Certification Centre of Building Products. All homes that are sold on the open market are expected to carry a current Energy Performance Certificate, in line with an EU Directive. EPCs are measured on a scale of A to G, with A being the most energy efficient homes and G being the least. The Register shows high levels of homes in Lithuania which only meet F and G currently (Figure 17). This is likely to be an under count as unimproved rural homes, which are off the district heating system, will be under represented. Under the UK definition of inadequate housing homes in Bands F and G are considered to be HHSRS Category 1 hazards under excess cold, but a direct comparison with the Lithuanian scale cannot be made as they use different assessment methodologies.

Figure 17 Energy efficiency of homes in Lithuania, compared to the UK



Burning solid fuel

Error! Reference source not found.20 shows that a large proportion (23%) of Lithuanian homes still burn solid fuel. This is particularly the case in rural areas, where wood is sourced locally from the forest. In itself, this might be considered to be an inexpensive, constant and sustainable resource. However, there are health risks associated with domestic wood burning, including its inefficiency (typically only heating one or two rooms), fire risk, and hazards associated with combustion products. Collecting the wood can be hazardous, particularly for an elderly person, with the added risks of exposure to extreme cold, falling and other accidents, although it is most likely that the wood is collected by others, delivered, and stored before use.

Policies for dealing with inadequacies

Building Regulations ensure that new homes are built to a good standard, especially in terms of their energy efficiency. Outside these regulations, intervention in the quality of the existing housing stock is restricted to those areas for which municipalities have powers, notably: improving the energy efficiency of homes that are served by district heating systems, improving the supply of piped water and sewerage systems to those that do not have them, and improving the quality of the urban environments in which housing is situated (reducing pollution, noise, etc.). Apart from these interventions, what goes on in someone's house is the responsibility of the homeowner themselves and hence home maintenance, or home improvement, is left to the market.

Pre-fabricated concrete block of flats in Vilnius, originally built around 1965 and refurbished through a municipal scheme. Works include insulated over-cladding, double glazed windows and improved district heating.

Improved pre 1940 traditional housing

There is growing culture of home improvement in Lithuania but disrepair is still present throughout the older housing stock. This is partly driven by the way that apartments were 'gifted' to tenants who had no experience of home maintenance and improvement, following the breakup of the Soviet Union, and also due to a lack of resources. The relationship between investment in the home and market value uplift is a concept which will still not apply to most owner occupiers in Lithuania. This has led to a rather 'make do and mend' approach to the exterior maintenance of properties, which is not usually reflected in their clean and tidy internal appearance. This results in a large proportion of the older housing probably performing worse than when it was constructed, due to disrepair, for example leaky roofs, walls and windows.

Examples of inadequate housing, Lithuania

Inability to keep home warm (excess cold)

Rural housing is typically old, draughty and poorly insulated. Heating is often provided by wood, taken from the forest. While wood is plentiful and inexpensive, it is difficult for an elderly person to store and use safely. There will be health hazards associated with the ability to keep warm, fire, smoke and gases within the home, and the risk of falls associated with bringing in wood. With demographic changes and the migration of young people to urban areas (and abroad), there will be a growing problem of vulnerable people being left to look after themselves in the countryside.

Disrepair is found throughout the pre 1990 housing stock, in both urban and rural areas. This is a concern where there is a risk to health and safety. In this Vilnius house, the balcony is loose, rusty and liable to collapse. There is a large open crack in the wall which requires urgent attention.

Disrepair and structural instability (rot) in pre 1940 urban house

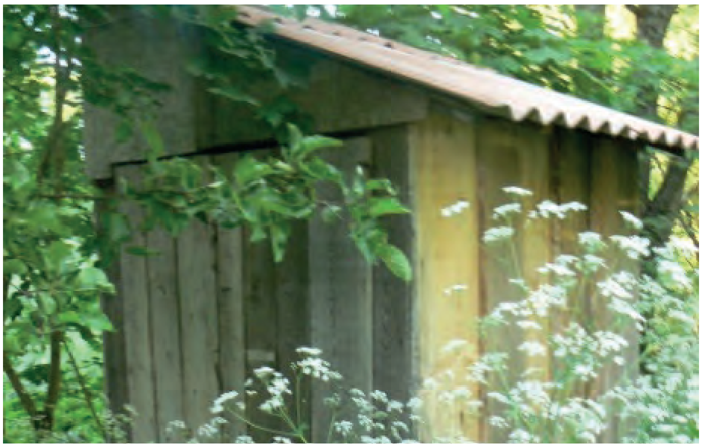
Homes are often repaired and improved in ad-hoc ways. This modernised home now has all internal amenities, including a bathroom and WC built on to the side (and Sky Television!), but has a poorly insulated corrugated iron roof and no proper drainage or sewerage system.

Cold, damp and rot in pre 1940 wooden house

This stylish and partially occupied old urban block is in very poor repair, with dampness throughout. It will cost a substantial sum of money to renovate and improve it, but this could be worthwhile because of its architectural merit and potential market value.

Dampness and rot in a C1900 multi-occupied building

It is 50m to the outside toilet from this isolated rural house. The elderly owner obviously does not make the walk very often! The only water supply is also outside - from a well.



