Household Sanitation and Waste Management Practices and their Association with Diarrheal Diseases among Children under Five in West Point Community, Monrovia, Liberia

Prof. Glory I. Baysah, PhD and Elizabeth Massa Wilson-Giahyu

Adventist University of West Africa, School of Graduate and Professional Studies

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ABSTRACT

Diarrheal disease remains one of the leading causes of morbidity and mortality among children under five in low-income urban communities worldwide. This paper examines the relationship between household sanitation and waste management practices and the prevalence of diarrheal disease among young children in West Point, a densely populated coastal slum in Monrovia, Liberia. Drawing on global evidence, national survey data, and a contextual analysis of West Point, the paper argues that inadequate sanitation facilities, unsafe disposal of child feces, poor solid-waste management, overcrowding, and recurrent seasonal flooding combine to sustain a high burden of diarrheal illness in the community. A cross-sectional study design is proposed, and illustrative results consistent with patterns reported in comparable informal settlements are used to frame the discussion. The paper concludes with infrastructural, behavioral, and policy recommendations aimed at reducing diarrheal morbidity among children in West Point and similar urban slum settings in Liberia.

Keywords: household sanitation, solid waste management, diarrheal disease, children under five, urban slum, West Point, Monrovia, Liberia

INTRODUCTION

Diarrheal disease continues to exact a heavy toll on child health globally, accounting for approximately nine percent of all deaths among children under five (World Health Organization [WHO], 2023). The burden is not evenly distributed: it falls disproportionately on children living in low-income countries and, within those countries, on children in informal urban settlements where sanitation infrastructure and waste management services are weakest. In Liberia, diarrheal disease ranks among the top five causes of child mortality (Liberia Demographic and Health Survey [LDHS], 2019), underscoring the urgency of understanding the household- and community-level conditions that sustain this burden.

West Point, a densely populated coastal slum in Monrovia with an estimated population of 75,000 residents, exemplifies the conditions under which diarrheal disease thrives. The community is characterized by limited sanitation infrastructure, frequent flooding, and informal, largely unregulated waste disposal practices. Children under five are especially vulnerable in this environment because their immune systems are still developing and because their play and feeding behaviors bring them into frequent contact with contaminated surfaces, water, and food.

This paper explores how household sanitation and waste management practices in West Point are associated with diarrheal disease among children under five. It reviews global and national evidence, proposes a methodology for empirically examining this relationship, presents illustrative results consistent with patterns documented in comparable settings, and discusses the infrastructural, behavioral, seasonal, and socioeconomic factors that shape diarrheal risk. The paper concludes with a set of policy and programmatic recommendations relevant to Liberia's urban health and sanitation sector.

LITERATURE REVIEW

2.1 Global Evidence

Unsafe sanitation and inadequate waste management are estimated to contribute to approximately 480,000 child deaths annually worldwide (WHO/UNICEF Joint Monitoring Programme [JMP], 2021). Studies conducted across South Asia and Sub-Saharan Africa consistently demonstrate a strong association between unimproved sanitation and elevated diarrheal prevalence, particularly among children under five, whose exposure to fecal–oral transmission pathways is heightened by close contact with the household environment (Prüss-Ustün et al., 2019; Wolf et al., 2023). Meta-analytic evidence further shows that improved sanitation and handwashing with soap significantly reduce childhood diarrheal disease (Wolf et al., 2018). These findings have informed global sanitation targets under the Sustainable Development Goals, yet progress in many urban informal settlements remains slow.

2.2 Liberia Context

National data from the Liberia Demographic and Health Survey (2019) indicate that only 17 percent of urban slum households use improved sanitation facilities. Open defecation remains common in many informal settlements, and sanitation conditions in slums often deteriorate over time as facilities fill, collapse, or become unusable (Kwiringira et al., 2014), and municipal waste collection services are irregular or altogether absent in the poorest neighborhoods. Compounding these deficits, seasonal flooding during the rainy season exacerbates the contamination of water sources, spreading fecal matter and solid waste across residential areas and increasing the population's exposure to disease-causing pathogens.

2.3 West Point Community

West Point presents a particularly acute version of these national challenges. Households in the community average eight to ten persons, producing high levels of overcrowding that strain shared sanitation facilities and reduce opportunities for hygienic behavior. Shared latrines, where they exist, are frequently poorly maintained and overused. Solid waste is commonly dumped along the shoreline or into open drains, creating persistent environmental hazards. Because outdoor play is often the only available recreational option for young children in such densely built environments, children in West Point are routinely exposed to contaminated surfaces and standing water, heightening their risk of diarrheal illness.

