The Journal of Public Space
ISSN 2206-9658
2024 | Vol. 9 n. 1
https://www.journalpublicspace.org

The Relationship between Access to Safe Water and Sanitation and Women's Health in the Self-produced Settlements.
A Case Study of Mathare in Nairobi

Angela Dominguez
University of the Basque Country, Spain
angeladominguezsanchez@gmail.com

Abstract
Access to safe water and sanitation in self-produced settlements is a significant societal problem. Yet, there is a notable gap in understanding and evaluating the impact on women's health, and how this intersects with public space. In Sub-Saharan Africa, nearly half of the urban population lives in self-produced settlements. These are complex environments that are continuously growing and are home to almost two-thirds of the population in cities such as Nairobi. Mathare, one of the largest self-produced settlements in Nairobi, exhibits notably poor health outcomes, with women experiencing diarrhoea at twice the average rate of Nairobi. In such a precarious context, the health of its inhabitants requires a specific approach. This paper devises a multidimensional framework for analysing and evaluating the key spatial and socioeconomic factors affecting women's health in these self-produced settlements. It connects women's health and well-being to broader structural disadvantages, such as insecure tenure, poor housing conditions, low monthly income and a lack of access to basic services. This case study emphasises the critical importance of access to safe water and sanitation. Women's daily routines often revolve around water, exposing them to heightened risks of waterborne diseases such as diarrhoea or typhoid fever. Moreover, many women can only access water and sanitation in public spaces in Mathare, where they are particularly vulnerable to violence. This research also concludes how these risks perpetuate a cycle of poverty and vulnerability among women in these communities and emphasises the critical importance of implementing multidisciplinary policies and tailored approaches to enhance the health and well-being of women living in self-produced settlements.

Keywords: self-produced settlements, women's health, slum health, access to safe water, access to adequate sanitation

To cite this article:
Dominguez, A. (2024) "The Relationship between Access to Safe Water and Sanitation and Women's Health in the Self-produced Settlements: A Case Study of Mathare in Nairobi", *The Journal of Public Space*, 9(1), pp. 67-88. doi: 10.32891/jps.v9i1.1812.

This article has been double blind peer reviewed and accepted for publication in *The Journal of Public Space*.

1. Introduction

By 2050, around 3 billion people will live in self-produced settlements globally (UN, 2016). This paper focuses on Sub-Saharan Africa, where roughly 238 million people live (UN, 2022). The rise of self-produced settlements represents a major issue for health promotion in cities of the Global South, as they harbour profound health disparities (Corburn & Riley, 2016). In the African context, the health challenges posed by self-produced settlements are particularly acute in places such as Kenya and its capital Nairobi. Approximately 65% of Nairobi's population live in self-produced settlements, representing only 5% of the city's residential land (Corburn & Riley, 2016). The health of women living in these settlements is influenced by factors such as economic status, educational level, and the conditions of the built environment.

In Kenya, lack of access to safe water and inadequate sanitation was the second leading cause of death in 2009 (Ministry of Health, 2014). In addition, women in self-produced settlements remain neglected compared to the rest of Nairobi and Kenya, as mortality rates are higher in comparison to middle- and high-income areas (APHRC, 2014). This article aims to deconstruct and explore the relationship between access to clean and safe water and sanitation and the health of women in self-produced settlements, illustrating intersections with the public spaces significant to these debates. It develops a multidimensional framework alongside a set of indicators for the analysis and evaluation of the key physical and socioeconomic dimensions of health, addressing them in relation with the main risks affecting women in self-produced settlements. This paper analyses the case study of Mathare, one of the largest self-produced settlements in the city of Nairobi (KNBS, 2019), where the incidence of diarrhoea reported by women and girls double Nairobi's average (Corburn & Karanja, 2016).

Although the gendered division of unpaid labour is a global phenomenon, women in the Global South are most often responsible for water supply, cooking, hygiene and small-scale productive activities, many of which take place in the public sphere (Matamanda et al., 2024). Where access to safe water and adequate sanitation is not available, this results in a great investment of women's time and energy. Furthermore, it increases the risk of water-related diseases and intensifies women's exposure to violent incidents such as sexual abuse and is linked to the perpetuation of their poverty (West et al., 2013; Matamanda et al., 2024, Harris et al., 2015; Sultana, 2020; Anwar et al., 2020). The direct and indirect violence women face in public spaces (Chant, 2013) hinders their safe access to water and sanitation as well as their active participation in urban life. The threat of experiencing violence often leads to women's withdrawal from social networks due to feelings of shame or social stigma (Heise et al., 2002). Consequently, this undermines their right to access resources and shape the public spaces that fulfil their human needs in the city (Harvey, 2008). Safe water is a vital element in the interaction between the dwellers of self-produced settlements and the State. Its absence evinces their marginalisation and lack of recognition as citizens and deepens their feelings of exclusion and precariousness while eroding their capacity to sustain livelihoods (Sultana 2020, Anwar et al., 2020).