Outside toilet for rural house

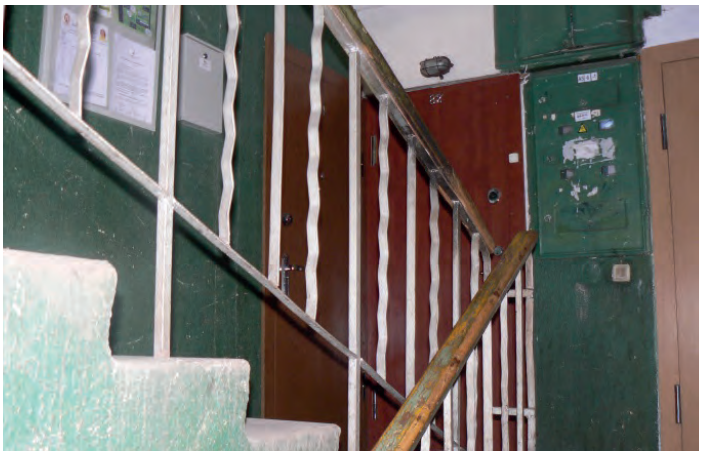
Case studies

Case Study 1

Ground floor, one-bedroom flat in 1966 Soviet style pre-fabricated concrete panel block, in a popular area of Vilnius. The occupants of the block were all tenants until 1990, when they became owner-occupiers as a legacy of Lithuania's succession from the Soviet Union. The owners are now responsible for their own repairs, some of which have been quite extensive and some of them almost non-existent. The owner of this flat now lives alone in retirement at the age of 93, having previously lived with her husband and sister in the same flat over a period of 40 years.

The flat has not been modernised internally, although UPVC double-glazed windows have been fitted in the last 10 years. The small kitchen and bathroom have the original amenities in working order. Warmth comes from an ageing district heating system. The common stairs and access ways are the responsibility of the surrounding owners and are in poor repair. The municipality maintains the grass and the children's play areas.

In terms of housing inadequacies, the elderly owner does not complain and says that her home meets her needs. Security seems to be her main concern and she double locks her doors and uses a chain at all times for fear of intrusion. The easily accessible ground floor balcony is a concern. When pressed about the cost of heating, she admitted that this was not in her control and that she could not afford her share of the utility bills (heating, gas, electricity, water). By any definition she would be in fuel poverty, except that she is unable to switch her heating off to save money.



If the individual had been part of the EQLS they most likely would have recorded inadequacies in the cost of utility bills and keeping warm. There is also some disrepair to the external walls, balcony and bathroom amenities which might have been recorded as 'rot'. An on-site inspection recorded no Category 1 HHSRS hazards, although there were risks under: cold; domestic hygiene; security; falls.

The current market value of the flat is estimated at around 50,000 Euros because of its favourable location.

Case Study 2

Wooden village house built before 1940. Owned and occupied by an elderly disabled lady of 87 on a pension of €200 per month. She has a 65 year old son who acts as her carer. Walls are timber and have no additional insulation. Windows are single glazed with ill-fitting wooden frames. There are two bedrooms but no bathroom or inside WC. The basic kitchen has no piped hot or cold water. Heating is provided from a wood fired stove, although electricity is available. Water is provided by a deep well in the garden.

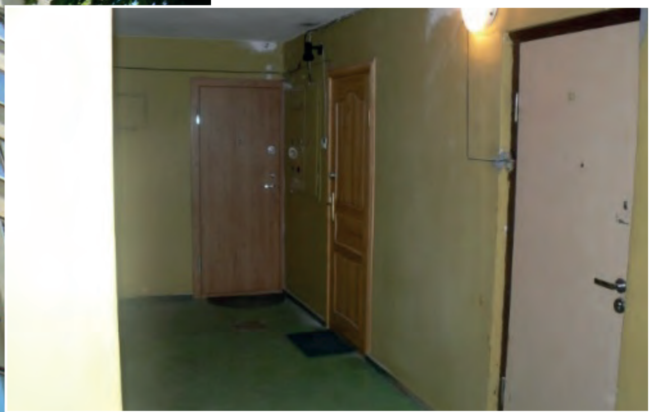
The original roof would have been made of shingles or (more energy efficient) thatch but this has been replaced with corrugated asbestos, perhaps some 40 years ago. There is storage space under the eaves, which is accessed via a dangerous looking ladder.

In terms of inadequacies, the home is in poor repair, lacks a proper heating system, inside bathroom or WC and so would be considered to be seriously inadequate.

When the UK HHSRS is applied, the home has Category 1 hazards under: cold; damp; domestic hygiene; falls; water supply and food preparation. There are also concerns over un-combusted fuel gases in the house and disturbance to the asbestos roof.

Case Study 3: Energy Improvements

The dwelling is an 8th floor flat in a 16 storey block of about 100 flats, built around 1970 in a favoured Vilnius location. Prior to improvement, flats were warm but costly to heat, which means that many households would have been in 'fuel poverty'.



The whole block is now subject to a municipal improvement scheme. The city of Vilnius is encouraging tenants to become involved in energy efficiency improvements by offering incentives to sign up to subsidised schemes. To take part, at least 50% of individual flat owners must sign up to the scheme, which is undertaken by contractors selected and project managed by the municipality. For their agreed participation, flat owners received a 40% subsidy. The schemes are popular and there is a waiting list for participation.

In this case, the works include repairs to the external fabric of the block, insulated over-cladding, double glazed windows and an energy-efficient replacement district heating system. The overall cost of the scheme is €500,000 (some €5,000 per flat), which looks like good value. The works do not include improvements to individual flats or to the access ways, which are the responsibility of individual owners.

Following improvement, some housing inadequacies will remain, including stair safety issues and problems of individual flat security.

