Energy and Buildings 131 (2016) 87–98

Contents lists available at ScienceDirect

Energy and Buildings

journal homepage: www.elsevier.com/locate/enbuild

Fuel poverty in Greece: Quantitative analysis and implications for policy

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ARTICLE INFO

Article history:
Received 4 April 2016
Received in revised form
12 September 2016
Accepted 13 September 2016
Available online 13 September 2016

Keywords:
Fuel poverty
Health impact
Objective measures
Subjective measures
Economic recession

ABSTRACT

This paper aims at implementing appropriate methodological approaches for a preliminary assessment of fuel poverty in Greece and analyzing in quantitative terms the potential impact of fuel poverty on public health. As regards the assessment of fuel poverty in Greece, both subjective and objective approaches have been implemented, utilizing primary data from existing surveys undertaken by National Statistical Authority, while the health impacts attributed to fuel poverty were quantified through statistical analysis. The implementation of objective approaches showed that around 20–25% of Greek households were in fuel poverty in 2013, while with subjective measures this percentage reaches to 29.5%, twice as in 2010. Furthermore, the regression models developed showed that the increased levels of fuel poverty observed after 2010 have had significant negative impacts on public health. Specifically, 1–2.7% of deaths recorded annually in Greece as well as the 2.7–7.4% of cardiovascular diseases and the 3.1–8.5% of respiratory infections treated by the Greek hospitals are attributed to fuel poverty. Taking into consideration that more than 60% of Greek households do not have adequate insulation, the development of ambitious energy saving programs for residential buildings could build synergies between climate change mitigation and fuel poverty alleviation.

1. Introduction

Fuel or energy poverty relates to insufficient access in energy sources and/or inadequate coverage of energy needs [2,37]. In developing countries, it is considered as one of the biggest social problems; globally over 1.3 billion people are without access to electricity and 2.6 billion people are without clean cooking facilities [23]. On the other hand, developed economies do not suffer from a widespread lack of access to energy sources, but there are concerns about the affordability of energy services [17]. For these cases, [18] mentioned that "*a household is in fuel/energy poverty when it is unable to afford an adequate amount of energy services to satisfy its basic domestic needs – particularly sufficient thermal comfort – or is forced to spend a disproportionate share of its income on them*". In one of the first attempts to define the problem, Boardman [3] characterized as fuel poor, households whose fuel expenditures on all energy services exceed 10% of their income. Despite the lack of analytical data regarding the number of people in fuel poverty, it is estimated that between 50 and 125 million Europeans are currently fuel poor [1]. The European Council Directive 2009/72/EC acknowledges that fuel poverty is a growing problem in the Community that should be addressed.

The Intergovernmental Panel on Climate Change (IPCC) urges the need to reduce consumption of fossil fuels in order to tackle climate change [24]; however, this should be achieved by ensuring adequate energy services for all population segments both in poor and more affluent countries. Obviously, reducing energy consumption through domestic energy deprivation is an unsustainable solution towards tackling climate change. Instead, it is crucial to develop and implement short- and long-term policies integrating both social goals, enhanced energy comfort and effective combat of climate change.

Nowadays, it is widely acknowledged that in developed countries, fuel poverty originates from a combination of three factors: low household income, low energy performance of buildings and high energy prices [7,43,9,39]. Of particular interest is the evolution of these parameters in Greece and how they were affected by the financial crisis of the recent years. As shown in Fig. 1, the disposable income and pensions increased continuously during the period 1995–2010 with higher rates than those observed for the consumer price index (CPI). These trends reversed in 2011 and onwards due to the economic crisis and the implemented austerity policies. As

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http://dx.doi.org/10.1016/j.enbuild.2016.09.025
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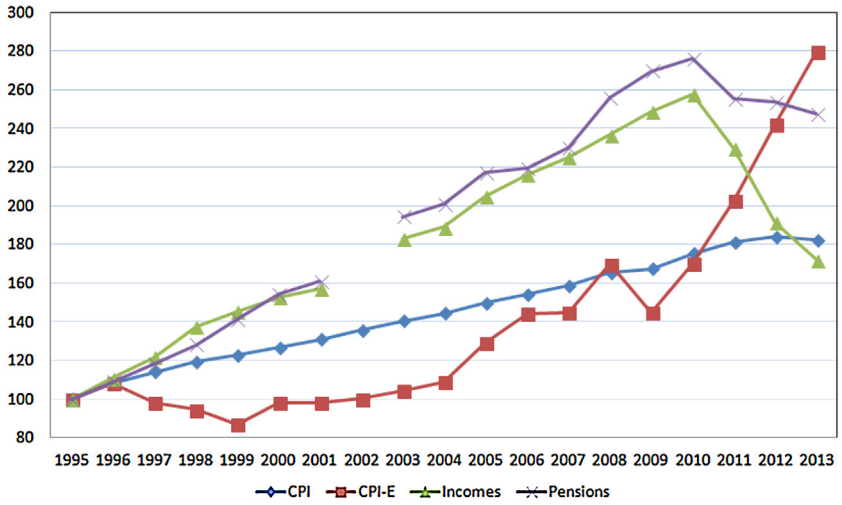

