New ways to clean homes may help in Ghana's fight against bacterial disease

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Credit: AI-generated image (disclaimer)

Bacteria that cause disease can be found in homes, schools and hospitals and are building up a resistance to antibiotic drugs. What this means is that, in the not-too-distant future, something as simple as a minor cut could develop into a life-threatening infection.

Up to 2 million people are infected by antibiotic-resistant bacteria every year. Antibiotic resistance could cost 10 million lives and as much as US$8 trillion each year by 2050 if the problem isn't challenged.

In Ghana, there are already a great number of deaths every year from infectious diseases, such as diarrheal diseases and lower respiratory infections. Lack of clean water and sanitation is the main cause. But it is hygiene that breaks the chain of infections and helps prevent them. And levels of domestic hygiene are influenced by a number of economic, educational and other factors.

We believe that understanding domestic hygiene practices better would help to prevent bacterial infection at home, reducing the need for treatment with antibiotics and thus reducing resistance.

I have been working with a group of scientists on design research work that crosses into specialist medical areas, in this instance antimicrobial resistance. In a recently published paper we present our findings based on work we have been doing in Ghana on a project called Dust Bunny, an international design-led research project. The project combines design research and microbiology to provide an informed assessment of practices in domestic cleanliness and to help with the design of novel solutions that reduce infections in the home.

The research has involved academics from a range of disciplines. These have included design, microbiology, epidemiology and social science. This meant that we were able to combine design innovation research methods with microbiology (which includes the study of bacteria).

Our findings show that although household dust is a low risk to health with respect to infectious disease, it provides a pool of antibiotic resistance that could compromise future infections and could cause disease in people who are already suffering from infectious or

non-infectious diseases.

Where science and everyday practice meet

Design research is a process that seeks to understand users, challenge assumptions, redefine problems and test innovative solutions. Its ability to engage real people, understand everyday problems and implement the "right" solution, not just the "newest technology," makes it a bridge between disciplines.

The reason it's important to find out more about home hygiene is that cleaning can actually spread bacteria. Cleaning cloths, towels and mops can spread infection to other rooms unless they are cleaned regularly. When pathogens (disease-causing bacteria) are present in the home they can infect younger and older family members and people who have an existing health condition, making them ill. In Ghana over 15,000 people (2,250 children under five) die each year from poor hygiene alone.

One of the challenges in the fight against bacteria is that they aren't visible to the naked eye. It's difficult to clean what we cannot see.

This is where design innovation methods can help. Working directly with households through methods such as observation, taking photos and making videos, following the household activities through a typical day, and storytelling, can help to develop a deeper understanding of the different ways people keep their homes clean. By engaging with households across different socio-economic groups, locations (city centre, suburbs and informal settlements) and building structures (apartments, detached houses, compound houses and so on), design innovation can create a more complete picture of the role of local traditions, culture, religious practices and individual perceptions on home cleanliness and hygiene.

This field helps to bridge the gap between advancements in science, technology and engineering and everyday contexts.

Microbiologists typically collect dust samples from random households and analyze them to find out how many and what type of bacteria are found in a house. The design research approach helps them to get a sample that represents different socio-economic groups, locations and building structures. This saves money and time.

Design methods help the people who are participating in research to understand the impact of home cleaning on the health of their families. They can then develop more effective cleaning strategies that take into account the type of bacteria found across different homes.

In the Dust Bunny project we worked closely with household participants to design new cleaning practices suitable for different types of homes. We didn't give standard instructions that overlooked local traditions and circumstances. People are much more likely to adopt new ways of doing things if they have been actively involved in their design.

There are creative ways to visualize and explain microbiological results in simple ways. People don't have to be highly educated to understand what the bacteria in their homes mean for their health.

The way forward

The insights gained from combining design and microbiology suggest that there are still challenges in working across disciplines. The function of design in specialist medical areas is not always clearly understood.

But it does provide information about behavior and how to promote best practices for public health. It can also improve targeting of microbiological sampling at the household level.

The Dust Bunny project is piloting these methods in Ghana and engaging with communities and scientists. This has captured both scientific and media attention. A video documentary was broadcast on Ghana Today Television in June and July 2019.

The team followed up the new cleaning practices with another round of microbiological analysis and interviews with households. It is currently analyzing the findings from these.

The key message is that citizens can do as much as scientists to fight drug-resistant bacteria and keep homes healthy.

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