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Factors Influencing Adoption of Cleaner Cooking Solutions in Parklands Sub-County Households, Nairobi, Kenya

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ABSTRACT

Purpose: The purpose of the study was to evaluate the factors driving the adoption of cleaner cooking solutions by households in Parklands Sub-County, Kenya. The study specifically aimed at determining the social factors, economic factors and technological factors affecting the adoption of cleaner cooking solutions by households in Parklands Sub-County, Kenya.

Methodology: The research design was descriptive research design. The target population was households using traditional ways of cooking, narrowed down from all households. Sampling involved simple random sampling, ensuring equal representation. The Yamane formula determined a sample size of 96. Data analysis encompassed descriptive and inferential statistics using SPSS.

Findings: From the results, social factors demonstrated a statistically significant positive correlation with adoption of cleaner cooking solutions ($r = 0.722$, $p < 0.01$). The regression coefficient ($\beta = 0.722$, $t = 10.061$, $p < 0.001$) indicated that for each unit increase in social factors, adoption increases by 0.630 units. Economic factors showed a stronger positive correlation with adoption of cleaner cooking solutions ($r = 0.808$, $p < 0.01$). The regression coefficient ($\beta = 0.808$, $t = 13.203$, $p < 0.001$) demonstrated that each unit increase in economic factors improves adoption by 0.765 units. Technological factors exhibited a very strong positive correlation with adoption of cleaner cooking solutions ($r = 0.850$, $p < 0.01$). The regression coefficient ($\beta = 0.850$, $t = 15.411$, $p < 0.001$) indicated that each unit increase in technological factors enhances adoption by 0.758 units. In conclusion, the study revealed statistically significant positive relationships between social factors, economic factors, and technological factors with the adoption of cleaner cooking solutions in Parklands Sub-County.

Unique Contribution to Theory, Practice and Policy: The study recommended that stakeholders strengthen adoption of cleaner cooking solutions by conducting community awareness campaigns, leveraging opinion leaders, and providing educational workshops. Robust economic support mechanisms should be prioritized through targeted subsidies, innovative payment models like pay-as-you-cook, and microfinance options to overcome initial cost barriers. Improving technological accessibility through user-centered design, compatibility with local cooking practices, and reliable after-sales support is also advised. Additionally, manufacturers and distributors should focus on products that align with user preferences while ensuring ease of operation, maintenance, and cleaning to facilitate wider adoption of cleaner cooking solutions in urban settings.

Key Words: *Social Factors, Economic Factors, Technological Factors and Cleaner Cooking Solutions*

Background of the Study

Clean cooking refers to all the low-to-zero emission methods by which people cook their food. It includes a cookstove or a hot plate if they run on electricity, solar, liquid petroleum gas (LPG), natural gas, ethanol, and advanced biomass cookstoves. Sustainable clean cooking means transitioning to a future where cooking needs are met in a more sustainable way that is economically, socially, and environmentally (Joshi, 2021). The adoption of traditional biomass fuels like firewood, charcoal, and crop residues for cooking in low- and middle-income countries (LMICs) poses significant health, environmental, and social challenges. Household air pollution (HAP) from these fuels causes an estimated 3.7 million deaths annually, predominantly affecting women and children (WHO, 2022). Additionally, the unsustainable harvesting of wood fuels contributes to deforestation and climate change. Recognizing these concerns, Sustainable Development Goal 7 (SDG 7) calls for "universal access to affordable, reliable, modern energy services'' by 2030. Achieving this goal hinges on the widespread adoption of clean cooking solutions in LMICs (Bailis, Ran & O'Connor 2020).

Improved cookstoves (ICSs) and solar cookers (SCs) are widely promoted clean cooking technologies. ICSs reduce emissions compared to traditional stoves, while SCs offer a zero-emission alternative but require behavioural adaptations and have high upfront costs (Johnson, et al., 2020). While millions of stoves have been disseminated, achieving sustained use and exclusive use remains challenging due to affordability, cultural acceptability, education levels, and perceived benefits. Advanced gasifier pellet stoves offer significant emission reductions compared to charcoal and wood, approaching near- LPG performance levels. Their high cost, unfamiliar fuel, and reliance on new distribution systems present hurdles for widespread use (Puzzilli, et al., 2022).