Conclusions for Lithuania housing

- Lithuania's housing displays the typical historical housing features and problems of the former Warsaw Pact and Soviet EU Member States.
- The BRE HHSRS based methodology identifies the costs, health and economic impacts of leaving people living with housing inadequacies.
- The study shows that the greatest risk to people's health from inadequate housing in Lithuania is from excess cold. This risk is recognised and there are successful policies in place to improve energy efficiency. However, progress is slow and there is a huge backlog of work to improve the energy efficiency of the existing housing stock.
- There are also policies in place to improve water supply and sanitary provision in rural areas, and to improve air quality and noise in urban areas. However, Lithuania still lags a long way behind Western Europe in the provision of basic amenities.
- This study exposes some inadequacies which appear to be largely over looked currently in Lithuania. These include the risks from falls and other home accidents, general disrepair, home security and the hazards associated with wood burning.
- There is a real (and growing) problem of the housing of elderly and vulnerable people. Not only is the demographic profile getting older, but many younger people have left Lithuania to study and work abroad. The problem is compounded in rural areas where the young have moved to the cities, leaving their elderly relatives to live in old homes that they have neither the resources of capability to heat and maintain, in communities which have been significantly depopulated.
- In the long term, Lithuania will have to manage the legacy of small Soviet style flats, which make up half of the housing stock and do not meet the space requirements and aspirations of future society.
- The final version of this study will provide a useful tool for housing, public health and energy advisors to engage with politicians to identify where investment in the housing stock is required, how policies might be targeted, the impact of their interventions, and their likely cost-benefit to society.

Case studies from France

Description of hosing in France

Table 19 shows that French households are of a similar size (2.3 persons per dwelling on average) compared to the UK, Germany and the USA, with very similar sized homes to the other European countries.

Table 23 Comparative housing stock statistics for France and selected countries

	France (2009)	UK (2008)	Germany (2009)	USA (2009)
Population (millions)	64	62	82	283
Occupied Dwellings (millions)	26	26	37.5	112
Persons per dwelling	2.3	2.3	2.4	2.5
Mean floor area per dwelling	85 m2	85 m2	83 m2	152 m2
Mean floor area per person	37 m2	37 m2	35 m2	61 m2
Dwelling age				
Pre 1940	30%	37%	24%	16%
Post 1940	70%	63%	76%	84%
Dwelling type				
House	59%	81%	39%	77%
Flat	41%	19%	61%	23%
Tenure				
Owned	58%	68%	41%	68%
Rented	42%	32%	59%	32%
Main fuel for heating				
Gas (piped)	34%	82%	35%	50%
Oil (+ kerosene, bottled gas)	24%	7%	35%	13%
Solid (coal, wood)	4%	1%	4%	2%
Electricity	28%	9%	16%	35%
District	10%	1%	10%	-

According to the INSEE, at the end of 2013 the housing stock in Metropolitan France had 33.9 million residences of which 83% (around 28 million) were main residences. More than half of these housing units (58%) were owner-occupied, Figure 18, of which nearly 20% were first-time buyers. The Paris agglomeration had 16% of the main residences and rural areas had 44% of the secondary residences. Of the tenanted dwellings, around 17% are in the social rented sector and 22% in the private rented sector. Of the owner-occupied dwellings about 81% were houses, the others were apartments. Some examples are shown in Figure 19.

The Hague: Ministry of the Interior and Kingdom Relations (2010) Housing Statistics in the European Union 2010 report states that, in 2006, around 17% of the housing stock was built before 1919 and 74% built between 1919 and 1998.

