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The Impact of Rapid Population Growth on Diarrheal Disease in African Cities

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ABSTRACT

Rapid urban population growth in African cities poses significant challenges to public health, particularly by exacerbating the prevalence of diarrheal diseases. This review examines the complex relationship between uncontrolled urban expansion and the increasing burden of diarrheal illnesses, which remain a leading cause of morbidity and mortality, especially among children under five. Rapid urbanization, driven by high fertility rates and rural-to-urban migration, has outpaced the development of essential water, sanitation, and hygiene (WASH) infrastructure, resulting in overcrowded informal settlements with inadequate access to clean water and sanitation services. Through analysis of demographic trends, case studies, and WASH-related health risks, this study highlights how poor sanitation, contaminated water sources, and environmental degradation contribute to the transmission of diarrheal pathogens. The review also explores current public health interventions and policy responses, identifying barriers such as weak governance, limited funding, and cultural factors that impede progress. Finally, it offers recommendations for integrated urban planning, resilient infrastructure investments, community engagement, and innovative technologies to mitigate diarrheal disease risks in rapidly growing African urban centers. Addressing these challenges is critical to improving health outcomes, achieving sustainable development goals, and building resilient, inclusive cities.

Keywords: Rapid urbanization**,** Diarrheal diseases**,** African cities**,** Population growth**,** Public health

INTRODUCTION

Diarrheal diseases remain one of the leading causes of morbidity and mortality globally, particularly affecting children under the age of five in low- and middle-income countries. Sub-Saharan Africa bears a disproportionately high burden of this public health crisis [1]. The World Health Organization (WHO) estimates that over 1.7 billion cases of diarrheal diseases occur globally each year, resulting in the deaths of approximately 525,000 children under five annually [2]. Diarrhea is commonly caused by microbial infections transmitted through contaminated food and water, inadequate sanitation, and poor hygiene practices. In urban Africa, where access to clean water and effective sanitation remains limited, these diseases continue to flourish [3].

At the same time, the African continent is experiencing unprecedented population growth, particularly in urban areas. According to the United Nations Department of Economic and Social Affairs (UN DESA), Africa's urban population is expected to triple between 2020 and 2050, growing from approximately 500 million to over 1.5 billion people [4]. This rapid urbanization is largely driven by high fertility rates and rural-to-urban migration in search of better economic opportunities, education, and healthcare. However, this demographic shift is taking place in the context of limited urban planning, weak governance, and underdeveloped infrastructure systems. Many cities in sub-Saharan Africa are already struggling to provide basic public services, including safe drinking water, adequate sewage disposal, and waste management [5]. As a result, urban environments are becoming increasingly conducive to the spread of communicable diseases, including diarrheal illnesses.

The link between urban population growth and public health is well-established, but there is a growing concern that the current trajectory of urban expansion in Africa may severely undermine efforts to reduce diarrheal disease incidence. Overcrowding, informal settlements, limited access to healthcare, and environmental degradation further exacerbate health risks [6]. For instance, in slum areas, which house a significant proportion of urban residents, open defecation, shared sanitation facilities, and reliance on contaminated water sources are common. These factors

create a vicious cycle of poverty and poor health outcomes, particularly affecting vulnerable groups such as children, women, and the elderly [7].

Understanding the dynamics between rapid urban population growth and diarrheal disease transmission is essential for designing effective public health interventions. This study seeks to review and analyze the causal relationship between these two phenomena, identifying key drivers and offering policy recommendations to mitigate the health risks associated with uncontrolled urbanization [8]. Despite ongoing efforts to improve public health in African cities, diarrheal diseases remain a persistent and widespread problem. One of the major contributing factors is the rapid increase in urban population, which has outpaced the development and maintenance of essential infrastructure for water, sanitation, and hygiene (WASH) [9]. The inadequacy of these services creates an environment where waterborne diseases thrive, especially in densely populated areas where people are forced to share limited resources. Urbanization, when not managed properly, leads to the proliferation of informal settlements or slums, where infrastructure is often nonexistent or poorly maintained. In such settings, residents may be forced to rely on contaminated surface water, use unimproved latrines, and live in unsanitary conditions—all of which increase the risk of diarrheal disease [10]. Furthermore, municipal authorities often lack the financial and technical capacity to address these challenges, leading to a public health crisis that disproportionately affects the poorest and most marginalized communities.

