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URBAN POVERTY AND HOUSEHOLD ADOPTION OF CLEAN COOKSTOVES IN GHANA

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Abstract

The rising levels of urban poverty due to rapid urbanisation have increased health risks associated with the use of traditional cookstoves in overcrowded households. However, the potential differences in the adoption of clean cookstoves between urban poor and non-poor households in Ghana remain poorly understood, as current studies focus mainly on the rural-urban divide despite the high vulnerabilities of the urban poor. This paper examines the factors influencing household use of clean cookstoves for cooking, with a focus on the urban poor. The study used data from the 2022 Ghana Demographic and Health Surveys (DHS). Descriptive analysis and binary logistic regression were employed to investigate the determinants of clean cookstoves. The results indicate that urban poverty, the age of the household head, and educational levels are significantly associated with the use of clean cookstoves. Urban poor households are significantly less likely than their urban non-poor counterparts to use clean cookstoves. The findings provide insights that can inform pro-poor inclusive energy policy interventions aimed at accelerating progress toward multiple SDGs—particularly SDG 3 (Good Health and Well-being), SDG 7 (Affordable and Clean Energy), and SDG 11 (Sustainable Cities).

Keyword: Clean cookstoves, urban poverty, urban poor, households, Ghana.

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Introduction

Globally, exposure to household air pollution from traditional cookstoves and open fires fuelled by traditional cooking fuels is a major public health issue. About one-third of the world's population cooks using open fires or inefficient stoves powered by biomass (Pratiti et al., 2020; World Health Organisation, 2024). Estimates from the World Health Organisation (WHO) in 2024 indicate that household air pollution caused 3.2 million deaths in 2020, including over 237,000 deaths of children under age 5 (World Health Organisation, 2024). The problem is especially severe in sub-Saharan African countries, such as Ghana, where women and children—who are mainly responsible for household cooking and collecting firewood—bear the highest health risks from using polluting fuels and technologies in their homes (Odo et al., 2021). Additionally, household smoke exposure from cooking is associated with a wide range of health issues, such as acute respiratory infections, maternal and neonatal mortality, stunting, wasting, cardiovascular disease, low birth weight, and burns (Odame & Adjei-Mantey, 2024; Odo et al., 2021; Pratiti et al., 2020; Clean Cooking Alliance, 2021).

To address these public health concerns, various development agencies and the Government of Ghana have launched projects to promote cleaner-burning, efficient cookstoves and cleaner fuels as strategies to tackle energy poverty (Africa Energy Portal, 2024; Bawakyillenuo, 2021; World Health Organisation, 2018; Relief International, 2019). Clean cookstoves and technologies refer to modern cookstoves designed to be less harmful to human health and the environment than traditional cookstoves, both by using cleaner, less polluting fuels and by changing conventional designs to address specific issues (Valenti, 2021). Obviously, some clean cookstoves (CCSs) still rely on polluting fuels, but their higher efficiency means they consume less fuel compared to traditional stoves. Consequently, adoption of clean cookstoves has the potential to improve cooking energy efficiency, reduce carbon emission levels, and enhance fuel savings, thereby contributing to the attainment of Sustainable Development Goals (SDGs), especially SDG targets 3.9.1 (reduce the number of deaths and illnesses attributed to household and ambient air pollution) and SDG 7.1.2 (proportion of population with primary reliance on clean fuels and technology).

The Government of Ghana's interventions to promote improved cookstoves gained prominence in the 1990s, when the Ministry of Energy initiated the distribution of the Ahibenso charcoal pot programme in 1989 (WHO, 2018). This simple cookstove is easy to construct from scrap metal using basic tools, such as hammers. It uses relatively less fuel for cooking, reduces cooking time, and minimises accidental burns. To mitigate the adverse effects of traditional three-stone and inefficient charcoal cookstoves, Relief International collaborated with vulnerable communities in Ghana to develop, produce, and market a fuel-efficient charcoal cookstove called the Gyapa (Relief International, 2019; UNFCCC, n.d). Other interventions to promote clean cookstoves include green energy financing in the form of grants, soft loans, and donor support strategies, and public education on the benefits of improved cookstoves in Ghana. Recently, the government has introduced a cylinder recirculation programme to distribute LPG to households. This programme requires licensed distributors to procure, brand, maintain, and fill empty cylinders and distribute them to households through retail outlets (WHO,2018).