Figure 18 Tenure profile of housing in the France

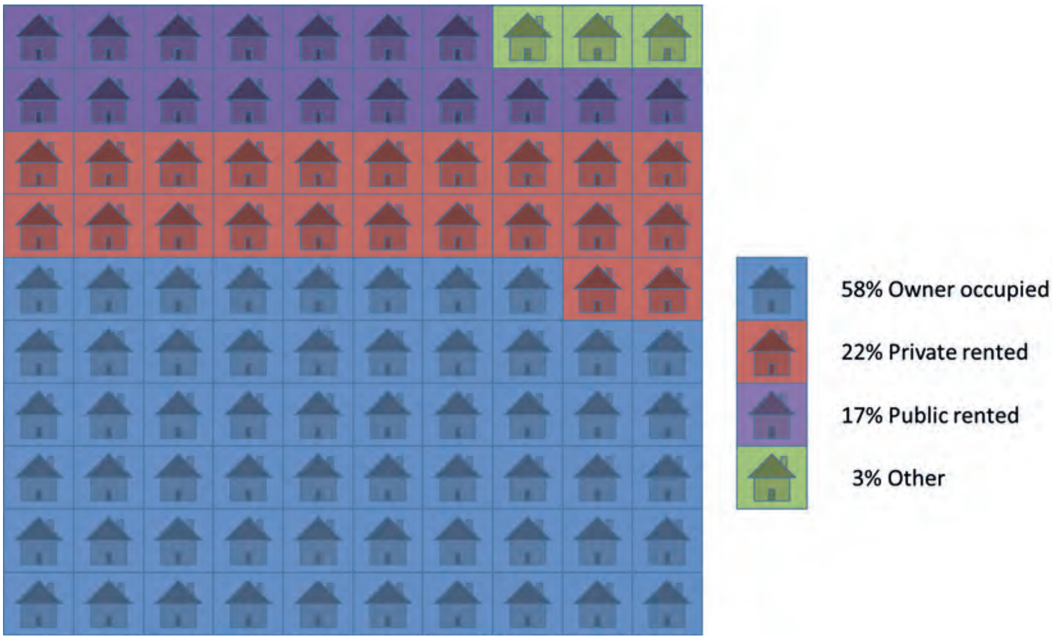


Figure 19 Examples of French housing

Inadequate housing in France

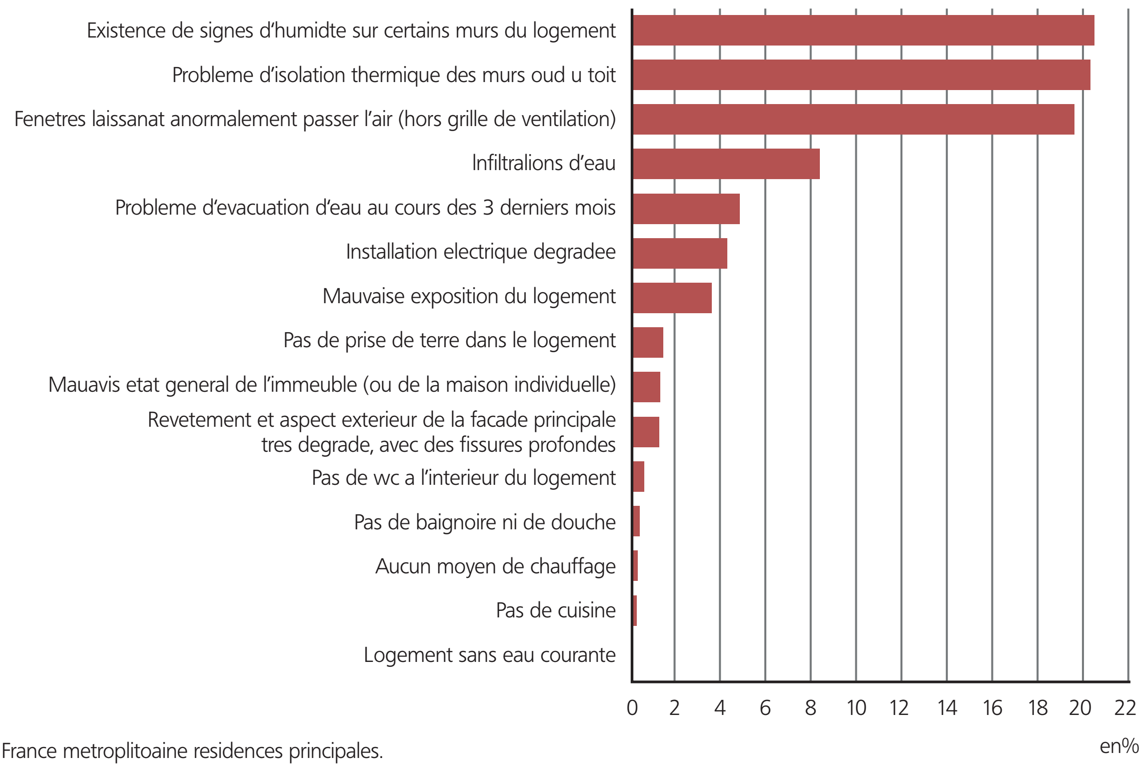
Within Europe, each of the Member States adopts its own approach to the assessment of housing conditions, and the differences in approach mean that it is difficult to compare the results of the assessments. However, there are various datasets that provide information on housing in the European Union, and while these vary, they do provide a means of comparing some aspects of housing. These include the Eurostat Statistics on Income and Living Conditions (EU-SILC). The Eurofound definition of Inadequate Housing uses the European Quality of Life Survey (EQLS), and focuses on nine housing aspects, three relating to whether the occupier can afford the 'running costs' and four dealing with the physical condition and facilities.

In 2011, INSEE reported that 2.9 million people were living in unsatisfactory housing, including crowded housing, unhealthy housing, housing without sanitary accommodation or without heating, and other forms of unsuitable or temporary dwellings. Of the 2.9 million, 800,000 were in crowded dwellings.

A 2015 report from INSEE stated that in 2013, 6% of households considered their housing conditions insufficient or very insufficient, whereas in 1973 this had been 15%. More than half of households who said they would like to change housing were planning to look for larger housing and 1.4 million households had filed or renewed an application for low-cost housing over the last twelve months, up in comparison to previous decades. There were 2.7 million households living in situations of crowded accommodation, and while this situation continued to decline in individual housing, there was a resurgence in collective accommodation. Some accommodation also had problems likely to threaten the safety or health of their occupants. The most common problems were dampness (including water penetration), poor fitting windows, and poor heat insulation in roofs or walls.

Individual dwellings in France are assessed using a checklist to determine whether action is necessary to deal with insalubrity (unhealthy conditions) – Grille de visite des immeubles susceptible d'être déclarés insalubres. The checklist covers the assessment of the condition of the dwelling itself, and, where the dwelling is an apartment, the building. It is comprehensive and includes the local environment, whether there are any potential nuisances, the state of the physical structure, and the presence of any risks to health. The surveyor is required to assess whether each aspect is good, satisfactory, bad, very bad, or, in some cases, dangerous. There is a weighting given for each individual aspect to reflect its relative importance, and a formula to provide a single figure for the dwelling (or building) on a scale of 0 to 1; 0 being good and 1 being insalubrious. Where a tenanted dwelling is identified as unhealthy there are powers to coerce the landlord to carry out remedial works, and provisions to protect the tenant. For both owner-occupiers and landlords, grants are available through Agence Nationale de l'Habitat (ANAH). Such grants are means tested, and each case is considered on its merits, taking into account local priorities. There are also some local and regional grants to complement the national ones.

Figure 20 Part des logements comportant des défauts



Champ: France metroplitoaine residences principales.
Source: Insee, enqueteL ogemen2r0 13.

Using different criteria, Fondation Abbé Pierre reported that 3.5 million people were inadequately housed at the beginning of 2010 (this includes people without their own accommodation).

In a study published in January 2015 on private housing ("Mémento de l'habitat privé") ANAH states that between 400,000 and 420,000 dwellings are insalubrious and unsafe. This is 200,000 less than they stated were insalubrious and unsafe in 2001.

The French Ministry of Health (DGS) has commissioned two on-going studies to explore potential definitions of unsatisfactory housing situations (both condition and inappropriateness) with a view to undertaking investigations into the health, social, and economic costs attributable to such housing.

