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Original research article

# Privation of energy services in Mexican households: An alternative measure of energy poverty

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### ABSTRACT

Energy poverty, understood as deprivation of energy services linked to satisfy human basic needs, is a strengthened research topic which is gaining relevance in Social Sciences. We point out that energy poverty affects millions of families in Mexico, so there is a need for overcoming this social justice problem. Hence, this paper presents a methodological framework to characterize families according to their levels of deprivation of energy services and, furthermore, identify the determining factors of these different levels of deprivation. Our results indicate that five groups of homes exist: one which does not lack any energy service; two which lack only one energy service; and two which lack the majority of energy services. Those variables which most precisely explain the probability that a home be found in each of these groups are per-capita income, size of settlement (urban or rural), and type of climate. We conclude our findings have public policy implications in that, upon characterizing households based on their level of deprivation of energy services, sound strategies may be designed and implemented to attend to the specific needs of each household group.

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## 1. Introduction

In September 2010, at the High Level Summit of the Millennium Development Goals, United Nations Secretary General Ban Ki-moon proclaimed a “Universal Energy Access”, ending his speech with the following statement [63]:

“Ladies and gentlemen, the barriers to energy access do not lie in the domain of technology. Yes, we need better technology. Yes, we need more money for research and development. Yes, we must do better at transferring technologies to developing countries so they can bypass business as usual and go straight to low-carbon growth. But, by and large, we already have the means to meet the needs of the poor. The real barriers stem from a lack of broad-based political will and commitment.”

The fact that the United Nations has recognized the role of access to clean energy in overcoming poverty and improving people's quality of life arises from a grave scenario of social injustice. Currently, approximately 3000 million people worldwide use biomass (firewood or coal) as fuel to cook their food and 1600 million do not have electricity in their homes [64].

A global scenario of this nature leads to serious social impacts, mainly in poor people's health. Exposure to smoke from burning firewood or coal to cook and heat homes poses a health risk; each year over four million people worldwide die from air pollution inside their homes from burning firewood or coal [70]. Particularly, women of reproductive age and youth are affected, above all in poor or developing nations, in which the rate of respiratory illnesses as well as stillbirths and low birth weight is increasing. Electricity is indispensable for covering several basic services, such as water treatment, purification and heating, as well as lighting and heating and cooling homes. These services satisfy basic human needs and prevent illnesses. For example, inadequate temperature in homes increases the probability of illnesses and deaths due to hypo- and hyperthermia. McMichael et al. [42] document the number of deaths linked to heat waves in different cities worldwide; over 30,000 Europeans died due to extreme high temperatures in August 2003.<sup>1</sup> The World Health Organization considers illnesses caused by heat waves to be a *public health problem* to be attended seriously, as an increase in such illnesses is predicted due to the effects of global warming [69].

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<sup>1</sup> In addition, these authors document that due to extreme heat, approximately 2000 people died in Athens in the summer of 1987; 221 people in the United States in 1994; in 1995, 514 people in Chicago and 619 in the United Kingdom; and 2600 people in India in 1998.

In the face of this global scenario, the key point in Ban Ki-moon's speech is that, aside from the need for better technology and more money for research and development, the real obstacle to achieving it is the lack of political will and commitment, which translates into a lack of social justice. Political actors' role to improve social justice is addressed by Amartya Sen in *The idea of justice*. He explains the difference between calamity and injustice. Calamity is injustice, according to Sen, when it could have been avoided, "and particularly if those who could have avoided it have failed" [59,p. 36]. Amartya Sen's idea of justice has deep theoretical and ethical implications in different fields of Social Sciences, and that is a topic out of our scope of work. However, we deem pertinent to take as a starting point Sen's perspective on the role of the State to mitigate the undesirable effects of market mechanisms derived from the capitalist model, specifically poverty problems and extreme social inequality such as starvation and indigence.

On this regard, Sen takes some distance from the contractualist vision inherent of John Rawls transcendental institutionalism and proposes a "comparative approach based on realizations" [59,p. 39]. Sen says that instead of looking for answers to the nature of perfect justice or characterizing perfectly equitable societies, it is necessary to focus on injustice and act to overcome it. The effect produced by this change of direction makes us focus on actual realizations of the societies we are studying, and not on ideally equitable rules and institutions.