The world is not on track to meet the goal of universal access to clean cooking by 2030, a key component of achieving SDG. According to the latest Tracking SDG 7: The Energy Progress Report, 2.6 billion people still cook with traditional polluting fuels (biomass, charcoal, coal, and kerosene), which is about one-third of the global population (IEA, 2021). Over the past three decades, the percentage of the global population mainly using polluting cooking fuels has declined from 53% in 1990 to 36% in 2020 (Stoner, et al.,2021). If we do not accelerate the process an estimated 2.4 billion people will remain without clean cooking services in 2030 (Zhang, 2022).

The disparity in access to cleaner cooking alternatives is starkly evident between urban and rural areas, with only 14% of urban populations depending on polluting fuels and technologies compared to 49% of the global rural populace. (WHO, Household Air Pollution, 2023). In urban areas, there has been a shift towards using gaseous fuels and electricity for cooking, while in rural areas high levels of biomass use persist alongside increasing gaseous fuel use (Stoner, et al., 2021).

Kenya faces a multi-faceted challenge in achieving SDG 7. While grid access has reached 50-64% of the population and solar lighting products are gaining traction, 93.2% of rural households still rely on polluting fuels for cooking, indicating great exposure to harmful pollutants. Wood fuel is commonly used primary cooking fuel, currently used by 75% of Kenyan households (IEA, 2021).

Efforts are underway, such as the Ministry of Energy (MOE) partnering with agencies through the Inter-Ministerial Committee on Clean Cooking to identify and promote cleaner cooking options. Initiatives like the Kenya Off- Grid Solar Access Project (KOSAP) supported by the World Bank have a clean cooking component to increase uptake of clean cookstoves in underserved counties (Energy M. o., 2019).

A study was conducted that investigated the adoption of advanced gasifier pellet stoves in 150 households within two peri-urban communities near Nairobi. This context was unique due to a recent government ban on charcoal production, prompting households to switch to alternative fuels like LPG and kerosene (Bailis, et al., 2020). The study revealed encouraging results. Participants demonstrated willingness to use the stoves and reduce reliance on polluting fuels. However, affordability, behavioural change, and ensuring a consistent and affordable fuel supply remain key barriers to large-scale use (Nzengya, Mwari, & Njeru, African Handbook of Climate Change Adaptation, 2021). To accelerate the transition towards clean cooking in Kenya and other LMICs, several strategies are crucial. According to Bailis addressing affordability through targeted subsidies and innovative financing models can incentivize stove use, particularly among low-income households. Secondly, bundling clean stoves with reliable, affordable fuel supplies can address both technical and economic barriers. Thirdly, tailored awareness campaigns and training programs can promote positive behavioural changes and ensure proper stove usage. Fourthly, building capacity and infrastructure for local pellet production and distribution can enhance fuel availability and affordability. Lastly, effective partnerships between governments, NGOs, private sector actors, and research institutions are critical for knowledge sharing, resource mobilization, and scaling up successful interventions (Bailis, et al., 2020).

HAP stemming from the adoption of inefficient and polluting fuels and technologies, poses significant health risks. The resulting indoor smoke contains harmful pollutants, including fine particles that can deeply penetrate the lungs and bloodstream. Particularly vulnerable are women and children, who spend substantial time near the domestic hearth. Moreover, reliance on polluting fuels necessitates extensive time for cooking and fuel preparation, aggravating the health and time burdens on households. In response to these challenges, the World Health Organization (WHO) issued pioneering health-based guidelines in 2014, advocating for cleaner fuels and technologies for household use. It aims to inform policymakers, promoting strategies to mitigate HAP. WHO identifies clean fuels and technologies such as solar, electricity, biogas, liquefied petroleum gas (LPG), and natural gas, along with biomass stoves meeting emission targets, as beneficial for health, recommendations include phasing out the adoption of unprocessed coal and discouraging the adoption of kerosene due to their detrimental effects on air quality and safety. Addressing these issues requires robust policy actions, as an estimated 2.1 billion people are projected to lack access to clean fuels and technologies by 2030. To achieve new targets, there must be rapid expansion of access to cleaner cooking and heating appliances, ensuring affordability for even the lowest-income households (WHO, Household Air Pollution, 2023).