Previous studies on household air pollution have mainly focused on the factors influencing the choice of household cooking fuel (Mensah & Adu, 2015; Odo et al., 2021). Empirical evidence from most sub-

Saharan African countries highlights several socio-economic factors, such as income, education, household size and age, time spent at home, and ownership, age, and type of dwellings, that affect both cooking fuel and cookstove choices (Mensah & Adu, 2015; Karimu et al., 2016; Odo et al., 2021; Odame & Amoah, 2024). The choice of cookstoves and technologies has not been thoroughly investigated (Prah et al., 2021; Adams, 2023). Meanwhile, the environmental impact, efficiency of household cooking fuel, and safety of household members depend not only on the cooking fuel itself but also on the nature of the cookstoves and technologies (WHO, 2018). Consequently, the type of cookstove determines how completely fuels are burnt, how much smoke is emitted, and how much fuel is needed, directly influencing health outcomes, fuel consumption patterns, and environmental degradation. A focus on clean cookstove adoption is therefore essential for a comprehensive understanding of household energy transitions. This will inform the design of interventions that promote cleaner, safer, and more sustainable cooking practices, particularly among urban poor communities, where energy poverty persists.

One key contributing factor to current environmental challenges, especially in SSA countries, is rapid urbanisation and the resulting increase in the percentage of the population living in urban poverty (MacTavish, 2023). Traditionally, studies on poverty in sub-Saharan Africa (SSA) often focus on rural areas, with less attention paid to urban poverty (Damba et al., 2019; Prah et al., 2021; Hassan et al., 2024). However, the poor urbanise faster than the general population, resulting in a greater proportion of households lacking secure land tenure, housing ownership, and tenancy; improved sanitation; better drinking water; and poor access to clean energy for cooking (Janz et al., 2023; Poku-Boansi et al., 2020). This situation makes the urban poor not only vulnerable to climate change-related risks but also contributors to environmental degradation.
Further, the continued reliance on traditional cookstoves in urban poor households worsens the burden of household air pollution and respiratory diseases, which disproportionately affect the health of women and children (Odo et al., 2021; Odame & Adjei-Mantey, 2024). Rural-urban variations in the choice of household cooking technologies have received considerable attention in the study of household air pollution in Ghana (Odame & Amoah, 2024; Karimu & Adu, 2016). Such studies, however, have failed to highlight the hidden consequences for the urban poor, who primarily reside in overcrowded housing located in informal settlements and rapidly growing urban areas, where the risks of indoor air pollution and fuel scarcity are more pronounced. A study focusing on urban poverty is therefore necessary to reveal intra-urban inequalities in household choices of cooking technologies, which will inform targeted interventions aimed at addressing the needs of the growing urban vulnerable population. This study aims to examine the patterns of clean cookstove adoption by households and identify the socio-economic and demographic determinants in Ghana, with a specific focus on the differences between the urban non-poor and urban poor households. The study further makes a major contribution to research on household air pollution (HAP) by highlighting gaps in existing studies, which most often prioritise rural-urban disparities over the realities of the urban poor. This paper aims to provide a deeper understanding of the emerging issues surrounding household energy transitions in the context of urban poverty in Ghana, where the adoption of clean cookstoves remains limited despite ongoing policy interventions.

This study is theoretically informed by the energy ladder hypothesis, which suggests that as household wealth improves, energy consumption shifts from traditional biomass toward modern, cleaner fuels (Ali et al., 2024; Adams, 2023; Karakara & Osabuohien, 2020). The study is further underpinned by the Theory of Change (Valenti et al., 2021), which posits that households' adoption of clean cookstoves has the potential to provide several positive socio-economic and environmental outcomes. This adoption could contribute to SDG 1 (No Poverty) by reducing household expenditures on inefficient fuels and freeing up time for income-generating activities, and to SDG 7 (Affordable and Clean Energy) by promoting access to modern, safe, and sustainable energy solutions. To this end, the adoption of clean cookstoves and cooking technology would most likely be influenced by household characteristics, which may vary depending on the interaction of demographic and socio-economic contexts within households. (Agbokey et al., 2019; Owusu-Amankwah et al., 2023; Adams et al., 2023) *2.2*