While many studies have explored the general impact of WASH conditions on health outcomes, there is a need for a focused analysis on how rapid urban population growth specifically influences the burden of diarrheal diseases in African cities. Without a clearer understanding of this relationship, policymakers and public health practitioners may struggle to develop effective interventions that can keep pace with urban expansion [11]. Therefore, this study aims to bridge this knowledge gap and provide evidence-based insights to inform urban health policy and planning.

This study aims to investigate the impact of rapid population growth on the prevalence and distribution of diarrheal diseases in African urban settings. Specifically, it seeks to assess urban population growth trends in selected cities over the past 30 years, evaluate the status of water, sanitation, and hygiene (WASH) infrastructure in fast-growing areas, and explore the relationship between urban density and diarrheal disease incidence. It also identifies key risk factors associated with disease outbreaks in high-growth urban zones and proposes effective policy and public health interventions. In addressing these objectives, the study poses five research questions that examine demographic trends, WASH infrastructure adequacy, statistical links between population density and disease, region-specific risk factors, and the effectiveness of existing interventions. The significance of this study lies in its focus on a major but underexplored urban public health challenge in sub-Saharan Africa. By examining diarrheal disease transmission through the lens of urbanization, it underscores the urgent need for integrated planning that combines infrastructure development with health policies. The study offers evidence to inform efforts toward achieving key Sustainable Development Goals, especially those related to health, clean water, sanitation, and sustainable cities. Additionally, it serves as a practical resource for stakeholders including researchers, urban planners, and public health officials, providing insights that support the design of more resilient and inclusive urban health strategies. With African cities expanding rapidly, the research emphasizes the importance of context-specific, innovative solutions to mitigate the health risks posed by inadequate services and rising population densities. Ultimately, this study contributes to a broader understanding of how urban growth shapes public health outcomes and what can be done to reduce disease burdens in vulnerable urban populations.

Rapid Urban Population Growth in Africa

Africa is currently the fastest urbanizing continent, driven by several key factors including rural-to-urban migration, high fertility rates, and natural population growth. This rapid urban population increase is resulting in the uncontrolled expansion of informal settlements, which often lack essential infrastructure and services [12]. Cities such as Lagos, Nairobi, and Kinshasa exemplify a trend of "urbanization without development," where urban growth outpaces the establishment of critical infrastructure. As a result, many urban areas are characterized by unplanned neighborhoods with inadequate access to clean water, sanitation, and waste management systems. The lack of coordinated urban planning and investment in basic services exacerbates living conditions, posing significant challenges to sustainable development. This rapid, unmanaged urbanization places immense pressure on city resources, increases the risk of public health crises, and limits economic opportunities for residents. Addressing these issues requires comprehensive urban planning strategies that integrate infrastructure development, service delivery, and environmental sustainability. Without such interventions, the rapid urban growth in Africa may continue to deepen existing socio-economic inequalities and undermine efforts to improve the quality of life in urban areas [13].

Diarrheal Diseases: Causes and Vulnerable Populations

Diarrheal diseases in urban Africa are predominantly caused by a range of pathogens, including bacteria such as *Escherichia coli* and *Vibrio cholerae*, viruses like rotavirus, and protozoa such as *Giardia lamblia* [14]. These pathogens are commonly transmitted through the fecal-oral route, primarily due to the consumption of contaminated water

and food, which is often a consequence of inadequate sanitation and poor hygiene practices. The burden of these diseases disproportionately affects certain high-risk populations. Children under the age of five are particularly vulnerable due to their underdeveloped immune systems, making them more susceptible to severe dehydration and complications. Immunocompromised individuals, especially those living with HIV/AIDS, also face increased risks due to their reduced ability to fight infections. Additionally, residents of informal settlements and slums are at heightened risk because of overcrowding, lack of access to clean water, and inadequate waste disposal systems. These conditions create an environment conducive to the rapid spread of diarrheal pathogens, leading to high morbidity and mortality rates among affected populations [15]. Addressing these issues requires targeted public health interventions focusing on improved sanitation, safe water access, and healthcare support for vulnerable groups.