Statement of the Problem

Kenya faces a significant gap in achieving universal access to clean cooking by 2030 despite the ongoing efforts and the urgency of addressing health, environmental, and economic challenges. Over 90% of Kenyan households still rely on polluting fuels like firewood, charcoal, and crop residues for cooking, exposing them to harmful HAP. This situation leads to an estimated 5% of premature deaths annually and contributes to deforestation and climate change (Petroleum, 2024). Several factors hinder progress towards clean cooking in Kenya. Affordability remains a major barrier, with cleaner options like LPG and advanced gasifier stoves often exceeding household budgets. Additionally, cultural preferences, lack of awareness, and limited access to reliable fuel supplies and efficient stoves further impede use (Bailis, et al., 2020). Kulindwa, Lokina, and Ahlgren (2019) examined the factors that motivate households in rural Tanzania to acquire better cooking stoves. The adoption of improved cooking stoves (ICS) and payment methods were found to be strongly correlated. Additionally, homes that received only one type of ICS were shown to embrace it at a lower rate (30%). Conversely, 48% of homes that received many types of ICS adopted them. Furthermore, the majority of homes (80%) bought the ICS that uses both firewood and charcoal, increasing the overall uptake of ICS to 48%. These findings offered factual proof that people in rural regions are switching from using firewood to charcoal for energy. According to the study, since rural households' cash flow is dependent on the seasonal income from agricultural activities, any efforts to promote ICS should give careful thought to providing them with a variety of ICS rather than just one type, encouraging ICS suppliers to give them credit, and offering ICS for cash at harvest time.

Vigolo, Sallaku, and Testa (2019) conducted a comprehensive literature review with the goal of determining the primary motivators and obstacles to clean cooking from the standpoint of the customer. It also seeks to characterize the way in which consumers view ICS in comparison to conventional stoves. Seven elements were identified through thematic analysis as potential drivers or barriers to the adoption of ICS: geography, social and cultural influences, fuel availability, attitude toward technology, economic factors, socio-demographics, and awareness of the advantages of ICS over traditional cookstoves. Convenience and applications, aesthetics, health-related effects, and environmental effects were the four main areas of perception. The study by Otieno (2019) analyzed the factors influencing use and adoption of, clean cooking technologies in rural households in Bondo Sub-County. Establishing the kinds of cooking energy and technologies that households utilize was one of the specific goals. Assess the impact of social interactions and household characteristics on technology use and adoption. Additionally, ascertain the ways in which institutional setup and policy affect technology use and adoption among families in Bondo Sub-County. According to the findings of a binomial logistic regression analysis, the use of upgraded cookstoves in the research area was strongly influenced by age, income, and household

awareness of a company that sold and repaired them. Different government ministries are in charge of policies pertaining to cooking technologies and biomass energy.

Despite the increasing awareness of the benefits of cleaner cooking solutions, the use rates among households in Parklands Sub-County, Nairobi, Kenya remain low. Traditional cooking methods, which rely heavily on biomass fuels like wood and charcoal, are still prevalent, posing significant health risks due to indoor air pollution, contributing to environmental degradation, and perpetuating economic inefficiencies. The reasons behind this reluctance to adopt cleaner alternatives are not well-understood, creating a gap in knowledge that hinders the development of effective interventions. This study aims to address this gap by evaluating the social, economic, and technological factors influencing the adoption of cleaner cooking solutions among households in Parklands Sub-County. By identifying and analysing these factors, the research seeks to provide actionable insights that can inform policy, drive community initiatives, and support businesses in promoting cleaner, more sustainable cooking practices in the region.

Specific Objectives

i To determine the effect of social factors on level of adoption of cleaner cooking solutions by households in Parklands Sub-County in Nairobi County, Kenya.
ii To establish the effect of economic factors on level of adoption of cleaner cooking solutions by households in Parklands Sub-County in Nairobi County, Kenya.
iii To assess the effect of technological factors on level of adoption of cleaner cooking solutions by households in Parklands Sub-County in Nairobi County, Kenya.