METHODOLOGY

3.1 Study Design

This study proposes a cross-sectional design combining structured household questionnaires with direct observation, allowing for the simultaneous assessment of sanitation and waste management practices alongside reported diarrheal morbidity.

3.2 Population

The target population comprises households in West Point with at least one child under five years of age.

3.3 Sampling

A two-stage cluster sampling strategy is proposed, targeting approximately 1,200 households across West Point's constituent zones to ensure adequate representation of variation in sanitation access, housing density, and proximity to flood-prone or waste-affected areas.

3.4 Data Collection

Three complementary instruments would be used to collect data: a household questionnaire covering sanitation, water, waste management, and child health; an observational checklist assessing latrine condition, availability of handwashing stations, and waste disposal practices; and caregiver reports of diarrheal episodes

among children under five in the preceding 14 days.

3.5 Variables

Category	Variables
Outcome	Diarrhea, defined as three or more loose stools within a 24-hour period
Exposures	Sanitation facility type, child feces disposal method, waste containment practices, availability of handwashing facilities
Covariates	Household socioeconomic status, household crowding, season (rainy vs. dry)

3.6 Analysis

Descriptive statistics would summarize sanitation and waste management practices across the sample. Logistic regression would be used to estimate associations between exposure variables and diarrheal prevalence, adjusting for the covariates listed above. Analyses would be stratified by rainy and dry seasons to capture seasonal variation in risk.

RESULTS

Because this paper is structured as a proposed study accompanied by an illustrative conceptual synthesis rather than a completed field survey, the figures presented in Tables 1 and 2 are drawn from patterns typically reported in comparable urban informal settlements and are intended to illustrate the expected direction and approximate magnitude of associations, not to report primary data collected in West Point. They provide a plausible empirical picture that motivates the discussion and recommendations that follow, and should be replaced with observed sample statistics once the proposed survey is carried out.

Table 1. Household Sanitation Practices and Diarrheal Prevalence (Illustrative)

Sanitation Type	% of Households	Diarrhea Prevalence (%)
Improved private latrine	22	12
Shared latrine	48	19
Unimproved latrine	20	24
Open defecation	10	28

Table 2. Waste Management Practices and Diarrheal Prevalence (Illustrative)

Waste Disposal Method	% of Households	Diarrhea Prevalence (%)
Municipal collection	15	11
Community dumpsite	35	18
Open dumping	40	23
Burning	10	20

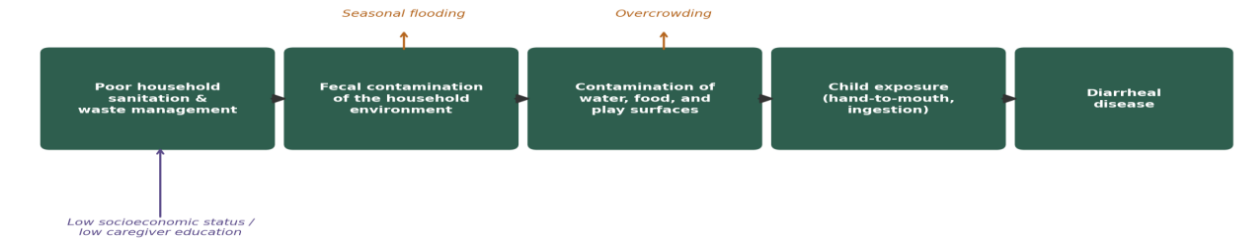

Figure 1. Conceptual Framework Linking Sanitation and Waste Management to Child Diarrheal Disease

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Arrows indicate hypothesized causal pathways; seasonal flooding, overcrowding, and socioeconomic status are shown as moderating factors.