Mechanisms Linking Population Growth and Diarrheal Disease

Population growth is closely linked to increased incidence of diarrheal diseases through several interrelated mechanisms. Rapid urbanization often outpaces the development of water infrastructure, resulting in water shortages and increased dependence on unsafe water sources [16]. This situation worsens during rainy seasons when runoff water mixes with waste, leading to widespread contamination. In addition, population surges contribute to inadequate sanitation and poor waste management, with practices such as open defecation and the overflow of pit latrines contaminating both soil and water sources. Overcrowded living conditions further amplify the risk, as densely populated settlements frequently share limited toilet facilities and lack proper handwashing stations, encouraging the spread of disease due to poor hygiene. Moreover, environmental degradation caused by unchecked urban expansion such as deforestation and inadequate drainage systems exacerbates the problem [17]. These conditions increase the likelihood of flooding, which spreads contaminants and creates favorable environments for the transmission of pathogens. Together, these factors form a vicious cycle in which population growth intensifies vulnerabilities to diarrheal diseases by compromising water quality, sanitation, hygiene, and environmental conditions. Addressing these challenges requires integrated urban planning and investment in water, sanitation, and hygiene (WASH) infrastructure to protect public health in growing communities.

Case Studies

Informal settlements across Africa face critical WASH (Water, Sanitation, and Hygiene) challenges, as illustrated by case studies from Kibera in Nairobi, Kenya, and Old Fadama in Accra, Ghana. Kibera, one of the continent's largest slums with over 250,000 residents, suffers from severe infrastructural deficits [18]. Limited access to sanitation facilities and heavily polluted water sources have led to recurrent cholera outbreaks, underlining the vulnerability of residents to waterborne diseases due to inadequate WASH systems. Similarly, Old Fadama in Accra highlights the consequences of rapid urban migration and unplanned settlement growth. The area is characterized by extreme overcrowding, inefficient waste management, and intermittent water supply. Poor drainage systems have exacerbated public health risks, resulting in a high prevalence of diarrheal diseases. Both cases underscore the pressing need for targeted WASH interventions in urban informal settlements. The absence of sustainable infrastructure not only endangers public health but also reflects broader systemic challenges, including urban governance, poverty, and environmental degradation. Addressing these issues requires collaborative efforts involving government bodies, NGOs, and community-based organizations to improve access to clean water, sanitation, and hygiene education [19].

Public Health and Policy Responses

Public health and policy responses to urban WASH (Water, Sanitation, and Hygiene) challenges involve a combination of infrastructure development, education, and innovation. Programs such as UNICEF's WASH initiatives and World Bank-funded urban sanitation projects aim to improve access to clean water and sanitation infrastructure in urban areas [20]. However, their effectiveness is often limited by issues of poor governance and inadequate funding. Health education and behavior change initiatives, particularly community-led total sanitation (CLTS) and hygiene education programs, have demonstrated positive outcomes in reducing open defecation and encouraging consistent handwashing with soap. These efforts are crucial in addressing sanitation-related health risks in densely populated urban settings. In addition, technological innovations play an increasingly important role in urban WASH strategies. Mobile-based platforms for reporting service gaps allow for real-time monitoring and faster response to sanitation problems, while decentralized waste treatment solutions, such as biodigesters, present sustainable and scalable approaches for waste management in informal settlements. Together, these strategies highlight a multi-faceted approach to improving urban WASH conditions, though their success hinges on strong governance, sufficient resources, and community participation [21].

Barriers and Future Directions

Efforts to improve urban public health through Water, Sanitation, and Hygiene (WASH) initiatives face a range of challenges, despite the promise shown by programs and technological innovations. Initiatives like UNICEF's WASH programs and World Bank-funded sanitation projects aim to enhance infrastructure, but their impact is often

hindered by limited funding, weak governance, and poor urban planning [22]. Political instability and population displacement further complicate service delivery, while cultural practices and resistance to behavior change slow the adoption of improved hygiene behaviors. Additionally, inadequate data impairs effective planning and targeting of health interventions. Despite these barriers, there are clear future directions for enhancing urban health outcomes. Integrated urban planning that combines health, housing, and environmental priorities is essential for coordinated development. Investment in climate-resilient WASH infrastructure can help urban areas better withstand floods and droughts. Technological solutions, such as mobile-based WASH reporting and decentralized waste treatment (e.g., biodigesters), offer scalable innovations for informal settlements. Community participation in planning and maintaining WASH services enhances sustainability, while health education programs like community-led total sanitation (CLTS) promote lasting behavior change. Finally, strengthening research and improving surveillance data—especially on diarrheal disease hotspots—will support evidence-based interventions [23]. Addressing these interlinked factors is vital for achieving sustainable urban health improvements.