Theoretical Framework

Diffusion of Innovations Theory

The Diffusion of Innovations Theory, developed by Everett Rogers in 1962, explains how, why, and at what rate new ideas and technology spread through cultures. It identifies five stages in the adoption process: knowledge, persuasion, decision, implementation, and confirmation. This theory also categorizes adopters into five groups: innovators, early adopters, early majority, late majority, and laggards. This theory is pertinent to the study as it helps in understanding how cleaner cooking solutions are perceived, adopted, and diffused among households in Parklands Sub-County. Social factors such as community norms, influence of opinion leaders, and social networks play a crucial role in this process. Economic factors like cost and perceived economic benefits also influence the decision-making process at each stage. Additionally, the technological attributes of cleaner cooking solutions, including relative advantage, compatibility, complexity, trialability, and observability, determine the rate and extent of their adoption. By applying the Diffusion of Innovations Theory, the study can identify the stages at which households are more likely to encounter barriers or facilitators to adoption. Understanding these stages helps in designing targeted interventions to promote the diffusion of cleaner cooking solutions, ensuring they are more widely accepted and utilized.

Theory of Planned Behavior

The Theory of Planned Behavior (TPB), proposed by Icek Ajzen in 1985, is a psychological theory that links beliefs and behavior. It suggests that individual behavior is driven by behavioral intentions where three components play a key role: attitudes towards the behavior, subjective norms, and perceived behavioral control. These factors collectively shape an individual's intention to perform a particular behavior. TPB is highly relevant for examining the adoption of cleaner cooking solutions as it considers both individual and social influences on behavior. Social factors affecting adoption can be analyzed through subjective norms, which encompass societal pressure and the influence of significant others. Economic factors can influence attitudes towards the behavior, determining whether households perceive cleaner cooking solutions as beneficial or costly. Technological factors contribute to perceived behavioral control, reflecting whether households feel capable of adopting and using these technologies effectively. By utilizing the Theory of Planned Behavior, the study can identify the beliefs and attitudes that hinder or facilitate the adoption of cleaner cooking solutions. This understanding enables the development of strategies that positively influence attitudes, reinforce supportive social norms, and enhance perceived control over adopting cleaner cooking technologies, thereby encouraging their widespread use.

Empirical Literature Review

Social Factors

The study by Kahura and Kamaria (2019) investigated the cost and accessibility related factors influencing the selection of areas of residence in Kenya in the case of Nairobi residents. Descriptive research design was used in the study. A sample of 150 respondents was drawn from the 985,016 households in Nairobi County that were identified by the study. The findings showed that income is the most significant economic factor, followed by price, transportation costs, cost of living, and transfer costs. The factors that were least ranked were maintenance costs, availability of mortgages, and ease of qualifying for a mortgage. The study also discovered that the road network was the most significant accessibility factor, followed by water, proximity to the workplace, parking, health facilities, interior space, electricity, and transportation expenses. Drainage, parks and open spaces, garden availability, and floor plans were the least ranked factors. The study suggested that when choosing a place to live, consideration should be given to cost-related factors like cost of living, among others, since they affect one's disposable income. Since these economic factors are likely to have an impact on the decision of their prospective tenants or buyers, it is also advised that landlords take them into account before deciding on the rent price or the price of a piece of land.

The study by Chelogoi, Jonyo and Amadi (2020) evaluated the influence of socio-cultural factors in access to public health care, the impact of institutional factors and demographic variables on public health care access. The findings demonstrated that the independent and dependent variables had positive correlations with one another. There was statistical significance in the P-value. The

findings were not the random chance, and the fact that P-0.01 < 0.05 indicates that there is a positive correlation between the variables. The connections were highly correlated and inclusive of one another. Accordingly, the alternative hypotheses were accepted and the null hypotheses were rejected. The findings indicate that access to healthcare is influenced by institutional (enabling), sociocultural (need), and demographic (disposing) factors. In order to benefit all households, socioeconomic factors should be addressed. The distribution of sociocultural elements among the households should be equitable.

