

Table 1. Spreads of harms according to their severity, adapted for France

Severity of Outcome	Representative Outcome	Spread of Harms (pre-2000 English values)	Spread of Harms (updated* French estimated values)
Class I Extreme	Myocardial infarction leading to death within 12 months	34%	3%
Class II Severe	Myocardial infarction not leading to death within 12 months*	6%	17%
Class III Serious	Respiratory condition	18%	30%
Class IV Moderate	Occasional mild pneumonia	42%	50%

* The prognosis of myocardial infarction has improved and mortality has fallen sharply over the last 20 years [24]. About 10% of victims continue to die within an hour and the mortality rate after a year is still 15%. Thanks to therapeutic progress, the speed of intervention of the emergency services and the increased availability of 7-day, 24-hour operational interventional cardiology units, mortality within 30 days has fallen by 68% over the last 20 years.

Table 2. Comparison of English and French indicators of energy performance

	Energy-performance indicators	
	English	French
Energy stage	Final	Primary
Presentation	Inverted relative value: 1 to 100 (very inefficient to efficient)	Absolute value: < 50 kWhPE/m ² → > 450 kWhPE/m ²
Uses	5 uses: heating, DHW*, air-conditioning, lighting, CMV**	3 uses: heating, DHW*, air-conditioning
Weather	National	Local

* DHW: Domestic Hot Water

** CMV: Controlled Mechanical Ventilation

Table 3. Estimated likelihood of an adverse health effect associated with energy inefficiency taking account of household income

For all energy inefficient dwellings (IPEL \leq 38)		Likelihood 1 in 18
Situation	Description	Likelihood
1	Energy inefficient housing occupied by households with an income below the poverty threshold	1 in 4
2	Energy inefficient dwellings occupied by households with an income in deciles 1, 2 or 3, but above the poverty threshold	1 in 20
3	Energy inefficient dwellings occupied by households with an income in deciles 4 to 10	1 in 320

Table 4. Estimated direct medical costs in France associated with the risk of exposure to low indoor temperatures

Category of severity	Health impact (representative)	Average cost per pathology (€)	Spread according to severity (%)	Cost to the health system (€)
I (extreme)	Acute coronary syndrome resulting in death [°]	9,863*	3	296
II (severe)	Acute coronary syndrome not resulting in death	13,850*	17	2,354
III (serious)	Severe infection of the respiratory system (hospitalisation)	2,138**	30	641
IV (moderate)	Pneumonia treated outside hospital	53***	50	26
'Theoretical' average cost of an impact				3,318

[°]during or after hospitalisation.

* Estimated cost based on PMSI (Information System Medicalisation Programme) data for the years 2007 to 2011, comparing the cost of management over the previous year of the acute coronary syndrome to the cost in the year following hospitalisation for patients who survived: €5,876 (including cases where the patient died during their stay); cost for the year following discharge from hospital: €7,974. For patients who died within a year, the hypothesis of a management cost for the following year divided by 2 (i.e. €3,987). Cost for category I of €5,876 + €3,987; for category II: €5,876 + €7,974. Analysis conducted from a societal viewpoint limited to direct medical costs [30].

** Analysis of the 2013 PMSI taking into account 2 'GHM' (homogenous groups of diseases) – 'pneumonia and pleurisy, level of severity 1' (GHM 04M051) and 'bronchitis and asthma, level of severity 1' (GHM 04M031); weighting of 50% for each GHM and evaluation with 2013 ENCC (National Hospital Seminar).

*** Estimated on the basis of 2 visits to a GP and a prescription for antibiotics (estimation of 'occasional mild pneumonia' considered in the English model for patients < 65 without comorbidity).

Table 5 – Variations tested in the sensitivity analyses related to the overall estimation of annual medical costs

Parameters included in the sensitivity testing	Variations assessed
IPEL (threshold chosen to identify thermally inefficient housing)	32 to 43
Proportion of households below the poverty threshold among low-income occupants of thermally inefficient housing	40% to 52%
Estimation of direct medical costs for the four categories of severity	-20 % to +20 % (for all costs)
Breakdown of categories III and IV of the spreads of harms	20% to 60% for category III (complement of 80% for category IV)
Estimated likelihoods of the occurrence of a harmful health impact related to the energy inefficiency of housing	-15% to +15%

Table 6 – Comparison of thermal renovation costs with annual medical costs

Estimated costs	1	2	3
	All inefficient homes (IPEL \leq 38) n=3,467,835	Inefficient homes occupied by low-income households (deciles 1, 2, 3) n=1,284,267	Inefficient homes occupied by households below the poverty threshold n=608,069
Renovation costs (investment in the 1 st year)	€47 billion	€15 billion	€6.5 billion
Before renovation			
Annual medical costs	€639 million	€617 million	€504 million
After renovation			
Annual medical costs after renovation	€5 million	€1.9 million	€0.9 million
Annual costs avoided for the health system	€634 million	€615 million	€503 million

Table 7. Lifetime of energy renovation measures

Energy renovation measures (7 actions)		Durability (years)
Action 1	Identical replacement of the heating system	15
Action 2	Wall insulation	30
Action 3	Roof insulation	30
Action 4	Windows changed (double glazing)	30
Action 5	Floor insulation	30
Action 6	CMV (controlled mechanical ventilation) hygro-B	15
Action 7	Replacement of the heating system with a heat pump	15

Table 8. Estimated costs and health benefits of energy renovation in France

Number of inefficient dwellings according to household income	Thermal renovation costs in million €/year	Medical costs in million €/year		For every €1 invested in upgrading, the amount saved for the health sector
		before energy upgrade	after energy upgrade	
608,069 inefficient homes occupied by households below the poverty threshold	305	504	1	€1.65
1,284,267 inefficient homes occupied by low-income households	713	617	2	€0.90
3,467,835 inefficient homes in total	2,000	639	5	€0.30