

Who Uses Bottled Gas in Developing Countries?

Educating the public, especially women, about the costs and benefits of fuel choice could promote a switch to cleaner fuels

More than a third of the world's population relies on biomass (wood, dung, crop residues, charcoal) for cooking and heating. Indoor air pollution from burning biomass in traditional stoves can cause serious health damage. Collecting biomass takes time away from such productive activities as schooling and child care. And concentrated use of fuelwood and charcoal can threaten tree resources. Yet a great many families in developing countries will continue to use biomass for the foreseeable future because it typically has the lowest financial cost.

Switching to a gaseous fuel, such as liquefied petroleum gas (LPG), is one way of reducing the problems associated with biomass use. LPG is the most commonly used clean fuel alternative for cooking in developing countries. The rate of LPG adoption by households tends to rise with income in areas where LPG would be the fuel of choice for convenience and cleanliness: urban areas without access to natural gas and all rural areas. But evidence in developing countries shows that many households using LPG also continue to use biomass and that use of multiple fuels is common except at high income levels.

Besides income, other factors also influence patterns of household fuel consumption. LPG is sold in cylinders, and delivery of bottled LPG requires good road infrastructure. There are economies of scale in cylinder management, so the LPG market requires a critical mass of regular consumers to become viable. These factors limit the availability of LPG in many parts of the developing world, particularly in rural areas. Cultural preferences and inadequate information about different fuel options—including fear of explosion and fire—also influence fuel use, and many high-income urban households

continue to use biomass in a number of developing countries.

A recent study by Kojima, Bacon, and Zhou, surveying 110 developing countries, found that LPG served as the primary cooking fuel for more than half the households in 33 countries. The use of LPG increased with wealth quintile in 51 of the 63 countries for which there was information on LPG use by quintile.

The study further examined national household surveys in Guatemala, India, Indonesia, Kenya, Pakistan, and Sri Lanka to gain a better understanding of what factors influence households' decision to use LPG (selection) and, for the households that have decided to use it, how much to use (consumption). In all six countries LPG *selection* increased with household expenditure and the highest levels of education attained by female and male household members, and LPG *consumption* (kilograms per month per household) increased with household expenditure and decreasing price of LPG.

Variables serving as proxies for the level of infrastructure development (electricity connection, urban rather than rural residence) increased selection and consumption, while engagement in agriculture (broadly associated with biomass availability) reduced them. Rising prices of firewood and kerosene, which compete with LPG, increased LPG selection. As expected, income and relative fuel prices were the two most important determinants of fuel use patterns.

Interestingly, the higher the education level attained by female and male members of a household, the more likely the household was to select LPG. This effect was larger for women than for men. Education affected consumption less than selection, and men's education increased consumption more than women's in India and Sri Lanka.

It is often speculated that female-headed households are more likely

to choose clean and convenient fuels because women are directly affected by fuel choice. Once education levels of women and men were separately accounted for, however, the gender of the head of household was not statistically significant in most cases. Where it was significant, results showed that male-headed households were more likely to choose LPG. This finding, which stands in contrast to other study findings, may suggest that female-headed households face unmeasured economic disadvantages that make less cash available for LPG purchase.

Some developing country governments subsidize LPG to encourage fuel switching. But recent steep rises in world prices of LPG mean that the subsidies needed would have to be so large as to be fiscally unsustainable. Monthly household expenditure of more than \$300 would be needed to enable a household to switch entirely to LPG and sustain its use. These findings suggest that in promoting household use of LPG, it would make sense to target households that have an income high enough to start using LPG without subsidies and that already live in areas with LPG marketers.

Education is likely to be a proxy for the level of awareness about the benefits and costs of LPG. In persuading households to start using LPG, raising awareness about the benefits of LPG use and providing basic training on safety features of LPG, especially among women, might be effective in shifting households away from solid fuels to LPG.

Household choice of LPG increases with household expenditure and level of education

Masami Kojima, Robert Bacon, and Xin Zhou. 2011. "Who Uses Bottled Gas? Evidence from Households in Developing Countries." Policy Research Working Paper 5731, World Bank, Washington, DC.