The study by Kanyi (2019) investigated the social and economic constraints facing households headed by children in Mathare slums Nairobi City County. Outlining the social, psychological, financial, and gender-related barriers that households with children face was one of the specific objectives. The Mathare slums in Nairobi City County served as the study's site. In this study, both qualitative and quantitative data were gathered using descriptive research. The social and economic limitations faced by child-headed households in Nairobi City County's Mathare slums served as the analytical unit. The sociological, psychological, economic, and gender-based barriers that children's households in Mathare slums face served as the units of observation. According to correlation analysis, the limitations in a household with children were positively and significantly connected with three variables: social, psychological, and economic challenges. Constraints in households with children were negatively correlated with gender-related issues. The strongest positive correlation, 0.622, was found for economically related challenges (EC). It is implied that providing orphaned children with financial support significantly improved their ability to overcome trauma associated with orphanhood and actively engage in improving their lives. Regression analysis revealed that sociological, psychological, and economic factors were positively connected with limitations in child- headed households. The results suggest that among households with children living in Mathare slums, economic difficulties are the predictor variable that contributes the most constraints. If all other factors stay the same, an increase of one unit by economic challenges raises the overall constraints in households with children by 0.441.

Economic Factors

The study by Zeynalova and Mammadli (2020) analyzed the economic factors affecting household consumption expenditures in Azerbaijan. According to the results of the regression analysis, the exchange rate, corporate tax, and VAT are the independent variables that have a linear relationship with household consumption expenditures. However, there is no significant correlation between income tax and disposable income and household consumption expenditures. Furthermore, a linear relationship between the exchange rate and consumption expenditures shows that a one percent increase in the exchange rate causes a 63.04 percent increase in household consumption expenditures when these variables are examined separately. This relationship is primarily caused by the fact that imports from other nations range from a minimum of 20.7% (in 2009) to a maximum of 72.7% (in 2014) of GDP between 1995 and 2017. A portion of the most consumed goods, including vehicles and related transportation equipment, food items, beverages, vegetables,

and electrical and technological equipment, were imported. Household consumption expenditures increased and the national currency's purchasing power decreased as a result of the dollar's appreciation relative to the national currency. The exchange rate and household consumption expenditures had a positive linear relationship as a result of this increase. There is also evidence of a positive correlation between household consumption expenditure and corporate tax. The growth of entrepreneurship was aided by the reduction of corporate tax by the following years: 35% in 1992, 32% in 1997, 30% in 1990, 27% in 2000, 25% in 2003, 24% in 2004, 22% in 2010, and 20% since 2010.

The research study Eryka (2021) focused on the effects of socioeconomic factors on utilization of improved sanitation facilities by households in Kenya. The probit model was used in the study. The results of the study showed that a household's choice of sanitation facility depends on the household head's sex, the highest level of education they have received, and their income. According to the study's findings, the development and application of sanitation policies should focus resources on empowering people with knowledge and expanding the sources of household income that can be used to fund improvements in sanitation.

Technological Factors

The study by Nwachukwu (2023) investigated the impact of digital technology on household economic status in Nigeria, the largest economy and mobile market in Africa. A unique data set from a nationally representative longitudinal household survey on living standards in 2018 was used in the analysis. This data set included information on the households' access to and use of particular digital technologies. State-fixed effects estimates and multiple linear regression analysis were used in this analysis. A heterogeneity analysis was performed to look at the interaction effects between the variables, and the Variance Inflation Factor was also used to test for multicollinearity. The findings demonstrated that a rise in mobile phone ownership and internet usage among households can have a positive impact and raise household wealth. According to the study, in order to optimize the advantages of owning a mobile phone, digital literacy should be encouraged. Additionally, in order to close the gap between urban and rural areas, internet infrastructures should be extended in rural areas.

The study by Kigomo, Senaji and Mwaniki (2021) sought to establish the influence of technological factors on the growth of home ownership through mortgage financing in Nairobi County, Kenya. The results of the study showed that mortgage financing in Kenya significantly increased home ownership due to technological factors ($t = 13.412$, $p < 0.001$). These results suggest that home ownership may be greatly impacted by technological elements like the internet and construction technology. The null study hypothesis, H0: Technological factors have no significant effect on the growth of home ownership through mortgage financing in Kenya, was rejected as a result of these findings. The study comes to the conclusion that technology is a major driver of processes and strategy in the mortgage industry. Rapid technological advancements are having a significant impact on mortgage customers' decisions.