2.3

Materials and Methods

Source of data

The study used the household recode dataset of the 2022 Ghana Demographic and Health Survey (GDHS). The GDHS is conducted by the Ghana Statistical Service (GSS) with support from the Demographic and Health Surveys Program and other partners. The data was collected from 17 October 2022 to 14 January 2023 (Ghana Statistical Service (GSS) & ICF 2024). The GDHS is a cross-sectional, nationally representative, population-based survey[1] that collected diverse demographic and health data from a nationally representative sample of household heads, women, and men. The 2022 GDHS used a stratified, representative sample of 18,450 households, selected from 618 clusters. This was designed to yield a representative sample at the national level, for urban and rural areas, and for each of the country's 16 regions, for most of the DHS indicators. The unit of analysis was defined to include a household that is exposed to HAP from the use of all types of cookstoves for cooking in an urban area.

Measurement of the Dependent Variable

The dependent variable used for this study is the household's adoption of clean cookstoves and technologies. During the DHS interviews, heads of households were asked the question, "In your household, what type of cookstove is mainly used for cooking?" Different kinds of cookstoves were given in response. Based on WHO guidelines, electric stoves, solar cookers, LPG/natural gas stoves, piped natural gas stoves, and biogas stoves were classified as "clean cookstoves" and coded as "1". In contrast, all others (manufactured solid fuel stoves, traditional solid fuel stoves, and three-stone stoves/open fires) were categorised as unclean cookstoves and coded as "0".

Measurement of the main Independent Variables

The main independent variable of interest in this study is urban poverty, based on household characteristics, which measures whether urban areas are classified as urban poor or urban non-poor. The operationalisation of this variable is based on the UN-HABITAT definition of a slum household as a guide for identifying urban poor households, from which the urban poverty cluster variable is constructed. The measurement of this outcome variable followed protocols similar to those in an earlier study by Asaaf et al. (2022) for the computation of urban poverty. Using the GDHS data, an urban poor household is therefore identified as a household in an urban area that lacks two or more of the following:

a. A household made of durable materials for the floor, wall, and roof Durable wall

[1] Detailed information on the survey is available at http://dhsprogram.com.

materials include cement stone with lime, cement, bricks, cement blocks, covered adobe, wood planks/shingles, and other finished surfaces. For flooring, durable options include: parquet or polished wood, vinyl or asphalt strips, ceramic/marble/porcelain tiles, terrazzo, cement, woollen or synthetic carpets, linoleum, or rubber mats. Similarly, durable roofing materials consist of zinc, aluminium, wood, ceramic tiles, cement, roofing shingles, asbestos, or slate roofing sheets.

b. Not more than three persons per sleeping room

c. Access to improved water
   Improved water sources include piped water, boreholes or tubewells, protected dug wells, protected springs, rainwater, and packaged or delivered water.

d. Access to improved sanitation
   According to the WHO standards, an improved sanitation facility is one that hygienically separates human excreta from human contact. Improved sanitation facilities include: - Flush or pour-flush toilets connected to a piped sewer system, septic tank, or pit latrine, - Ventilated improved pit latrines, - Pit latrines with slabs, and - Composting toilets.

Thus, the urban poverty variable was constructed based on household characteristics with two categories: urban poor and urban non-poor. The STATA code that was used to construct the urban poverty variable can be found on the DHS Program GitHub website in the Analysis Code repository.[2]

Based on previous studies (Adams et al., 2023; Owusu-Amankwah et al., 2023), the study used a range of household socio-demographic variables as potential covariates. The variables include the sex of the household head, the age of the household head, the highest educational level of the household head, and the marital status of the household head.

Statistical Analysis

With the aid of Stata software version 19 (Stata Corp: College Station, TX, USA), frequency and percentage were used to describe the characteristics of households, while the chi-square test was used to explore the association between each independent variable and the outcome variable. Given the binary nature of the dependent variable — household use of clean cookstove (Yes = 1, No = 0) — a binary logistic regression (logit model) is used to estimate the probability that a household uses clean cookstoves. The logit model estimates the relationship between a binary dependent variable and a set of independent variables by modelling the log odds of the probability of the outcome. The model is specified as:

$$\text{logit}(P) = \log(P / (1 - P)) = \beta_0 + \beta_1X_1 + \beta_2X_2 + \ldots + \beta_kX_k$$

Where:

- P is the probability that the household uses a clean cookstove or otherwise.

- β_0 is the intercept.

