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Child Pneumonia Risks in Rural Kenyan Homes Not Significantly Lowered By Use of Ceramic Indoor Cookstoves

DEERFIELD, IL. (December 11, 2012)—Inexpensive, locally-produced ceramic cookstoves may produce less smoke than traditional indoor 3-stone firepits, but they don't significantly reduce indoor air pollution or the risk of pneumonia in young children, according to results from a small, year-long observational study by researchers working in rural Kenya.

The findings, published online today in the *American Journal of Tropical Medicine and Hygiene*, are the first to examine the health impacts of ceramic cookstoves that do not vent smoke to the outside of the house, said Robert Quick, MD, MPH, a researcher in the Division of Waterborne, Foodborne, and Enteric Diseases at the U.S. Centers for Disease Control and Prevention.

Women who used the ceramic stoves (called "upeshi jiko," which is Swahili for "quick stove") reported less smoke in their homes, along with fewer stinging eyes and runny noses. However, the study found that even though there were fewer respiratory symptoms, these stoves only reduced air pollution by 13 percent and there was no significant difference in pneumonia among children under 3 years of age in these homes when compared to those in homes with 3-stone firepits.

Women and their young children bear the brunt of health problems caused by cooking indoors, in inadequately vented spaces, over open fires fueled by unprocessed wood, charcoal or other biomass.

"Despite requiring less fuel, these stoves may not be efficient enough," Quick said. "The belief is that you need much more efficiency, maybe a reduction of 50 percent or more, to really observe the health benefits," he added.

Pneumonia is the leading cause of death for children under 5 years of age in developing countries, with nearly 70 percent of these 1.2 million deaths occurring in Southeast Asia and sub-Saharan Africa. Research has found household air pollution can increase the risk of pneumonia—a 2008 study found that exposure to this type of pollution from burning solid fuel nearly doubled the risk of pneumonia in young children. Very small particles and toxic gases in indoor smoke can inflame the airways and lungs.

Cleaner burning cookstoves are thought to be one way to reduce harmful household air pollution. The Global Alliance for Clean Cookstoves, one of the most prominent public-private partnerships in this area of public health, has raised US \$114 million in its goal to put 100 million new stoves into households in the developing world by 2020.

“This support of improved cookstoves is exactly what we need to be seeing on this front, but we also need to be sure that the improved cookstoves are actually improving the air quality in a way that reduces health risks too,” Quick added. “There is currently a lot of research activity into the design of cleaner burning cookstoves, including by the Kenya Medical Research Institute and the Centers for Disease Control and Prevention.”

At the same time, there is limited evidence that the cookstoves they evaluated can yield health benefits, according to Quick and his colleagues from the Emory University School of Medicine, Kenya’s Safe Water and AIDS Project, the Kenya Medical Research Institute and the Centers for Disease Control and Prevention.

Methodology

For one year, Quick and his colleagues followed the health of children under 3 years of age in 20 villages in the Nyando District of Kenya’s Nyanza Province, which were already participating in a water quality study.

Since 2008, households in the district have been able to purchase locally produced upesi jiko stoves, sold at a cost of about 150–300 Kenya shillings or US \$2-3. The researchers looked at how rates of cough, pneumonia, and severe pneumonia differed among the infants, and whether these differences were related to upesi jiko or traditional firepit cooking. The cases of pneumonia were diagnosed by fieldworkers trained to recognize familiar signs of the illness, such as a cough combined with a specific rapid breathing rate, but the cases were not confirmed by x-rays or other objective tests.

The stoves study also was not a randomized controlled trial, Quick noted. The number of homes in the study was relatively small. Also, he and his colleagues found there were lower rates of coughing and pneumonia in households with cell phones, a pattern that is consistent with other studies showing that wealthier households—perhaps due to factors such as better access to health care—have a lower risk of the disease. Future randomized studies that include more households and stoves that burn more cleanly, he said, will help clarify whether improved stoves can really make a difference in children’s respiratory health.

Building a Cleaner Cooking Stove

The Global Alliance for Clean Cookstoves and the World Health Organization are also evaluating six other cookstove technologies in a separate study, to find out which designs produce the least pollution, Quick said. “Even though a stove might appear to be burning efficiently, you don’t necessarily remove the key exposures associated with pneumonia.”

The locally-made ceramic cookstoves in the Kenyan study are built into a matrix of mud and sand in the homes and draw air in through a small hole in the side to deliver heat up to a burner surface. The upesi jiko stoves are somewhat more efficient than 3-stone firepits and require less wood or other fuel for cooking.

Better Health Through Home Improvement?

“There is a real demand for upesi jiko stoves and I think that just reflects that the reality of using a three-stone firepit is not very pleasant,” said Quick. “If you’ve ever been in any of these huts while people are cooking, there’s this choking smoke in the household.”

Along with reducing smoke, the upesi jiko cooked faster and gave women more space for food preparation. Quick said that health researchers and global partnerships should pay more attention to these kinds of details as they strive to find ways to reduce household air pollution. “The more we’re meeting the actual demands of these mothers, the better we’ll do.”

“This research on cookstoves illustrates that the approach to improving children’s health must employ strategies that take a holistic view of the child, one that includes the home,” said David H. Walker, MD, the new president of the American Society of Tropical Medicine and Hygiene and chair of the department of pathology at the University of Texas Medical Branch in Galveston. “Data from this and further studies will help aid programs make evidence-based decisions as they determine where to allocate their increasingly scarce funds.”

In the end, cost may be still a significant factor in adopting cleaner cookstoves. The upesi jiko stoves “are relatively cheap, around \$3, but even this small cost is beyond the reach of many people who typically earn US \$1-2 per day,” Quick explained. According to the study, despite the active marketing and availability of this stove, most households didn’t have one.

“Based on our findings in Kenya, the Global Alliance for Clean Cookstoves may want to explore various options—including subsidies—for improving access to clean burning, safe cookstoves by the poorest households where children are at greatest risk of pneumonia,” Quick added.

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