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# Healthy dwellings in Sub-Saharan Africa: from residential waste management to children's health

## IN BRIEF

Many towns and cities in sub-Saharan Africa (SSA) include informal settlements with poor living conditions. Tor example, 58% of Nairobi's population live in such settlements, often classified as 'unhealthy' if they do not provide access to water, sanitation and hygiene (WASH) services.
To inform local and national policy, CUSSH researchers have developed and used tools to understand the influence of unhealthy homes and neighbourhoods in SSA on health. Examples of this include the development of a new Healthy Housing Index (HHI), used to demonstrate the extent to which unhealthy housing in SSA is associated with health morbidities in both adults and children, due to house-level factors ranging from wealth to the sex of the household head, but also due to environmental factors such as location of the house and neighbourhood wealth.
At neighbourhood and city scales, the complex issue of residential waste management requires attention, especially in Kisumu County, where pollution from waste sites affects residents' health. New ways of managing waste have been proposed, which aim to replace commonly used fuels with biogas from waste, improving indoor air quality and residents' health.

**The studies demonstrate that healthy environments contribute to healthy housing. People living in deprived communities are regularly exposed to higher levels of outdoor and indoor pollution, either from burning at nearby landfill waste sites or through using unclean fuels. One method of alleviating this is to use biogas from waste directly as cooking fuel, which could help the existing waste management problem in cities and improve the health of their residents.**

### Methods

- The HHI was developed to categorize the characteristics of healthy housing across SSA countries **[1]**, and then used to assess the effect of healthy housing factors on child morbidity outcomes (ARI, diarrhoea, fever) **[2]**
- Two case studies used Participatory System Dynamics was used to evaluate the effectiveness of policies concerning household waste management and air pollution in slums in Nairobi, Kenya **[3]**
- System Dynamics is a method based on computer simulation, in which a model of the cause-and-effect relationships of a complex system is built, parametrised and validated using real-world information. The studies make a case for using it for complex, multi-stakeholder environmental issues. It was used again for residential solid waste management analysis in Kisumu, Kenya **[4]**
- Attention-based analysis of waste management was used to determine views from various relevant actors across Kisumu county **[5]**

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# OUTLINE RESULTS

- Household wealth is a strong determinant of healthy housing, while larger household size and having a male head of household decreased the odds of a healthy house **[1]**.
- In terms of children's health, reduced odds of diarrhoea and acute respiratory infection (ARI) are found in healthier housing in Cameroon, Kenya and Nigeria, and reduced odds of fever in all SSA countries except South Africa **[2]**
- A contributing factor to ARI in SSA is the use of unclean fuels such as kerosene in cooking. **Dianati et al., 2019** suggest that a provision or subsidy for cleaner fuels alongside indoor pollution monitoring and health impact assessment would drastically reduce indoor pollution levels, and therefore improve people's health **[3]**. These fuels could be directly sourced from proposed residential waste-to-biogas initiatives, which, alongside a ban on landfill burning, would generate over 1.1 million tonnes of cumulative savings in GHG emissions by 2035. It would also reduce particulate matter ($PM_{2.5}$) emissions from the waste and residential sectors by over 30%, saving 1150 cumulative life years over 2021 – 2035 **[4]**.
- However, **Salvia et al., 2021** found that the issues of solid waste management are particularly complex due to the misaligned views of stakeholders: a holistic approach is necessary to action future policies. Two main themes were the practice of managing waste, from its generation and separation to collection and treatment, and the practice of ensuring that waste is managed appropriately **[5].**

# IMPLICATIONS

**Relevance to Local and National Policymakers**

- The publications highlight key policy and program issues that need further interrogation in the search for pathways to addressing the healthy housing deficit in most SSA countries.
- To better understand the variability in children's health across the region, national health and demographic surveys should include sufficient data to capture housing attributes relating to location, physical design, environment, quality of housing, and social attributes.
- To achieve significant reductions in indoor air pollution in slums, a combination of measures must be implemented together. These include encouraging the uptake of clean cookstoves, indoor pollution monitoring and health impact assessment studies, which will also increase public awareness of the issues and associated potential harms to health.
- Supporting local manufacturers, providing subsidies for cleaner fuels and improving electricity supply will encourage public behaviour change in lighting and cooking practices.
- Local policies, regulations and initiatives intended to trigger change towards sustainable waste disposal and effective management are in place, although lack of compliance and resistance to change is frequently reported.
- The multitude of issues surrounding solid waste management appear to originate from the varied and often inconsistent views of the system across stakeholders. A more structured participatory approach and involvement of stakeholders across the multiple stages of waste management is key, starting from the development of county integrated development plans, most notably residents and CBOs. Closer and more sustained engagement of the informal sectors in waste collection is recommended.

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# PUBLICATIONS


**[1] Iddi S**, Muindi K, Gitau H, Mberu B. (2022). Characterization of Healthy Housing in Africa: Method, Profiles, and Determinants. Journal of Urban Health, 1-18. https://doi.org/10.1007/s11524-021-00603-5

**[2] Muindi K**, Iddi S, Gitau H, Mberu B. (2023). Housing and health outcomes: evidence on child morbidities from six Sub-Saharan African countries. BMC pediatrics, 23(1), 1-13. https://bmcpediatr.biomedcentral.com/articles/10.1186/s12887-023-03992-5

**[3] Dianati K**, Zimmermann N, Milner J, Muindi K, Ezeh A, Chege M, ... Davies M. (2019). Household air pollution in Nairobi's slums: A long-term policy evaluation using participatory system dynamics. Science of the Total Environment, 660, 1108-1134. https://doi.org/10.1016/j.scitotenv.2018.12.430

**[4] Dianati K**, Schafer L, Milner J, Gomez-Sanabria A, Gitau H, Hale J, ... Davies M. (2021). A system dynamics-based scenario analysis of residential solid waste management in Kisumu, Kenya. Science of the Total Environment. 777., 146200. https://doi.org/10.1016/j.scitotenv.2021.146200

**[5] Salvia G**, Zimmermann N, Willan C, Hale J, Gitau H, Muindi K, ... Davies M. (2021). The wicked problem of waste management: An attention-based analysis of stakeholder behaviours. Journal of Cleaner Production, 129200. https://doi.org/10.1016/j.jclepro.2021.129200