Energy Efficiency

An important issue in France (and throughout Europe) is housing energy inefficiency, in particular, when an energy inefficient dwelling is occupied by a household on low income, called 'fuel poverty', energy precariousness, or energy vulnerability. However, there is no Europe wide definition of fuel poverty or standardised methodology to form a comparable measurement of energy efficiency.

All Member States are required to adopt Energy Performance Certificates (EPCs, in France the Diagnostic de performance Energétique (DPE)) for dwellings, giving details of the energy efficiency. However, while these certificates look similar, the method of calculation behind them varies. In France, the DPE calculations require details of the dwelling including the size, orientation, walls, windows, materials, etc. as well as a description of its heating, hot water, cooling and ventilation equipment. The calculation is a normative simplified annual calculation, based on the French 1988 thermal regulation together with a database describing thermal characteristics of French dwellings. It also assumes normative occupant behaviour and comfort standards. For old buildings (built before 1948) and apartments with a communal heating system, it is possible to calculate the DPE from the energy bills from the previous year instead of using modelled calculations. However, this means comparisons between older and newer dwellings can be difficult since they apply two very different methods, one theoretical and one using fuel bills.

France differentiates between primary and final energy; final energy is the energy delivered and metered at the boundary to the dwelling, while primary energy is the energy at source. While these will be the same for fossil fuels, in France, where about a third of dwellings are heated with electricity, there is a very large difference between primary and final energy. The EU Energy Performance Building Directive (EPBD) requires the primary rather than the final energy to be displayed in the DPE.

According to a 2011 study of the 150,000 DPEs that had been issued to French dwellings the average energy label is class E. While this study included only those dwellings with a DPE, a more recent 2013 survey provides data based on a representative sample of all French housing – Enquête Performance de l'Habitat, Équipements, Besoins et Usages de l'énergie. This Phébus survey was in two parts – a face to face interview with the residents focusing on their energy-use, their equipment, and energy consumption, their behaviour concerning energy, and also the DPE of the dwelling. The survey, conducted from April to October 2013, provides a 'snap-shot' of the energy performance of the main residences of in France, taking into account the characteristics of the occupants, the equipment, the energy uses, and energy consumption. It will allow the assessment of fuel poverty with analysis of incomes compared to energy costs, as well as more subjective questions on satisfaction in terms of heating and thermal comfort.

EDF R&D (Électricité de France, Research & Development) has been commissioned to work on Phébus, and is working with the Medical Studies Department of EDF (Service des Etudes Médicales) to investigate housing energy inefficiency and vulnerability. The sample of dwellings was taken randomly from the INSEE National housing survey 2011, and consisted of 8000 dwellings representative of the regions, climate zones, housing types (individual or collective), and years of construction.

As mentioned above, energy precariousness/vulnerability is not the same as energy inefficiency, but it is related. In 2015, INSEE reported that for 15% of households living in Metropolitan France, the proportion of income devoted to heating dwellings and to hot water is high, being twice the median affordability ratio. In addition, 10% of households have very high costs for their most important car journeys. Altogether, 22% of households (5.9 million) are 'energy vulnerable' for one or other of these, and 3% (700,000) are energy vulnerable for both types of expenses.

The EQLS data suggests that 9.3% of French households cannot afford to heat their dwelling, although it is not clear whether this includes heating water for domestic purposes.

The current French Project involves complex analyses and calculations, the aim being to obtain results on energy inefficiency and precariousness to compare with and support the INSEE findings and those of the EQLS. The project will also calculate the cost to society, particularly the health sector, attributable to energy inefficiency and precariousness, and the cost associated with improving the energy efficiency.

Conclusions for French housing

France has strategies and policies directed at tackling unsatisfactory housing conditions including housing energy inefficiency and vulnerability. To determine the scale of the problems, France has in place various surveys that provide data on the state and condition of the housing stock. While the policies and strategies will be on-going, the surveys do show that they have resulted in reducing the number of unsatisfactory dwellings.

As well as tackling other housing inadequacies, France has recognised energy vulnerability and energy inefficiency as an important social, health, and climatic issue. It has also recognised and is investigating the cost to society of unsatisfactory housing.

Conclusions

In England, one study (Davidson et al, 2010) has looked in detail at the health costs associated with poor housing, and the potential cost of mitigating this risk through repairs. This report considers how the English data and methodology might be applied across the 28 EU Member States by using the EQLS inadequate housing data as a starting point. It is noted that England is not necessarily representative of every Member State, both in terms of the cost to repair problems and in the cost of health issues arising from these problems. However, through the use of cost comparator indices, it is possible to provide a credible first attempt at pricing the burden of inadequate housing across Europe.

It report has considered the background literature associated with living in poor housing, the direct and indirect costs of inadequate housing, and provides an estimate of the financial burden associated with such housing. The most important cost is the medical cost but there are many other secondary costs involved. The report focuses on medical costs and establishes a starting point until more accurate data becomes available from Member States.

The following conclusions can be drawn for this study.

- Research and legislation makes the argument that there is a direct relationship between the housing that people live in and their health and socio-economic opportunities. This is recognised by organisations such as the WHO, Eurofound, the Member States of the EU, their municipalities and housing providers.
- Attempts have been made to define, measure and quantify the costs to society of leaving people living with housing inadequacies. These have been limited by the availability of good quality, comparable data at national and international level.
- The most useful information (in terms of the fact that the problems can be costed and rectified) is around the design and condition of existing housing. The lack of affordable housing is considered as an inadequacy but not quantified in this study.
- It has been possible to develop a model which estimates the cost and effects of the most significant housing inadequacies across all EU Member States on a comparable basis by applying detailed information from the EHS (and other data sources) to more generic data from the EQLS.
- The total cost of making existing housing reasonably healthy and safe (in relation to the six Eurofound inadequacies covered) is estimated to be some €295 billion at 2011 prices.
- If all the remedial work was undertaken now, the cost benefit to EU society would be some €194 billion per annum.
- By far the greatest economic and social benefits from remedial action on Eurofound's six costed housing inadequacies will be from heating and insulation improvements. Such improvements are known to prevent long term respiratory and circulatory illnesses and reduce winter deaths. By contrast, the provision of missing amenities, while welcome and necessary, does not have such an impact on actual long-term health problems and their consequences.
- The costs and impacts of undertaking remedial work are likely to be an undercount, because of the limited number of inadequacies that can be assessed through the model. Some of the 23 un-measured home health and safety hazards (HHSRS), while uncommon overall, will be over-represented in some parts of Europe and these should not be overlooked.