CONCLUSION

The rapid pace of urban population growth in African cities has profoundly exacerbated the incidence and burden of diarrheal diseases. As urban centers expand without corresponding investments in water, sanitation, and hygiene (WASH) infrastructure, millions of residents especially those in informal settlements remain vulnerable to disease outbreaks driven by contaminated water, poor sanitation, and overcrowded living conditions. The interplay between weak urban governance, limited funding, and political instability has hindered the delivery of essential public services, creating an environment where diarrheal illnesses thrive. Despite ongoing interventions by global and local stakeholders, progress has been uneven and slow. However, there are clear pathways forward. Integrated urban planning, resilient WASH infrastructure, community involvement, and innovative technologies present promising solutions. Ensuring sustainability requires not only financial investment but also political commitment and a deeper understanding of urban health dynamics. Strengthening surveillance systems and fostering a culture of behavior change are equally crucial. Addressing these challenges holistically will be key to reducing the burden of diarrheal diseases and promoting healthier, more resilient African cities in the face of continued population growth.

REFERENCES

1. Nian, T., Guo, K., Liu, W., Deng, X., Hu, X., Xu, M., E, F., Wang, Z., Song, G., Yang, K., Li, X., Shang, W.: Non-pharmacological interventions for smoking cessation: analysis of systematic reviews and meta-analyses. BMC Med. 21, 378 (2023). https://doi.org/10.1186/s12916-023-03087-z
2. Diarrhoeal disease, https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease
3. Obeagu, E. I., Ugwu, O. P. C. Curbing Diarrhea in Children below five years old: The sub-Saharan African Standpoint.*J. New Medical Innovations and Research.* 2024;5(1); DOI:10.31579/2767-7370/083
4. Nations, U.: 68% of the world population projected to live in urban areas by 2050, says UN, https://www.un.org/uk/desa/68-world-population-projected-live-urban-areas-2050-says-un
5. Emmanuel, K.: Promoting Sustainable Development of Cities Using Urban Legislation in Sub-Saharan Africa. Presented at the July 15 (2022)
6. Ugwu, O. P. C., Alum, E. U. and Uhama, K. C. (2024). Role of Phytochemical-Rich Foods in Mitigating Diarrhea among Diabetic Patients. Research Invention Journal of Scientific and Experimental Sciences. 3(1):45-55.
7. Uti, D. E., Agah, V. M., Orji, O. U., Ezeani, N. N., Bawa, I., Omang, W. A. and Itodo, M. O. (2023). Physico-chemical and Bacteriological Analysis of Water used for Drinking and other Domestic Purposes in Amaozara Ozizza, Afikpo North, Ebonyi State, Nigeria. *Nigerian Journal of Biochemistry and Molecular Biology*, 38(1), 1-8. https://doi.org/10.2659/njbmb.2023.151.
8. Uhama, K. C., Ugwu, O. P. C., Alum, E. U. (2024). Phytochemicals and Vitamins as Adjunct Therapies for Diarrhea in Diabetic Patients. Research Invention Journal of Research in Medical Sciences. 3(2):27-37.
9. Omuna D., Obaroh I. O., Akiyode O. O., Eniru E. I., Tiyo C. E & Omoding, J. (2024). Impacts of climate change on water security in Uganda: A review. Int. J. Adv. Multidiscip. Res. 11(9): 47-60. DOI: http://dx.doi.org/10.22192/ijamr.2024.11.09.005
10. Alum, E.U., Obeagu, E.I., Ugwu, O.P.C. Enhancing quality water, good sanitation, and proper hygiene is the panacea to diarrhea control and the attainment of some related sustainable development goals: A review. Medicine (Baltimore). 2024 Sep 20;103(38):e39578. doi: 10.1097/MD.0000000000039578. PMID: 39312342; PMCID: PMC11419503.
11. Coombs, N.C., Campbell, D.G., Caringi, J.: A qualitative study of rural healthcare providers' views of social, cultural, and programmatic barriers to healthcare access. BMC Health Serv Res. 22, 438 (2022). https://doi.org/10.1186/s12913-022-07829-2