Research Methodology

The research design was descriptive research design which was chosen for its ability to comprehensively analyze factors driving the adoption of cleaner cooking solutions in Parklands Sub-County. The target population was households using traditional ways of cooking, narrowed down from all households. Sampling involved simple random sampling, ensuring equal representation. The Yamane formula determined a sample size of 96. Data collection was implemented through a structured questionnaire. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were generated to summarize and describe the main features of the data. Inferential statistics, such as Pearson correlation coefficients and simple linear regression, were employed to make inferences about the population based on the sample data. The results of the analysis were presented in the form of tables and figures, providing a clear and visual representation of the findings.

Results

The study achieved a robust response rate of 100%, with 96 participants responding out of the 96 targeted respondents. This high level of engagement from participants significantly enhances the credibility of the study's findings.

Descriptive Results

The overall mean for the social factors influencing the adoption of cleaner cooking solutions is 3.97, with a standard deviation of 1.04, implying that while there was general agreement on the positive influence of social factors, there was moderate variability in how these factors were perceived across the community. Second, the overall mean for the economic factors influencing the adoption of cleaner cooking solutions was 3.97, with a standard deviation of 1.02, indicating general agreement that economic factors such as income, financial support, and long-term savings positively influence the adoption of cleaner cooking solutions. Besides, the overall mean for the technological factors influencing the adoption of cleaner cooking solutions was 4.01, with a standard deviation of 0.99, indicating general agreement that technological factors such as ease of operation, efficiency, reliability, and continuous innovation significantly influence adoption.

Inferential Results

Effect of Social factors on level of adoption of cleaner cooking solutions

Correlation between social factors and level of adoption of cleaner cooking solutions.

A Pearson correlation coefficient was calculated to examine the relationship between social factors and level of adoption of cleaner cooking solutions. The results indicated a statistically significant, strong positive correlation ($r = 0.722^{**}$, $p < 0.01$) as shown in Table 1. This suggests that as the influence of social factors increases, the level of adoption of cleaner cooking solutions tends to improve significantly.

Table 1 Correlation between social factors and level of adoption of cleaner cooking solutions

Correlations

		Social Factors	Adoption of Cleaner Cooking Solutions
Social Factors	Pearson Correlation	1	.722**
	Sig. (2-tailed)		.000
Adoption of Cleaner Cooking Solutions	Pearson Correlation	.722**	1
	Sig. (2-tailed)	.000	
	N	95	95

**. Correlation is significant at the 0.01 level (2-tailed).

Linear Regression between social factors and level of adoption of cleaner cooking solutions

A simple linear regression was performed to predict the level of adoption of cleaner cooking solutions based on social factors. The model explains 51.6% of the variance in the adoption of cleaner cooking solutions (Adjusted $R^2 = 0.516$) as shown in Table 2. This indicates that social factors are substantial predictors of adoption levels, although 48.4% of the variance is accounted for by other factors not considered in this study and error term.

Table 2 Regression between social factors and level of adoption of cleaner cooking solutions

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.722[a]	.521	.516	.51073

a. Predictors: (Constant), Social Factors

ANOVA table for social factors and level of adoption of cleaner cooking solutions

The ANOVA results show that there is a statistically significant linear relationship between social factors and level of adoption of cleaner cooking solutions ($F(1, 93) = 101.233$, $p < 0.001$) as shown in Table 3. This confirms that the regression model is a good fit for the data.

Table 3 ANOVA table for Linear Regression social factors and level of adoption of cleaner cooking solutions

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26.407	1	26.407	101.233	.000[b]
	Residual	24.259	93	.261		
	Total	50.665	94			

a. Dependent Variable: Adoption of Cleaner Cooking Solutions
b. Predictors: (Constant), Social Factors

Coefficients for Linear Regression between social factors and level of adoption of cleaner cooking solutions

The regression analysis yielded a statistically significant positive relationship between social factors and adoption of cleaner cooking solutions ($\beta = 0.722$, $t = 10.061$, $p < 0.001$) as shown in Table 4. The unstandardized coefficient ($B = 0.630$) suggests that for each unit increase in social factors, adoption of cleaner cooking solutions is expected to increase by 0.630 units. The constant term (1.492) represents the expected value of adoption when the influence of social factors is zero.