- $\beta_1, \beta_2, \ldots, \beta_k$ are coefficients of independent variables X_1 to X_k.

Similar to Amoah and Addoah (2021), marginal effects are computed to describe the change in the propensity of the dependent variable (i.e., the household adopting clean cookstoves) that occurs when an independent variable changes by one unit, holding all else constant. In a logit model, the marginal effect of a variable X is computed as:

$$\partial P/\partial X = \beta * P * (1 - P)$$

Where:

- β is the logit coefficient of the variable.

- P is the predicted probability of the outcome.

The initial model included only the main independent and dependent variables, and

[2] https://github.com/DHSProgram/DHS-Analysis-Code/tree/main/AS81_urbanpoverty.

the final models were adjusted for all potential covariates.

Results

Descriptive statistics

A total of 10,320 urban households were considered for this study. Only 41.7% of the households used clean cookstoves, with the majority (58.3%) not using them (Figure 1).

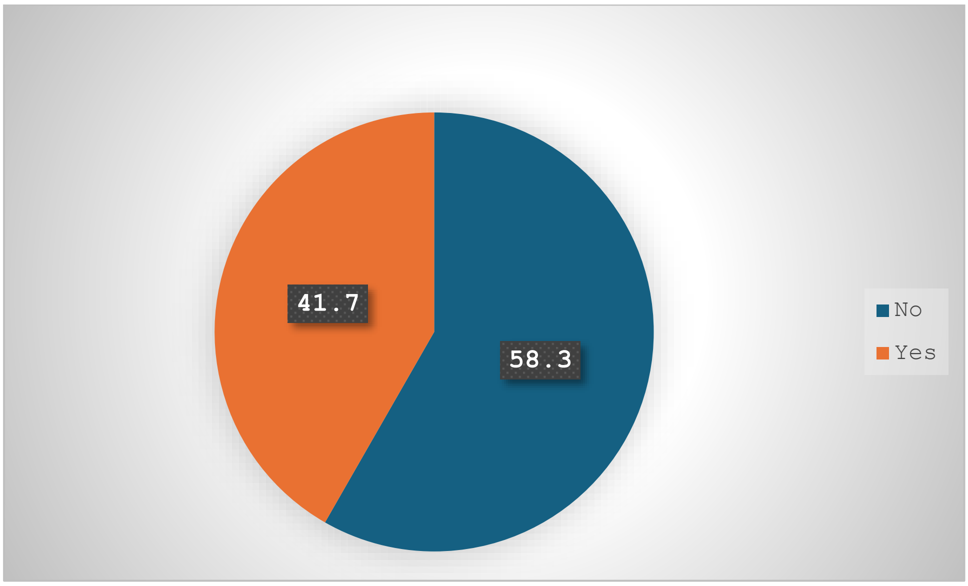

Figure 1: Percent of urban households using clean cookstoves

Table 1: Socio-demographic characteristics of urban households by household use of a clean cookstove for cooking

		Household uses a cleanstove for cooking		
		No	Yes	
Variables	**Frequency (%)**	**%**	**%**	**P-value**
Urban poverty based on household characteristics				0.000
Urban non-poor	9014 (87.3)	54.1	45.9	
Urban poor	1307 (12.7)	87.4	12.6	
Age of head of household				0.000
15 to 35 years	3477 (33.7)	49.8	50.2	
36 to 60 years	5101 (49.4)	59.9	40.1	
61+ years	1743 (16.9)	70.5	29.5	
Highest educational level of head of household				0.000
No Education	1343 (13.0)	90.3	9.7	
Primary	1098 (10.7)	80.7	19.3	
Secondary +	7858 (76.3)	49.7	50.3	
Current marital status of head of household				0.000
Never married	2118 (20.5)	46.6	53.4	
Currently married	5691 (55.1)	56.9	43.1	
Formerly Married	2511 (24.3)	71.3	28.7	
Sex of head of household				0.000
Male	6256 (60.6)	54.4	45.6	
Female	4065 (39.4)	64.3	35.7	

Table 1 summarises the background characteristics of the households, as well as the association between the use and non-use of clean cookstoves. The majority of the households (87.3%) lived in urban, non-poor households. Most of the household heads are aged 36-60 (49.4%), currently married (55.1%), and are males (60.6%) (See Table 1).