Hence, it is crucial to develop an intersectional approach for understanding the nexus between the right to the city, gender, access to water and health (Matamanda, 2022). To explore the relationship between access to safe water and sanitation and women's health in self-produced settlements, this paper begins with a literature review to characterise these urban contexts and understand the particularities and factors

impacting health, especially among women. Secondly, drawing on existing literature, the paper develops an analytical framework with key indicators that defines measurable physical and socio-economic dimensions related to safe access to water and sanitation in these settlements. Thirdly, this paper presents an overview of the context of the case study, assessing the influence of colonialism in the creation of spatial inequality that ultimately affects the quality of public space and women's health. The fourth section applies the aforementioned analytical framework to the case of Mathare using data collected from local rigorous studies. Finally, the conclusion highlights the impact the precarious supply of basic services such as water and sanitation have on the health of women in Mathare, and its reciprocal interaction with the socioeconomic context, to undermine women's right to the city.

2. Literature review

2.1. Characterisation of self-produced settlements

Existing research deploys various terms, such as "slum" or "informal settlement" (Nuissl & Heinrichs, 2013), to characterise the socio-spatial concentration of urban poverty, each laden with subjectivities and varying by geographical context. However, these expressions fail to convey their true significance or the economic and cultural contributions they make to the cities in which they are located (UN Habitat, 2006). On one hand, the term 'informal' perpetuates the exclusion and discrediting of its residents, proving insufficient to capture its complexity while obscuring the responsibility of institutions in producing informality as they perpetuate power relations (Abad, 2020). On the other hand, the more common yet equally controversial term is 'slum', which continues to carry a negative connotation of poverty, unsanitary conditions, misery, and insecurity (Nuissl & Heinrichs, 2013).

In this paper, the concept of 'self-produced settlements' is employed to restore agency and legitimacy to the population (Roy, 2011; Nuissl & Henrichs, 2013; Abad, 2020). This approach analyses 'the urban' from a subaltern perspective, eschewing the false dichotomy of formal/informal (Yiftachel & Mammon, 2022; Miraftab, 2009) and encouraging citizens to challenge normalised power relations and define their own terms of engagement (Miraftab, 2009). This is especially pertinent in the context of such colonial heresy as Nairobi. Additionally, the United Nations Human Settlements Programme (UN Habitat) has defined a 'slum' as a spatial context with "inadequate access to safe drinking water, inadequate access to sanitation and other infrastructure, poor structural quality of housing, overcrowding and insecure residential conditions" (UN Habitat, 2003, p.12). However, self-produced settlements are not homogeneous, and inhabitants do not have equal access to space production and its associated services, with exclusions often based on income, gender, ethnicity, and other factors (Corburn & Riley, 2016)." Moreover, Corburn and Riley (2016) highlight the broader structural forces that contribute to the formation and persistence of self-produced settlements, including political corruption that benefits from urban poverty, neoliberal pressures that weaken or privatise services and a lack of institutional investment in infrastructure and housing. This, in turn, demands a critical look at the histories of colonialism and the 'export' of urban planning decisions from the Global North to the Global South, failures in wealth redistribution and corruption, of housing policies and other national and urban policies (Corburn & Riley, 2016; Ezeh, 2017; UN Habitat, 2003).

2.2. 'Slum health': Health in self-produced settlements

Determinants of health in self-produced settlements require specific attention, as interventions effective in other urban contexts may not be applicable to these areas (Ezeh, 2017). Corburn and Riley (2016) define 'slum health' as the ongoing advancement of well-being, living conditions, access to services, and life-affirming opportunities, coupled with the mitigation of risks, disabilities, hazards, and diseases, particularly in the Global South. They argue that certain resources and technologies essential for improving slum health, such as municipal wastewater treatment, necessitate large-scale investments most effectively managed by governmental entities, whereas other resources can be more efficiently provided by local communities (Corburn and Riley, 2016). Dwellers of self-produced settlements cope with multiple overlapping problems, such as entrenched poverty, overcrowded housing and tenure insecurity, and these issues contribute to health inequalities, for example, increased risk of exposure to environmental pathogens causing infections and communicable diseases (Corburn and Sverdlik 2017). Insecure tenure results in a lack of investment in housing improvements, such as the provision of latrines or improved electrical and structural systems, increasing the potential for accidents or exposure to climatic events. In addition, overcrowding is associated with the development of respiratory diseases and the spread of tuberculosis, influenza, meningitis and other diseases (Corburn & Riley, 2016; Mitullah, 2002). Moreover, diseases such as cholera, typhoid, numerous bacterial diseases, malaria and other enteric diseases flourish in conditions where people have inadequate access to water and sanitation and where stagnant water is contaminated (ONU Habitat, 2003, Winter et al., 2018). Self-produced settlements are unhealthy places with particular risks of infection and injury alongside shared environmental risks such as poor sanitation (Ezeh 2017). Indeed, Corburn and Sverdlik (2017, p. 5 state that residents of self-produced settlements "increasingly face the 'triple threat' of infectious diseases, non-communicable conditions (e.g. diabetes, cardiovascular disease and mental illness) and injuries due to violence or road traffic accidents".