12. Awor P, Wamani H, Bwire G, Jagoe G, Peterson S (2012). Private sector drug shops in integrated community case management of malaria, pneumonia, and diarrhea in children in Uganda. *The American journal of tropical medicine and hygiene, 87, (5), 92, doi: 10.4269/ajtmh.2012.11-0791.*
13. Haou, E., Allarané, N., Aholou, C.C., Bondoro, O.: Integrating Sustainable Development Goals into Urban Planning to Advance Sustainability in Sub-Saharan Africa: Barriers and Practical Solutions from the Case Study of Moundou, Chad. Urban Science. 9, 22 (2025). https://doi.org/10.3390/urbansci9020022
14. Agwu, E., Oming, S., Moazzam, M. L. (2015). Prevalence of Cryptosporidiosis among diarrhea patients attending clinics in Bushenyi district of Uganda. Spec parasite pathogens J, 1, (1), 01-08.
15. Pessoa Colombo, V., Chenal, J., Orina, F., Meme, H., Koffi, J. d'Arc A., Koné, B., Utzinger, J.: Environmental determinants of access to shared sanitation in informal settlements: a cross-sectional study in Abidjan and Nairobi. Infectious Diseases of Poverty. 12, 34 (2023). https://doi.org/10.1186/s40249-023-01078-z
16. Adam Birhan, N., Workineh, A.Y., Meraf, Z., Abich, E., Alemayehu, G.M., Alemu, Y., Nigussie, A., Birhan, T.Y.: Prevalence of diarrhea and its associated factors among children under five years in Awi Zone, Northwest Ethiopia. BMC Pediatrics. 24, 701 (2024). https://doi.org/10.1186/s12887-024-05191-2
17. Critchley J. A, Ejemot-Nwadiaro R. I, Ehiri J. E, Arikpo D, Meremikwu M. M (2015). Hand washing promotion for preventing diarrhea. *Cochrane Database of Systematic Reviews, 9, 9. Art. No.: CD004265. DOI: 10.100.*
18. Okesanya, O.J., Eshun, G., Ukoaka, B.M., Manirambona, E., Olabode, O.N., Adesola, R.O., Okon, I.I., Jamil, S., Singh, A., Lucero-Prisno, D.E., Ali, H.M., Chowdhury, A.B.M.A.: Water, sanitation, and hygiene (WASH) practices in Africa: exploring the effects on public health and sustainable development plans. Tropical Medicine and Health. 52, 68 (2024). https://doi.org/10.1186/s41182-024-00614-3
19. Ogban G. I, Ndueso E. M, Iwuafor A. A, Emanghe U. E, Ushie S. N, Ejemot-Nwadiaro R. I (2020). Basic Knowledge of Childhood Diarrhea and Health-seeking Practices of Caregivers of Under-five ChildreninCalabar-South, Calabar, Nigeria. *Asian Journal of Medicine and Health, 18, (4), 12-23. https://doi.org/10.9734/ajmah/2020/v18i430195.*
20. Hutton, G., Chase, C.: Water Supply, Sanitation, and Hygiene. In: Mock, C.N., Nugent, R., Kobusingye, O., and Smith, K.R. (eds.) Injury Prevention and Environmental Health. The International Bank for Reconstruction and Development / The World Bank, Washington (DC) (2017)
21. Ndueso E. M, Iwuafor A. A, Emanghe U. E, Ushie S. N, Ejemot-Nwadiaro R. I, Ogban G. I, (2021). Availability and Affordability of Sanitation and Health Promoting Amenities: Driving the Impact of Knowledge of Childhood Diarrhea on Health-Seeking Practices of Under-five … *Highlights on Medicine and Medical Research, 3. B P International, 140-155. https://doi.org/10.9734/bpi/hmmr/v3/2344E.*
22. Wit, S. de, Luseka, E., Bradley, D., Brown, J., Bhagwan, J., Evans, B., Freeman, M.C., Howard, G., Ray, I., Ross, I., Simiyu, S., Cumming, O., Chandler, C.I.R.: Water, sanitation and hygiene (WASH): the evolution of a global health and development sector. BMJ Global Health. (2024). https://doi.org/10.1136/bmjgh-2024-015367
23. Nelson, S., Drabarek, D., Jenkins, A., Negin, J., Abimbola, S.: How community participation in water and sanitation interventions impacts human health, WASH infrastructure and service longevity in low-income and middle-income countries: a realist review. BMJ Open. 11, e053320 (2021). https://doi.org/10.1136/bmjopen-2021-053320

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