References

Agence Nationale de l'Habitat (ANAH) (2015) Mémento de l'habitat privé 2014.

AJPH (2003) Special Issue – Built Environment and Health; American Journal of Public Health, Vol 93 No.9.

Ambrose P. et al (1996) The Real Cost of Poor Homes. Royal Institute of Chartered Surveyors, London.

APHA (1938) Basic Principles of Healthful Housing. American Public Health Association.

APHA/CDC (1986) Housing and Health: Recommended Minimum Housing Standards. American Public Health Association and US Center for Diseases Control.

APHA/NCHH (2014) The National Healthy Housing Standard. American Public Health Association and National Centre for Health Housing.

Attanasio O, and Emmerson C (2001) Differential mortality in the UK. Working Papers (W01/16) The Institute for Fiscal Studies, London;

Audit Commission (2009) Building better lives: Getting the best from strategic housing. Audit Commission, London.

Berry M (2002). Affordable Housing. A Project for the Brotherhood of St Laurence in partnership with the Committee for Economic Development. Australian Housing and Urban Research Institute, Melbourne.

Burridge R & Ormandy D (1993) Unhealthy Housing: Research Remedies and Reform; E & FN Spon, London.

Conseil Supérieur d'Hygiène Publique de France (2003) Grille de visite des immeubles susceptible d'être déclarés insalubres

Davidson M, Roys M, Nicol S, Ormandy D, and Ambrose P (2010) The Real Cost of Poor Housing. IHS BRE Press, Bracknell.

Davidson M, Nicol S, Roys M and Beaumont A (2011) The Cost of Poor Housing in Wales. IHS BRE Press, Bracknell.

Davidson M, Nicol S, Roys M, Garrett H, Beaumont A and Turner C (2012) The Cost of Poor Housing in Northern Ireland. IHS BRE Press, Bracknell.

DCLG (2008) Review of Health and Safety Risk Drivers, BD2518. Department for Communities and Local Government, London.

Eurofound (2016), Inadequate housing in Europe: Costs and consequences, Publications Office of the European Union, Luxembourg.

Friedman, D (2010) Social impact of poor housing, ECOTEC.

Fujiwara D (2013) The Social Impact of Housing Providers. Housing Associations' Charitable Trust (HACT)

Garrett H, Davidson M, Nicol S, Roys M and Summers C (2014a) The Cost of Poor Housing in London. IHS BRE Press, Bracknell.

Garrett H, Davidson M, Roys M, Nicol S and Mason V (2014b) Quantifying the Health Benefits of the Decent Homes Programme. IHS BRE Press, Bracknell.

HMSO (1954) Housing Repairs and Rents Act 1954, s9. Her Majesty's Stationery Office, London, UK.

HMSO (2004) Part 1 of the 2004 Act, and Housing Health and Safety Rating System (England) Regulations 2005, and Housing Health and Safety Rating System: Operating Guidance.

Howden-Chapman P and Carroll P (2004) Housing and Health: Research, Policy and Innovation; Steele Roberts, New Zealand.

Howden-Chapman P, Matheson A, Crane J, et al. (2007) Effect of insulating existing houses on health inequality: cluster randomised study in the community. BMJ 2007; pp 334-460

Ineichen B (1993) Homes and Health: how housing and health interact; E & FN Spon, London. BMA (2003) Housing and Health: building for the future; British Medical Association, London.

Jacobs DE, Clickner RP, Zhou JY, et al. The prevalence of lead-based paint hazards in U.S. housing. Environmental Health Perspectives. 2002;110 (10):A599-A606.

Lawson R (1997). Bills of Health. Radcliffe Medical Press, Oxford.

Marmot M, Davey Smith G, Stansfield S, Patel C, and North J (1991) Health Inequalities among British Civil Servants: The Whitehall 11 Study;

Meerding WJ, Mulder S, and van Beeck EF (2006) Incidence and costs of injuries in The Netherlands. European Journal of Public Health, Vol 16, No.3, 271-277.

Ministry of Health (1919) Manual of Unfit Housing and Unhealthy Areas. MoH, London.

National Center for Healthy Housing seven principles of healthy homes, available at http://www.nchh.org/WhatWeDo/HealthyHomesPrinciples.aspx

National Housing Federation (1997). Housing for Health. National Housing Federation, London.

Nicol S, Roys M, and Garrett H (2015) The cost of poor housing to the NHS. IHS BRE Press, Bracknell.

ODPM (2006) The Housing Health and Safety Rating System: Operating Guidance. Available at http://www.communities.gov.uk/publications/housing/hhsrsoperatingguidance

Ormandy D (ed) (2009) Housing and Health in Europe: the WHO LARES project. Routledge, London;

Pittini et al (2015) The state of housing in the EU 2015. A housing Europe review.

Ranson R (1991) Healthy Housing: A Practical Guide; E & FN Spon, London.

Raw, G. J., Cayless, S. M., Riley, J., Cox, S. J. and Cheyne, A. (2000), A risk assessment procedure for health and safety in buildings, BRE Report 402, BRE Press, Watford, UK.

