Household Characteristics and Energy Use in Ghana

Introduction

Household energy use has increasingly featured in development discussions at both international and national levels. Biomass fuels, mainly wood fuels (firewood and charcoal and to a lesser extent crop residues) are the most important primary energy sources across the developing world, including Ghana (Ghana Statistical Service, 2008). Households that rely on biomass fuels are exposed to health problems, and in most developing countries women and child are most affected (IEA, 2013; WHO, 2006; Smith, et al, 2004).

Increases in non-biomass household fuel usage is something that has been attributed to improvement in household wealth, education, occupation and urbanization (Hosier & Dowd, 1987; Ouedraogo, 2006; Alem et al, 2013; Rao & Reddy 2005). However, most of these rely on cross-sectional data and extrapolate the findings of a regression analysis.

Yet, similar sizeable regression coefficients, particularly for education have, over time, not yielded the expected benefits that they portended. For instance, cross-sectional women's education coefficients have frequently promised dramatic contraceptive and child health transitions that time has not produced, leading to education attaining a "silver bullet", a status in the reproductive and health literature (Dodoo et al. 2014). The corollary then is that one needs to lean on longitudinal data to get a better appreciation of the extent to which the education, occupation, income, and urbanicity, among others, can be credited for increases in households using non-biomass.

The current study uses data from 2000 and 2010 censuses and applies regression and decomposition analysis, to ascertain the factors implicated in the increase in non-biomass use in Ghana during that period. Given the afore referenced literature, we particularly focus on the question of whether education, income, urbanization and occupation and other household characteristics explain the dramatic increase in proportion of households using non-biomass fuels for cooking from 9.6% (2000) to 20.4% (2010).

Source of Data and Methods

Source of Data

Ten percent sample of both the 2000 and 2010 Population and Housing Census conducted by the Ghana Statistical Service with sample sizes 352854 and 472538 respectively was analyzed. The main purpose of the Population and Housing Census was to collect and provide detailed information on the nature and characteristics of the population of Ghana. Both censuses collected data on houses, facilities and amenities in houses at the national and regional levels. Information on the household head including age, education, occupation and sex was also gathered. Wealth index of the household was calculated using factor analysis.

The main sources of cooking fuels for households included wood, charcoal, crop residue, saw dust, and animal waste known as biomass fuels and gas, electricity, kerosene known as non-biomass fuels.

Methods of Analysis

Descriptive statistics were used to summarize household characteristics and the types of fuel used by households. At 5% confidence level, the Pearson Chi-square test was conducted to indicate the nature of the relationship between each independent and dependent variables. In order to attribute the proportion of change in the use of non-biomass fuels to the factors being studied, the processes of standardization and decomposition were employed.

Results

Our preliminary analysis yields some very intriguing results, presented below:

1. The effect of household wealth; the energy ladder model posits that the use of non-biomass fuels such as LPG and electricity increases with wealth. Thus, as household income increases, households are more likely to move away from biomass fuels towards clean fuels (Hosier & Dowd, 1987; Giampietro et al., (2012). Observations from Table 1 indicate that household use of non-biomass fuels increased in 2010 from figures observed in 2000 as household wealth increased. This likely due to the fact that households' wealth

or the proportion of households now in the middle and rich wealth groups have increased thus can afford these fuel sources. About one-quarter of the increase in clean fuels usage was explained by changes in wealth. (see Table 2). This is an indication that household wealth is a major determinant non-biomass fuel usage.

2. The effect of education: education is seen to be significantly related to energy use in both the 2000 and 2010 censuses. Generally, education is believed to increase people's knowledge and awareness concerning health issues related to energy and time efficiency related to the use of modern fuels (Heltberg, 2005; Mekonnen & Köhlin, 2008). However, in 2010, as heads of households' education increased households used less non-biomass fuels. It was expected that educational attainment of the household head will translate positively into the use of non-biomass fuel. On the contrary, education reduced non-biomass usage by about 97.8 percent. (see Table 2).

Table 1. Percentage Distribution of Household Characteristics by Non-Biomass Fuels**.**

Factors	**2000(%)**	**2010(%)**	**Factors**	**2000(%)**	**2010(%)**
Poor	13.5	11.7	Professional	29.2	17.4
Middle	7.4	27.4	Clerical/services	16.3	17.9
Rich	5.2	18.8	Skilled Agric	2.2	26.3
No Education	2.9	21.5	Skilled Work	10.5	18.1
Primary	5.7	21.5	Other Occupation	7.2	16.6
Secondary	13.6	19.6	No Occupation	10.5	19.8
Higher	30.9	15.9	Urban	17.3	32.7
			Rural	3.0	5.6

Source: Generated from the 2000 and 2010 Censuses

3. The effect of occupation of head of household; Rao & Reddy, (2005) noted that if the source of income is from a wage/salary then the probability of using LPG is higher. Inversely, about a third of heads of households with professional occupation used non-biomass fuels for cooking in 2000 compared to 17.4 percent of household heads in 2010. Like education, occupation of the household head had similar effect with occupation of household head specifically household heads' with professional occupations reducing the

rate of non-biomass use by 16 percent. In all, about 4.27 % of the reduction in clean fuel use within the period could be explained by the occupation of head of household.

4. The effect of urbanicity; the use of non-biomass fuel is characterized by urban dwelling. This is mainly due to the availability and access to these kinds of fuel. In contrast, rural households will use more biomass fuel since it is easily available and in most cases cheap (Lee, 2013). According to the 2010 census report, for the first time in Ghana's history, more than half of the population reside in urban centres and this is likely to have translated into the increased number of households in urban areas who use non-biomass fuels in that period. Decomposition analysis showed that about 61.4% of the increase in households using clean fuel usage could be explained by urbanicity.

Table 2. Decompostion of Household Non-Biomass Usage.

Factor	Effect on Non-Biomass Used (%)
Wealth Index of Household	23.1
Education of Household Head	-97.8
Occupation of Household Head	-4.27
Type of Place of Residence	61.4
Region of Residence	121.7
Sex of household head	-9.5
Age of household head	10.1
Size of Household	-1.88

Source: Generated from the 2000 and 2010 Censuses

Conclusion

These preliminary findings show that income, urban dwelling and region of residence positively influence the proportion of households using non-biomass fuels. However, education and occupation showed otherwise, results which are different from those presented by other research. Further analysis will try to look at other household characteristics that are likely to affect household energy use and the interactions that exist between these variables in order to inform policy makers on what interventions to put in place to promote the use of health cooking fuels in Ghana.