Based on these arguments, we think it is necessary to approach the study of energy poverty in Mexico with a comparative focus based on realizations, because energy poverty implies the privation of a series of energy services that satisfy human needs which at the end is a problem of social justice. As Walker and Day [67,p. 73] point out, energy poverty is a problem of distributive injustice, so is essential the recognition of different rights and needs of vulnerable groups, especially in Mexico where many people are unable to satisfy needs linked to energy services. On this regard, we argue that more important than measuring energy poverty based on a synthetic indicator, we require actions and public policies oriented toward reducing energy poverty, and for this, it is necessary to characterize the energy-poor within a coherent theoretical and methodological framework. This is, in fact, the objective of our paper. Said in other words, we believe that more than analyzing the nature of perfect justice, we must focus on tackling this social problem and act as required to eradicate it. Research on energy poverty related to Mexico in particular is almost inexistent, so this paper tries to fill this important research gap.

Before explaining our methodological proposal, we briefly review the literature on energy poverty and present our research problem.

## 2. Precedents of the problem

### 2.1. Literature review

Energy poverty, or fuel poverty,<sup>2</sup> is defined as "the inability to attain a socially and materially necessitated level of domestic energy services" [13,p. 31]. Due to an increase in illnesses and deaths caused by the inability to pay for fuel to heat homes, the

<sup>2</sup> There is at present a semantic discussion about the relationship between energy and poverty. In the United Kingdom and Ireland, where the main studies about this topic have been developed, the term fuel poverty has traditionally been used, but with the spread of this research line across Europe, mainly France, Germany, Italy, Poland and Eastern Europe, the energy poverty term has been used more (see Refs. [26,11,12]). Taking into account that this subject has just been recently introduced in the Latin-American context to describe the relationship between energy and poverty, and not fuel and poverty, the energy poverty term will be used understanding that there is no formal conceptual differentiation between both terms.

research problem of energy poverty became relevant in practically all of Europe. This social problem has been covered by a series of public policies, including the "2001 UK Fuel Poverty Strategy" with the objective of eradicating energy poverty in the UK by 2016; the "National Action Plan for Social Inclusion" in Ireland; and the "Groupe de travail Précarité énergétique Rapport" in France [61,p. 564].

The most well-known approach to studying energy poverty is the *income approach* developed by Brenda Boardman, who considers that "a household is found in energy poverty when it cannot have adequate energy services with 10% of its income" [9,p. 27]. This 10% threshold is related to a series of economic and demographic variables. Upon applying this approach in the United Kingdom, approximately 19% of families were considered to live in energy poverty in 2008.

Many authors have questioned the scientific rationale of establishing an income threshold based on families' ability to pay for services, which are dependent on energy consumption [71,34,35,33] (Clinch and Healy, 2001). Aside from a series of methodological problems related to the amount of income considered and the lack of information necessary to carry out related calculations, the income approach does not take into account that people can spend more than 10% of their incomes in energy services because they want to, in other words, it is not a forced shortage, thereby it cannot be conceptualized as energy poverty.

With this in mind, Healy [33] developed the consensual approach to energy poverty as an adaptation of the relative deprivation approach to the study of poverty, whose principal proponents are Peter Townsend and David Gordon. Townsend (2010: pp. 85–86) points out that poverty is a relative concept that "can only be defined in relation to the material and emotional resources available at a particular time to the members either of a particular society or different societies". Walker et al. [68] argue that the relative poverty approach resists the search for universal moral resolutions of the human needs. The key point of this approach is that people not only satisfy their physical needs but also perform social roles. According to this perspective, we point out that the satisfaction of human needs related to energy consumption is determined by people's opinion with respect to the social and institutional structure at a given moment in time. Thus, people suffer from relative deprivation when they do not satisfy the needs which are considered basic (or essential) according to the customs and culture of a society.

In this manner, the consensual approach to energy poverty proposes an index which ponders various quantitative and qualitative indicators. The quantitative indicators measure infrastructure at home related to thermal comfort, while the qualitative indicators estimate people's relative feeling of satisfaction or deprivation with respect to their energy situation (Table 1). This methodology was first applied in Ireland and has taken hold in the rest of Europe in recent years (see for example Refs. [56,32,62,61,11,12]). Thomson and Snell [61,p. 568] applied this methodology in the European Union and presented their results for 2007, showing that Denmark was the nation with the least energy poverty (less than 3% of families) while those with the greatest energy poverty were Portugal (≈20%), Chipre (≈22%), Romania (≈24%) and Bulgaria (≈31%).

García [28,29] points out that it is difficult to apply both income and consensual approaches to estimate energy poverty in Mexico and the rest of Latin America, due to several conceptual and methodological problems as follows:

First, in the case of the income approach, García warns that it is not applicable in the majority of nations given the lack of precise information regarding characteristics of energy consuming equipment. However, the main problem is that it does not consider –according to the theory of the adaptive comfort model [10,8,6,18]–that people's perception of what is a comfortable

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