RenvH (2004) Special Issue – Housing, Health and Well-being; Reviews on Environmental Health, Vol 19 Nos. 3-4.

Ridge T (2009) Living with Poverty: A review of the literature on children's and families experiences of poverty. Research Report No. 594, Department for Work and Pensions, London.

Roys M, Nicol S and Garrett H (2016) The Full Cost of Poor Housing. IHS BRE Press, Bracknell.

Sandel M, et al (1999) There's No Place Like Home: How America's Housing Crisis Threatens our Children, Housing America, San Francisco;

Statistics Lithuania (2013) Report on the 2011Population and Housing Census of the Republic of Lithuania

The Hague: Ministry of the Interior and Kingdom Relations (2010) Housing Statistics in the European Union 2010 http://www.bmwfw.gv.at/Wirtschaftspolitik/Wohnungspolitik/Documents/housing_statistics_in_the_european_union_2010.pdf

Thompson H et al (2002) Housing Improvement and Health Gain: A Summary and Systematic Review. MRC Social and Public Health Sciences Unit, Occasional Paper 5. For examples of robust studies, see Howden-Chapman P, et al (2008). Effects of improved home heating on asthma in community dwelling children: Randomised controlled trial. BMJ, 337, 852-855

University of Warwick (1986, 1987, 1991, 2003, and 2006) the series of Unhealthy Housing conferences

WHO (1948) Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.

WHO (1968) The physiological basis of health standards for dwellings. Geneva: World Health Organization

WHO (2002 and 2004) World Health Organization's symposiums on Housing and Health

Zaloshnja E, Miller TR, Lawrence BA, Romano E (2005). The Cost of Unintentional Home Injuries. American Journal of Preventative Medicine 2005: 28(1).

Appendix A - Data sources to inform the development of models to estimate inadequate housing costs

Without a large, expensive, bespoke survey that covers every EU Member State at the same point in time, there will be no single, comparable data source that can provide the data required to estimate the cost of inadequate housing in Europe. It is therefore necessary to build a model from existing data sources gathered for other purposes, but which contain as many of the ingredients as possible. After reviewing the literature and various commonly referenced data sources, the data sources described in Table A1 were found to be most useful as the building blocks in developing assumptions and elements of a model for our purposes.

Table A1: Data sources to inform development of model to estimate costs of inadequate housing

Data source	Coverage	Data collected	Advantages	Disadvantages
EQLS	EU28 at the same point in time (2011).	12 potential inadequacies.	Total EU coverage at one point in time using the same methodology.	Self-assessment by individual adults, not households or dwellings. Small range of inadequacies addressed. No dwelling age, type or cost data.
EPISCOPE	18 EU Member States (+ Norway) provide data in a similar format.	Dwelling age and type, heating systems, energy efficiency, fuel costs.	Good typology and energy efficiency data. Presented at dwelling level.	Limited EU coverage. No standard template, data are often incomparable between countries.
EU-SILC	28 EU Member States.	Household data, including some questions on living conditions.	Comprehensive set of statistics with large sample. Some housing inadequacy questions.	Few questions directly related to housing inadequacies. Methods of data collection and survey questions are not harmonised, therefore comparability between countries and over time can be compromised.
EHS/SHCS/ LiW/ NIHCS	Sample survey of 13,000 homes in England each year plus 5,000 in Scotland. Smaller occasional samples in Wales and Northern Ireland.	Comprehensive data on dwellings, households, energy efficiency, costs and the 29 HHSRS hazards weighted to national dwelling totals.	Comprehensive data, which can be linked to other data sources, such as NHS, ROSPA.	Only covers UK.
Eurostat	28 EU Member States.	Pulls together latest census and other statistics from across the EU.	Comprehensive data on populations and households. Some data on access to amenities.	Limited data on housing inadequacies.
LARES	8,519 surveys in 3,373 dwellings across 8 European cities in 2003–2004.	Housing and health data from inspectors and interviewees.	Good data on individual cities on the impact of housing inadequacies on health.	Limited coverage that cannot be extrapolated to whole country due to lack of rural surveys. Small sample sizes at city level and combined dataset not representative of EU
EDF/ Phébus	Housing and energy survey of France.	Detailed data on domestic energy usage and efficiency across France.	French energy models can be calibrated against UK models and vice versa to extrapolate findings and validate results.	Only applicable to France.
Building construction price indices (PPP)	Each EU Member State.	Index of comparative construction prices based on a standard starting position of 100.	Can give prices at EU average and at Member State level.	Costs are a reflection of incomes so, for example, just because housing improvement costs are lower in Romania doesn't mean that people will be more able to afford them.
Local census data	Each individual EU Member State.	Varies, but provides more detail than the harmonised data provided to EUROSTAT.	Can be used to refine international models and provide more accurate local figures on the presence and distribution of inadequate housing.	Will not provide accurate comparisons at international level.

Notes: EQLS= European Quality of Life Survey
EU-SILC = European Union Statistics on Income and Living Conditions
EHS = English Housing Survey; LiW = Living in Wales; NIHCS = Northern Ireland House Condition Survey; SHCS = Scottish House Condition Survey.
LARES = Large Analysis and Review of European housing and health Status

Appendix B - Housing factors and health problems linked to each of the 29 HHSRS hazards

A housing health and safety rating system is one of the key foundations for assessing the (in)adequacy of housing and then calculating the costs that society bears due to some of the hazards leading to injuries or illnesses. Table A2 lists a range of health problems in relation to particular housing inadequacies covered by the UK's Housing Health and Safety Rating System (HHSRS).