Table 2: Logit Model

Variables	(1) Logit	(2) Logit	(3) Logit	(4) Logit	(5) Logit	dy/dx
Urban poverty based on household characteristics						
Urban non-poor (RC)						
Urban poor	-1.4790***	-1.5091***	-1.3671***	-1.3632***	-1.3966***	-0.2518
	(0.147)	(0.146)	(0.149)	(0.148)	(0.147)	(0.0214)
Age of head of household						
< 35 years (RC)						
36 to 60 years		-0.4792***	-0.3118***	-0.3108***	-0.2570***	-0.0509
		(0.067)	(0.072)	(0.071)	(0.075)	(0.0150)
61+ years		-0.9358***	-0.6274***	-0.6291***	-0.4821***	0.0948
		(0.111)	(0.114)	(0.114)	(0.115)	(0.0224)
Highest educational level attained						
None (RC)						
Primary			0.5012**	0.4955**	0.4876**	0.0697
			(0.198)	(0.198)	(0.199)	(0.0286)
Secondary +			1.8199***	1.7735***	1.7402***	0.3159
			(0.149)	(0.149)	(0.149)	(0.0207)
Current marital status						
Never married (RC)						
current married					0.0974	0.0194
					(0.093)	(0.0184)
Formerly married					-0.3921***	-0.0765
					(0.125)	(0.0243)
Sex of head of household						
Male (RC)						
Female				-0.1838**	-0.0213	-0.0042
				(0.077)	(0.080)	(0.0156)
	(0.348)	(0.352)	(0.344)	(0.346)	(0.346)	
Constant	-0.0201	0.3696	-1.2838***	-1.1760***	-1.2198***	
	(0.222)	(0.235)	(0.263)	(0.266)	(0.274)	
Observations	8,795	8,795	8,779	8,779	8,779	

Dependent Variable: Household Clean Stove for Cooking
RC: Reference Category
Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The results further show that the association between household use of clean cookstoves and urban poverty is statistically significant at $p < 0.05$. This indicates that the type of cookstove used by urban households is influenced by urban poverty, with only 12.6% of urban poor households using clean cookstoves compared to 45.9% among urban non-poor households. Furthermore, with $p < 0.05$, a statistically significant association is observed between the educational attainment of household heads and the use of clean cookstoves. The use of clean cookstoves is observed to be highest (50.3%) for household heads with secondary education or higher, compared to only 9.7% for those without any formal education.

Table 2 shows the coefficients, standard errors, and estimated marginal effects of key variables in the logit model predicting household adoption of clean cookstoves in Ghana. The marginal effect is used in this study to describe how a small change in an independent variable affects the probability that the outcome, in this case, the adoption of clean cookstoves, will occur. As shown in the table, the age of the household head, educational level, and urban poverty have a significant association with the use of clean cookstoves. For instance, urban poverty has a statistically significant negative relationship with the use of clean cookstoves in all the estimated models.

The negative coefficient and marginal effect provide enough evidence that urban poverty reduces the likelihood of using clean cookstoves. The results indicate that, "all else held constant", living in an urban poor household relative to an urban non-poor household is associated with a 25.2% decrease in the use of clean cookstoves.

Households where the head is aged above 61 years are 9.5 percentage points less likely to adopt clean cookstoves than those with younger heads (less than 35 years), indicating that higher ages are associated with a lower likelihood of adopting clean cookstoves. Moreover, the positive coefficients and significant marginal effects in the table further indicate that education is a strong predictor of clean cookstove adoption. Specifically, households where the head has secondary or higher education are 31.6 percentage points more likely to adopt clean cookstoves than those with no formal education. In contrast, those with primary education would have a nearly 7% increase in the likelihood of using clean cookstoves compared to household heads without any formal education.

After providing empirical evidence of a negative relationship between household use of cookstoves and urban poverty, the data were disaggregated by the sex of household heads to investigate whether the use of clean cookstoves and the urban poverty nexus remain robust across male-headed and female-headed households. The study still finds a negative and statistically significant relationship between urban poverty and the use of clean cookstoves for both male- and female-headed households. This means that urban poor households are less likely to use clean cookstoves compared to urban non-poor households, irrespective of the sex of the household head (see Table 3).