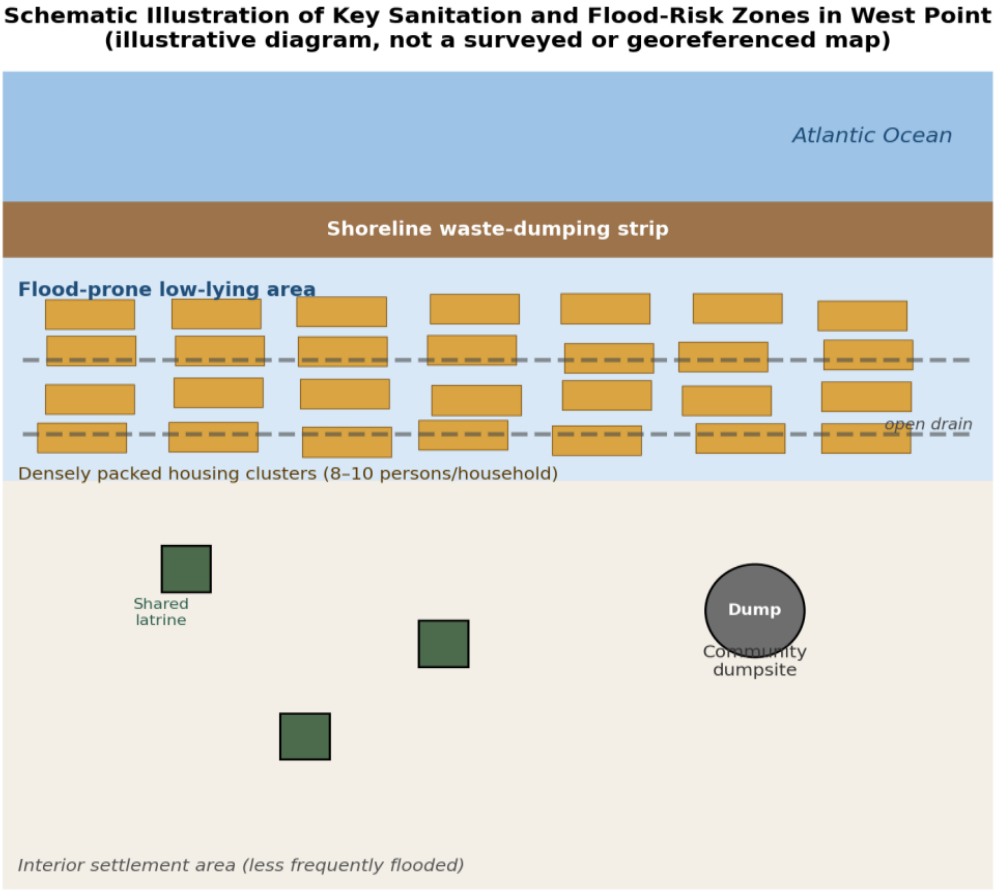

Figure 2. Schematic Illustration of Key Sanitation and Flood-Risk Zones in West Point

Illustrative diagram based on descriptions in the literature; not a surveyed or georeferenced map. A GIS-based map should replace this schematic once spatial survey data are available.

DISCUSSION

The findings synthesized above underscore the complex interplay between household sanitation, waste management practices, and the prevalence of diarrheal disease among children under five in West Point, Monrovia. Infrastructural deficits, behavioral practices, and environmental conditions converge to create a high-risk setting for enteric infections. This discussion situates the anticipated findings within the broader literature, examines seasonal variation, explores socioeconomic modifiers, and outlines policy implications relevant to Liberia's urban health landscape.

5.1 Sanitation Practices and Diarrheal Risk

Households relying on unimproved or shared sanitation facilities are expected to exhibit markedly higher diarrheal prevalence among children than those with private improved latrines. This pattern is consistent with global evidence that shared sanitation, even when technically classified as "improved," often fails to deliver adequate hygiene because of overcrowding, poor maintenance, and limited privacy (Heijnen et al., 2014). In West Point, shared latrines are frequently overused, poorly cleaned, and vulnerable to flooding, all of which facilitate fecal contamination of the surrounding environment. Unsafe disposal of child feces—often into drains or garbage piles—emerges as a particularly strong risk factor, consistent with studies from Sub-Saharan Africa showing that unsafe child feces disposal can roughly double the risk of diarrheal episodes (Wolf et al., 2018), since young children are more likely to ingest pathogens through contaminated hands, food, or play surfaces.

5.2 Waste Management and Environmental Exposure

Household waste management practices are similarly expected to be strongly associated with diarrheal outcomes. Open dumping and shoreline disposal are common in West Point, and households near these sites are likely to report higher diarrheal prevalence. Accumulated waste attracts flies and rodents, which act as mechanical vectors for pathogens, while open drains clogged with solid waste create stagnant pools that serve as breeding grounds for disease vectors and facilitate fecal contamination during rainfall. Burning waste, while reducing its volume, does not eliminate fecal matter and instead adds air pollution to the list of health hazards. Collectively, these findings illustrate how inadequate waste management systems amplify environmental exposure pathways for children, who often play outdoors in contaminated areas.