Table A2: Hazards and their associated health problems

Hazard	Key housing factors contributing to the hazard	Main health problems linked to the hazard
Physiological requirements		
Dampness and mould growth	Heating and thermal insulation Ventilation Damp-proofing Disrepair allowing water penetration Exposed water tanks and pipework Condition and design of water-using amenities Small room sizes/overcrowding	Respiratory disease Allergic symptoms (such as asthma, rhinitis) Infections (mainly fungal) Nausea and diarrhoea Depression and anxiety
Excess cold	Energy efficiency (heating, thermal insulation and fuel) Dampness Ventilation	Cardiovascular conditions Respiratory diseases Rheumatoid arthritis Impaired thermoregulation (hypothermia)
Excess heat	Thermal insulation Heating controls Area and orientation of glazing	Cardiovascular conditions Genitourinary disease
Asbestos and manufactured mineral fibres (MMF)	Presence of asbestos – accessible position or unsealed Presence of MMF – accessible position or unsealed Disrepair to asbestos-based material	Respiratory problems, pleural disease, lung cancer, mesothelioma Dermatitis
Biocides	Use/misuse of chemicals to treat timber and mould growth	Varies depending on the chemical used
Carbon monoxide and fuel combustion products	Disrepair to flueless appliances (including cookers) Inadequate ventilation or flues Disrepair to flues or ventilation	Headaches and dizziness, leading to unconsciousness and death Damage to nervous system – short-term memory loss Respiratory problems Aggravation of asthma
Lead	Lead water pipes Lead paint	IQ deficiency Lead poisoning
Radon	Design and repair of floors	Lung cancer Other cancers (leukaemia, skin, gastrointestinal)
Uncombusted fuel gas	Condition, design and siting of gas supplies and appliances	Asphyxiation
Volatile organic compounds (VOCs)	VOC-emitting materials or treatments used Inadequate ventilation	VOC-emitting materials or treatments used Inadequate ventilation
Psychological requirements		
Crowding and space	Level of occupancy Size of kitchen in relation to occupancy and use Sharing of amenities	Psychological distress Reduced concentration Reduced tolerance Poor hygiene Increased risk of accidents Spread of contagious disease

Entry by intruders	Defensible space External lighting Natural surveillance Locks to windows and doors Condition of windows and doors Concierge or entry phone for flats	Emotional stress (from fear of crime or as a result of burglary) Injuries from aggravated burglary
Lighting	Size, shape and position of windows Obstruction of windows Adequate artificial lighting and controls	Depression and psychological conditions Eye strain
Noise	Situation of dwelling Sound insulation Repair of windows and external doors Noisy/badly sited equipment or facilities	Psychological stress Sleep disorders Anxiety and irritability Cardiovascular conditions
Protection against infection		
Domestic hygiene, pests and refuse	Repair/design allowing ingress of pests Refuse space (internal and external) Refuse chutes (flats)	Gastrointestinal disease Asthma and allergic rhinitis Emotional distress Depression and anxiety
Food safety	Ratio of facilities to occupants Adequate supplies of hot and cold water Disrepair to facilities Drainage Sharing of facilities	Food poisoning (mild to fatal)
Personal hygiene, sanitation and drainage	Ratio of facilities to occupants Adequate supplies of hot and cold water Disrepair to facilities Drainage Sharing of facilities	Gastrointestinal illness (mild to fatal) Anxiety and depression
Water supply for domestic purposes	Quality of water supply Water tanks protected against contamination	Gastrointestinal illness (mild to fatal) Legionnaires disease
Protection against accidents		
Falls associated with baths	Design and condition of baths/showers Size and layout of bath/shower rooms Poor lighting/glare	Physical injury (cuts, swellings, fractures) Deterioration in general health for elderly
Falls on the level (falls on level surfaces)	Trip hazards, steps or steep slopes Uneven surfaces Disrepair to surfaces Inadequate drainage of surface water Poor lighting/glare	Physical injury (cuts, swellings, fractures) Deterioration in general health for elderly
Falls associated with stairs or steps	Design and state of repair of stairs/steps Provision and condition of handrails and guardrails Poor lighting/glare Size/design of landings Projections to stairs or foot of flight	Physical injury (cuts, swellings, fractures, death) Deterioration in general health for elderly
Falls between levels	Design and state of repair of windows Design and state of repair of balconies Height above ground Hardness/projections on ground	Physical injury (cuts, swellings, fractures, death) Deterioration in general health for elderly
Electrical hazards	Age/disrepair of electrical installation Number and location of socket outlets	Electric shock (mild to fatal)

Fire	Location of heater/cooker Adequacy and repair of heating State of repair of electrical installation Number and location of socket outlets Fire protection to escape routes Detectors/alarms Fire-fighting equipment	Inhalation of smoke/fumes (mild to fatal) Burns (mild to fatal)
Hot surfaces and materials	Unprotected hot surfaces or flames Temperature of hot water to taps Poor layout or inadequate space to kitchen	Burns and scalds Psychological distress
Collision and entrapment	Design, location and disrepair of doors Design, location and disrepair of windows Unprotected gaps in banisters Low headroom, beams or ceilings	Physical injury (cuts, piercing, trapping, bruising, crushing)
Explosions	Design and repair of gas supply and appliances Design and repair of hot water systems Inadequate or defective liquefied petroleum gas (LPG) storage	Physical injury (crushing, bruising, fractures, death)
Ergonomics	Space and layout of kitchen amenities Space and layout of washing and toilet amenities Design/repair of taps, windows and doors	Physical injury (strains, sprains, bruises, fractures)
Structural collapse and falling elements	Structural movement or cracks Disrepair to external fabric (especially chimneys and cladding) Disrepair to internal fabric (especially ceilings and stairs)	Physical injury (minor to fatal)

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BRE
Bucknalls Lane
Watford
United Kingdom
WD25 9XX

T +44 (0)333 321 8811
E enquiries@bre.co.uk
www.bre.co.uk