Evidence from the disaggregated model shows some variation between male- and female-headed households in their use of clean cookstoves. While statistically significant relationships were observed for both groups in the overall model, significance was found only at the level of primary education among female household heads. This suggests that primary education may be particularly important for women in shaping household decisions about clean cookstove use, possibly reflecting their central role in energy transition and health-related choices. By contrast, higher education appears to strengthen the adoption of clean cookstoves across both male- and female-headed households, underscoring the role of education as a critical determinant of clean energy transitions.

Differences also emerged based on marital status in the disaggregated model. Among male household heads, currently married men were significantly more likely to use clean cookstoves relative to never-married men, indicating that marriage may strengthen men's capacity or motivation to adopt clean cookstoves for their households. Conversely, among female household heads, being formerly married was associated with a significantly lower likelihood of using clean cookstoves compared to never-married women.

Table 3: Logit Model

Variables	(Male) Logit	Marginal effect dy/dy	(Female) Logit	Marginal effect dy/dx
Urban poverty based on household characteristics				
Urban non-poor (RC)				
Urban poor	-1.4220***	-0.2722	-1.3729***	-0.2209
	(0.150)	(0.0239)	(0.262)	(0.0317
Age of head of household				
<35 years (RC)				
36 to 60 years	-0.2705***	-0.0549	-0.2289*	-0.0425
	(0.097)	(0.0198)	(0.125)	(0.0235)
61+ years	-0.6188***	-0.1251	-0.2644	-0.0489
	(0.137)	(0.0274)	(0.194)	(0.0359)
Highest educational level				
None (RC)				
Primary	0.0731	(0.1026)	0.7699***	0.1065
	(0.285)	(0.0401)	(0.241)	(0.0327)
Secondary +	1.6902***	0.3213	1.7225***	0.2898
	(0.215)	(0.0318)	(0.196)	(0.0252)
Current marital status				
Never Married (RC)				
Currently married	0.2063*	0.0415	-0.0361	-0.0070
	(0.125)	(0.0249)	(0.158)	(0.0308)
Formerly married	-0.0105	-0.0022	-0.7095***	-0.1326
	(0.176)	(0.0354)	(0.168)	(0.0317)
Constant	-1.2062***		-1.1873***	
	(0.328)		(0.322)	
Observations	5,464		3,315	

Dependent Variable: Household Clean Stove for Cooking
RC: Reference Category
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Discussions

The findings of this study provide insights into how socio-demographic factors influence household use of clean cookstoves among urban non-poor and urban poor households. This study has become increasingly important in response to the global demand for promoting cleaner, safer, and more sustainable cooking practices, especially among the urban poor in low-income countries (WHO, 2024). The study found that a majority of urban households still do not use clean cookstoves for cooking, despite the government's effort to promote their use. This finding is particularly concerning for Ghana's progress towards achieving multiple SDGs, especially as the country's population becomes increasingly urbanised, with projections indicating a rise in the urban poor.

Additionally, it emerged that the proportion of Ghanaians using clean cookstoves is lower among the urban poor compared to the urban non-poor. The continued use of traditional cookstoves, characterised by their poor energy efficiency and high emissions among dense, poorly ventilated urban poor households, particularly exacerbates the risk of higher emissions of harmful pollutants, such as PM2.5 and carbon monoxide, which are often linked to various respiratory infections in children (Odo et al., 2021). Additionally, previous studies have emphasised how the search for firewood to fuel traditional cookstoves reinforces gender inequalities and contributes to time poverty (Prah et al., 2021). Therefore, transitioning to clean cooking technologies should be a priority for the country.

Furthermore, urban poverty status is found to be a driving factor in the propensity of a household to adopt clean cookstoves. This finding supports the energy ladder hypothesis, which posits that household consumption of cleaner energy sources increases with rising income levels (Ali et al., 2024; Adams, 2023; Karakara & Osabuohien, 2020). A recent study in Ghana, for instance, found that any unit increase in household income leads to a 65% higher chance of the household choosing LPG over charcoal (Ali et al., 2024). Consequently, wealthier urban households would find it most convenient to transition upward on the energy ladder toward LPG or electric cookstoves; the urban poor would risk being limited to dependence on wood fuel and inefficient stoves, reinforcing the “energy divide”. Thus, the promotion of cleaner energy (SDG 7.1) through the adoption of clean cookstoves in Ghana cannot succeed without sustained progress in eradicating extreme poverty (SDG 1.1), implementing nationally appropriate social protection programmes (SDG 1.3), and reducing multidimensional poverty (SDG 1.2).