Table 4 Coefficients for Linear Regression between social factors and level of adoption of cleaner cooking solutions

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.492	.255		5.851	.000
	Social Factors	.630	.063	.722	10.061	.000

a. Dependent Variable: Adoption of Cleaner Cooking Solutions

The regression equation can be expressed as:

Adoption of Cleaner Cooking Solutions = 1.492 + 0.630 × Social Factors + error term

This model demonstrates that for every unit increase in the influence of social factors, the level of adoption of cleaner cooking solutions in Parklands Sub-County, Nairobi is predicted to improve by 0.630 units, holding all other factors constant.

Effect of Economic factors on level of adoption of cleaner cooking solutions

Correlation Analysis between effect of economic factors and level of adoption of cleaner cooking solutions

A Pearson correlation coefficient was calculated to examine the relationship between economic factors and level of adoption of cleaner cooking solutions. The results indicated a statistically significant, very strong positive correlation ($r = 0.808$, $p < 0.01$) as shown in Table 5. This suggests that as the influence of economic factors increases, the level of adoption of cleaner cooking solutions tends to improve significantly.

Table 5 Correlation Analysis between effect of economic factors and level of adoption of cleaner cooking solutions

Correlations			
		Economic Factors	Adoption of Cleaner Cooking Solutions
Economic Factors	Pearson Correlation	1	.808**
	Sig. (2-tailed)		.000
Adoption of Cleaner Cooking Solutions	Pearson Correlation	.808**	1
	Sig. (2-tailed)	.000	
	N	95	95

**. Correlation is significant at the 0.01 level (2-tailed).

Linear Regression between effect of economic factors and level of adoption of cleaner cooking solutions

A simple linear regression was performed to predict the level of adoption of cleaner cooking solutions based on economic factors. The model explains 64.8% of the variance in the adoption of cleaner cooking solutions (Adjusted $R^2 = 0.648$) as shown in Table 6. This indicates that economic factors are substantial predictors of adoption levels, although 35.2% of the variance is accounted for by other factors not considered in this study and error term.

Table 6 Correlation Analysis between economic factors and level of adoption of cleaner cooking solutions

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.808[a]	.652	.648	.43536

a. Predictors: (Constant), Economic Factors

ANOVA table for Linear Regression for economic factors and level of adoption of cleaner cooking solutions

The ANOVA results show that there is a statistically significant linear relationship between economic factors and level of adoption of cleaner cooking solutions ($F(1, 93) = 174.313$, $p < 0.001$) as shown in Table 7. This confirms that the regression model is a good fit for the data.

Table 7 ANOVA table for Linear Regression for effect of economic factors and level of adoption of cleaner cooking solutions

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	33.039	1	33.039	174.313	.000[b]
	Residual	17.627	93	.190		
	Total	50.665	94			

a. Dependent Variable: Adoption of Cleaner Cooking Solutions

b. Predictors: (Constant), Economic Factors

Coefficients for linear regression between effect of economic factors and level of adoption of cleaner cooking solutions

The regression analysis yielded a statistically significant positive relationship between economic factors and adoption of cleaner cooking solutions ($\beta = 0.808$, $t = 13.203$, $p < 0.001$) as shown in Table 8. The unstandardized coefficient ($B = 0.765$) suggests that for each unit increase in economic factors, adoption of cleaner cooking solutions is expected to increase by 0.765 units. The constant term (0.977) represents the expected value of adoption when the influence of economic factors is zero.

Table 8 Coefficients for linear regression between effect of economic factors and level of adoption of cleaner cooking solutions

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.977	.234		4.185	.000
	Economic Factors	.765	.058	.808	13.203	.000
a. Dependent Variable: Adoption of Cleaner Cooking Solutions						

The regression equation can be expressed as:

Adoption of Cleaner Cooking Solutions = 0.977 + 0.765 × Economic Factors + error term

This model demonstrates that for every unit increase in the influence of economic factors, the level of adoption of cleaner cooking solutions in Parklands Sub-County, Nairobi is predicted to improve by 0.765 units, holding all other factors constant.