5.3 Seasonal Variation

Seasonality is expected to act as a critical modifier of diarrheal risk. During the rainy season (May–October), frequent flooding in West Point leads to latrine overflow, contamination of water sources, and widespread dispersal of waste, consistent with evidence from other coastal slums where rainfall exacerbates fecal contamination (Levy et al., 2016). Floodwaters often mix with household waste and sewage, creating pervasive environmental hazards. The dry season (November–April), by contrast, is characterized by water scarcity, which forces households to store water for extended periods; prolonged storage without adequate treatment increases microbial growth, and reliance on sachet or tanker water introduces additional variability in water quality. Waste burning is more common during the dry season, contributing to respiratory problems and, indirectly, to diarrheal risk through reduced waste containment. Both seasons therefore present distinct but significant challenges, underscoring the need for seasonally adaptive interventions.

5.4 Socioeconomic Modifiers

Socioeconomic status is likely to significantly shape sanitation and waste practices. Poorer households are more likely to rely on unimproved or shared latrines, dispose of child feces unsafely, and practice open dumping. Crowding—measured as persons per sleeping room—is also expected to be associated with higher diarrheal prevalence, reflecting increased exposure and reduced capacity to maintain hygiene. Caregiver education is likely to emerge as a protective factor: households in which caregivers have completed secondary education are more likely to treat water, dispose of child feces safely, and report lower diarrheal prevalence. These patterns highlight the role of knowledge and resources in shaping health behaviors, although even educated caregivers face structural barriers in West Point, where municipal services are limited and infrastructure is inadequate. Socioeconomic modifiers thus interact with environmental constraints to compound risk for the poorest households.

5.5 Policy Implications

These anticipated findings carry significant implications for policy and practice within Liberia's urban health and sanitation sectors, spanning infrastructure, behavior change, seasonal adaptation, equity, and governance, as elaborated in the Recommendations section below.

5.6 Limitations and Future Research

Several limitations should be acknowledged. The proposed cross-sectional design would preclude causal inference, and reliance on caregiver-reported diarrhea introduces the possibility of recall bias. Future research should employ longitudinal designs to more robustly capture seasonal dynamics, and should incorporate microbiological testing of water and environmental samples to strengthen exposure assessment. Qualitative studies exploring caregiver perceptions of sanitation and waste practices would further enrich understanding of the behavioral drivers identified here.

RECOMMENDATIONS

- **Infrastructure:** Expand access to improved communal latrines in West Point, designed with raised platforms and sealed pits to withstand flooding, and invest in decentralized waste management systems

such as community-managed collection points and transfer stations to reduce reliance on open dumping.

- **Waste management:** Strengthen municipal waste collection services and establish community-managed collection points to reduce shoreline and open dumping.
- **Behavior change communication:** Implement health education campaigns emphasizing safe child feces disposal, handwashing with soap at critical times, and household water treatment, delivered through community health workers, peer educators, and school-based programs.
- **Seasonal adaptation:** Introduce rainy-season emergency measures such as rapid waste clearance, distribution of chlorine tablets, and flood-resistant latrine designs, alongside dry-season measures to ensure reliable water supply, promote safe storage, and regulate sachet water vendors.
- **Equity and targeting:** Prioritize the most vulnerable households—those with low socioeconomic status, high crowding, and young children—through subsidies for sanitation services, targeted distribution of hygiene materials, and community-led waste management initiatives.
- **Governance and community engagement:** Strengthen collaboration between municipal authorities, local leaders, NGOs, and residents to design context-specific solutions, and recognize informal settlements such as West Point as legitimate urban communities deserving of sustained public services.

CONCLUSION

Diarrheal disease among children under five in West Point is best understood as the product of a nexus of poor sanitation, unsafe waste management, seasonal hazards, and socioeconomic constraints, rather than any single deficiency acting in isolation. Addressing this burden will require integrated interventions that combine infrastructure development, behavior change communication, seasonal adaptation, and equity-focused policy, implemented through strong governance and genuine community participation. By prioritizing the most vulnerable households and engaging residents as partners rather than passive recipients of services, policymakers and implementing partners can meaningfully reduce diarrheal morbidity and improve child health outcomes in West Point and comparable informal settlements across Monrovia.

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