The age of the household head is observed to be negatively related to the use of clean cookstoves, and older households are less likely to adopt clean cookstoves. This is understandable since older household heads often resist change and may have more conservative cooking practices due to their attachment to traditional methods, which can lead to continued household exposure to smoke emissions. This aligns with Mensah and Adu’s (2015) study, which found that the marginal effect of the household head's age is positive but decreasing between the ages of 18 and 30 years and negative for all ages above 30 years. The age-related gap in cookstove adoption highlights the importance of age-sensitive energy policies and behaviour change strategies. Without targeted messaging and financial support mechanisms (such as subsidies and microfinance), older household heads may be left behind in the transition to clean energy. Promoting intergenerational awareness can help bridge this gap and ensure that no demographic group is excluded from Ghana’s transition to cleaner energy.

There is evidence to show that a household head with secondary education or higher is more likely to adopt a clean cookstove relative to a head with no formal education. This confirms previous studies that have consistently identified formal education as a key driver for the clean energy transition in SSA. For instance, Owusu-Amankwaah et al.’s (2023) study examining the determinants of household cookstoves finds that primary cooks with a university-level education are 14 times more likely to use LPG stoves as their primary stoves relative to primary cooks who have no formal education. Household heads with higher levels of education are most likely to be aware of the environmental benefits of using clean cookstoves and will consequently adopt their use. Overall, this study reinforces the notion that higher levels of education are linked to the adoption of cleaner energy (Ali et al., 2024; Karakara & Osabuohien, 2020). To this end, increasing access to formal education in Ghana, particularly among women and the urban poor, and implementing energy policies can be used to accelerate the transition to clean cooking and reduce household air pollution, which aligns with SDG 4 (Quality Education) and SDG 7 (Affordable and Clean Energy).

This study further highlights the vulnerability of formerly married women, who may face economic and social constraints, compared to their never-married counterparts. This contrasts with a previous study, which finds that marital status is not a significant determinant of improved cookstove adoption in Ghana (Adams et al., 2023). There is evidence to indicate that marriage exerts different influences on the use of clean cookstoves, favouring households headed by married men while disadvantaging those headed by formerly married women in urban Ghana. In Ghana, as is the case in most countries in SSA, husbands typically control household financial decision-making, while wives are responsible for managing daily chores, such as cooking. Consequently, in married households, a husband's ability to influence the adoption of clean cookstoves may be stronger due to their ability to pool more resources, which would most likely make them more able to afford the initial cost of accessing a clean cookstove.

Conclusion

This study has examined household-level factors that influence the adoption of clean cookstoves and related technologies in urban areas of Ghana. There is evidence to suggest that the use of clean cookstoves in households is relatively low. The logit model reveals that the socio-economic and demographic conditions of households significantly determine the propensity to adopt clean cookstoves. Specifically, urban poverty and the age of the household head were negatively associated with the adoption of a clean cookstove. In contrast, the educational attainment of the household head was positively associated with the adoption of a clean stove. These findings suggest that targeted interventions aimed at improving education and alleviating poverty could enhance the uptake of clean cookstoves. Additionally, raising awareness about the benefits of the adoption of clean cookstoves may further encourage urban households to transition towards cleaner cooking methods.

It is evident that the clean cook stove holds the potential to transform the lives of the urban poor in Ghana. By positioning clean cooking as both a climate mitigation strategy and a sustainable development policy, Ghana can unlock the benefits of clean energy transitions by designing more effective interventions, including subsidies for older adults and marginalised groups, and awareness campaigns tailored to the needs of urban poor and rural communities. This study has provided insights into the adoption of clean cookstoves in urban areas through the use of quantitative analysis. However, this approach has limitations for fully explaining the sociocultural and behavioural practices that affect household choices regarding clean cookstoves. To further the achievement of the Sustainable Development Goals—especially SDG 7 and SDG 13—future research should integrate qualitative methods. Such approaches would facilitate the discovery of the underlying perspectives, lived experiences, and contextual factors that influence energy transitions, thereby enabling the development of more inclusive and effective pro-poor policy interventions that account for the diverse needs of communities. By combining quantitative data with qualitative insights, researchers can gain a more comprehensive understanding of energy transitions and their implications for health and environmental sustainability.

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