Effect of technological factors on level of adoption of cleaner cooking solutions

Correlation Analysis between technological factors on level of adoption of cleaner cooking solutions

A Pearson correlation coefficient was calculated to examine the relationship between technological factors and level of adoption of cleaner cooking solutions. The results indicated a statistically significant, very strong positive correlation ($r = .748$, $p < 0.01$). This suggests that as the influence of technological factors increases, the level of adoption of cleaner cooking solutions tends to improve significantly.

Table 9 Correlation Analysis between technological factors on level of adoption of cleaner cooking solutions

Correlations			
		Desire and Action stages	E-conversion Rates
Desire and Action stages	Pearson Correlation	1	.748**
	Sig. (2-tailed)		.000
E-conversion Rates	Pearson Correlation	.748**	1
	Sig. (2-tailed)	.000	
	N	204	208

**. Correlation is significant at the 0.01 level (2-tailed).

Linear Regression between technological factors on level of adoption of cleaner cooking solutions

A simple linear regression was performed to predict the level of adoption of cleaner cooking solutions based on technological factors. The model explains 72.0% of the variance in the adoption of cleaner cooking solutions (Adjusted $R^2 = 0.720$) as shown in Table 10. This indicates that technological factors are substantial predictors of adoption levels, although 28.0% of the variance is accounted for by other factors not considered in this study and error term.

Table 10 Regression Analysis between technological factors on level of adoption of cleaner cooking solutions

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.850[a]	.723	.720	.34967

a. Predictors: (Constant), Technological Factors

ANOVA table for Linear Regression for technological factors on level of adoption of cleaner cooking solutions

The ANOVA results show that there is a statistically significant linear relationship between technological factors and level of adoption of cleaner cooking solutions ($F(1, 91) = 237.505$, $p < 0.001$) as shown in Table 11. This confirms that the regression model is a good fit for the data.

Table 11 ANOVA table for Linear Regression for technological factors on level of adoption of cleaner cooking solutions

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.039	1	29.039	237.505	.000[b]
	Residual	11.126	91	.122		
	Total	40.165	92			

a. Dependent Variable: Adoption of Cleaner Cooking Solutions
b. Predictors: (Constant), Technological Factors

Regression Coefficients between technological factors on level of adoption of cleaner cooking solutions

The regression analysis yielded a statistically significant positive relationship between technological factors and adoption of cleaner cooking solutions ($\beta = 0.850$, $t = 15.411$, $p < 0.001$) as shown in Table 12. The unstandardized coefficient (B = 0.758) suggests that for each unit increase in technological factors, adoption of cleaner cooking solutions is expected to increase by 0.758 units. The constant term (0.993) represents the expected value of adoption when the influence of technological factors is zero.

Table 12 Coefficients for Linear Regression between technological factors on level of adoption of cleaner cooking solutions

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.993	.202		4.923	.000
	Technological Factors	.758	.049	.850	15.411	.000

a. Dependent Variable: Adoption of Cleaner Cooking Solutions

The regression equation can be expressed as:

Adoption of Cleaner Cooking Solutions = 0.993 + 0.758 × Technological Factors + error term

This model demonstrates that for every unit increase in the influence of technological factors, the level of adoption of cleaner cooking solutions in Parklands Sub-County, Nairobi is predicted to improve by 0.758 units, holding all other factors constant.

Conclusions

In conclusion, there is a significant statistical relationship between social factors and the level of adoption of cleaner cooking solutions. In addition, different economic factors like household income and financial subsidies affect the rate of adoption of cleaner cooking solutions. In terms if technological factors, it was established that there was a statistically significant positive

relationship between technological factors and the rate of adoption of cleaner cooking solutions. Therefore, it was concluded that social factors, economic factors, and technological factors positively contributed to the adoption of cleaner cooking solutions in Parklands Sub-County.

Recommendations

With social networks and reliance on communal leaders established as an essential social factor, community education should be rolled out on the benefits of using cleaner cooking solutions. Secondly, providers and stakeholders in charge of consumption policies in the country should come up with various plans that offer financial cushioning against the high cost of changing to cleaner cooking solutions. This will help to ensure that average wage earners are still able to enjoy the benefits of these cleaner cooking solutions despite their lower income status. Besides, provider companies in charge of technological innovations should consider the listed technological factors during the innovation process. Working on improving the efficiency, ease-of-use, and operability of technology can prompt users into adopting the use of cleaner cooking solutions.

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