Fig. 1. Evolution of the general Consumer Price Index (CPI), the Consumer Price Index for fuel and power (CPI-E), the average annual total disposable income and average annual pension in Greece for the period 1995–2013 (for all indices 1995 = 100).
Source: Hellenic Statistical Authority.

Nomenclature

CPI	Consumer price index
CPI-E	Consumer price index for fuel and power
EU-SILC	Survey of income and living condition undertaken in all member states of european union
t	Time in months
MP	Secondary meteorological parameters
HDD	Heating degree days
CDD	Cooling degree days
UWRM	Index showing the percentage of households with inability to keep home adequately warm. It is usually estimated on an annual basis
$UWRM_A$	A monthly transformation of the index UWRM taking the annual values of UWRM for the basic months of the winter period (December–March), with all other months taking the value 0
$UWRM_B$	A monthly transformation of the index UWRM taking the annual values of UWRM for all the months of the winter period (October–May) with the months of the summer period taking the value 0
S	Dummy variable. It takes the value 1 in order to indicate months of the year with special events (e.g., holidays), and 0 otherwise
HBS	Household budget survey, which is undertaken in all member states of european union
BIC	The normalized bayesian information criterion used for the evaluation of the time series models developed
AR	Autoregressive
MA	Moving average
φ	The coefficients of the autoregressive structures included in time series models developed
θ	The coefficients of the moving average structures included in time series models developed

regards the energy prices, after a long period (1995–2009) with generally mild upward trends (similar to CPI), the additional taxes imposed on fuels and electricity after 2010 resulted in a sharp increase of consumer price index for fuel and power (CPI-E). Furthermore, in Greece, the existing building stock presents relatively

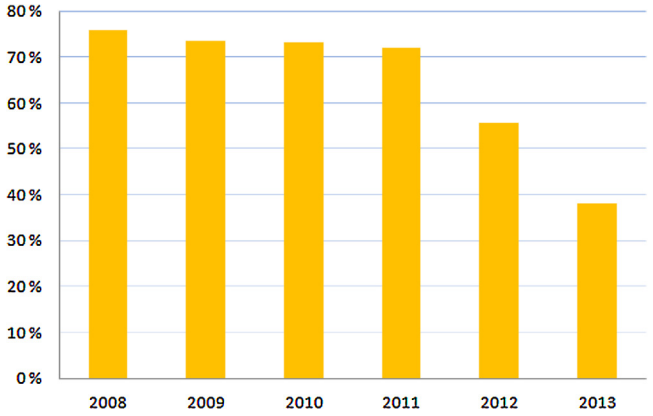

Fig. 2. Evolution of the percentage of households in Greece that use central space heating systems.
Source: Hellenic Statistical Authority, Household Budget Survey for years 2008–2013.

low energy performance, since more than 60% of residential buildings with a total floor area of around 210 million m^2, have been constructed before 1980, when the first thermal insulation regulation was enacted [25]. As clearly depicted in Fig. 2, the number of households in Greece that use central systems for space heating was reduced by 50% in 2013 compared to the levels recorded in 2011 or earlier, with an increasing number of households utilizing other cheaper and usually less efficient heating systems, which cover only part of the whole household. These trends imply that parameters influencing fuel poverty have been considerably deteriorated in Greece during the last four years. However, the development of effective policies to address the problem requires a systematic procedure in order to calculate the percentage of households in fuel poverty and the broader triggered impacts.

The present paper has three aims: (i) to implement appropriate methodological approaches for providing a preliminary assessment of fuel poverty in Greece based on already available data from National Statistical Authority and not on specialized field surveys; (ii) to estimate in quantitative terms the potential impacts of fuel poverty on public health in order to improve decision-making as regards the evaluation of programs and policies aiming to fuel poverty alleviation; and (iii) to provide useful insights into the extent to which the economic recession in Greece has affected fuel