The Sustainable Development Goals (SDGs) attach central importance to access to water and sanitation across several SDGs. Of particular note are SDG 3 (Good Health and Well-Being), SDG 5 (Gender Equality), SDG 6 (Clean Water and Sanitation), SDG 10 (Reduced Inequalities), SDG 11 (Sustainable Cities and Communities) and SDG 17 (Partnerships for the Goals). The latter include specific targets and indicators that foster universal access to water and sanitation and consequently the health and well-being of all people, particularly women and girls.

2.3. The case of women

Women and girls are disproportionately affected by inadequate water and sanitation, poor housing, high crime rates and frequent sexual violence in self-produced settlements. Women often serve as the chief earner; they frequently work multiple jobs with minimal support from law enforcement given the risks of violence they face. These harsh conditions severely impact their safety, health, and quality of life (FAWCO, n.d., Amnesty International, 2009).

Women in self-produced settlements also bear disproportionate responsibilities for unpaid work including water provision, cleaning, and cooking, exposing them not only to mental stress but also to health risks related to waterborne diseases and musculoskeletal issues such as arthritis from carrying water over long distances (Matamanda, 2022). Additionally, poor sanitation practices during menstruation contribute to health issues such as vaginal

infections and urinary tract infections (UTIs) and complications like haemorrhoids are common (Winter et al., 2018).
Women also face increased vulnerability to violence while fetching water in the public space or using public sanitation facilities after dark (West et al., 2013; Sultana, 2020). This threatening scenario leads many women to opt for practices that avoid the use of public sanitation points, but which pose a risk to both their individual and collective health. Some of these alternatives include not drinking liquids, inducing constipation and UTIs, and also using so-called 'flying toilets' (Winter et al., 2018). This latter practice consists of defecating in a bag that is then thrown into public space, greatly impacting community health as it contaminates and stagnates surface water and aquifers, increasing the risk of malaria and other diseases spread by mosquitoes and other vectors, such as dengue fever (Winter et al., 2018; Corburn & Karanja, 2016). Additionally, these areas become breeding grounds for viruses and bacteria, leading to common illnesses among women, such as typhoid fever and diarrhoea (Corburn & Karanja, 2016). Furthermore, long-term sustained exposure in early life to excreta-related pathogens such as helminths or worms, can limit cognitive brain development and decrease immunity to disease (Corburn & Karanja, 2016).
Additionally, diarrhoea is prevalent among women in Mathare, with 90% of cases attributed to faecal contamination of drinking water and food (Corburn & Karanja, 2016), severely impacting health by hindering nutrient absorption. This poses a critical concern for the 12% of Nairobi's self-produced settlement residents affected by HIV, as diarrhoea reduces the effectiveness of antiretroviral treatment (Madise et al., 2012). In addition, women in these settlements face a 38% higher HIV prevalence than men, primarily due to lower socio-economic status, higher rates of violence, and a lack of quality services and infrastructure (Madise et al., 2012; Corburn & Karanja, 2016; Amnesty International, 2010; West et al., 2013).
Further, inadequate water and sanitation services impose a significant economic burden on families in self-produced settlements. They incur costs for preventive measures such as purchasing uncontaminated water, using public latrines, and buying fuel for boiling water. Beyond that, they face medical expenses for treatment and lost wages due to illness, particularly when women must care for children during episodes of diarrhoea (Corburn & Karanja, 2016). Poor health outcomes also lead to economic losses at the national level, with sanitation-related diseases costing Kenya 0.9% of its GDP in lost productivity (WSP, 2012).

3. Analytical framework

Drawing on existing literature, an analytical framework for the determinants of women's health, alongside a set of measurable indicators, has been developed. The dimensions and sub-dimensions of the analytical framework, presented in Table 1, are drawn from those presented in "The Challenge of Slums" (UN, 2003). The physical determinants include (i) access to safe water, (ii) access to safe and dignified sanitation, and (iii) housing and environment. Socio-economic determinants include (iv) security of tenure, (v) income, and (vi) health status.

A. PHYSICAL DIMENSIONS	
1. Access to safe water	
Key Indicators	**Recommendation**
1.1. % of households with piped water inside the dwelling.	100% of households with piped water (UN, 2015)
1.2. Distance (metres) from any household to the nearest water point.	300m maximum to the nearest water point (Sphere Association, 2018).
1.3. No. of people per water point.	250 people maximum per water point (Sphere Association, 2018).
2. Access to safe and dignified sanitation	
Key Indicators	**Recommendation**
2.1. % of households with private sanitation.	100% of households have private sanitation (UN, 2015).
2.2. Distance (m) from any household to a latrine.	Maximum 30m distance between a household and a functioning latrine (see Note below).
2.3. No. of people per latrine.	20 persons maximum (Sphere Association, 2018).
2.4. % of households served by a waste collection system.	100% of households served by a waste collection system (UNHCR, 2024)
2.5. Location of latrines and sanitation facilities in at-risk areas.	All excreta containment facilities are at least 30 m from any surface or groundwater source (UNHCR, 2024).
3. Housing and environment conditions	
Key Indicators	**Recommendation**
3.1. Sufficient usable area per person for private and public outdoor activities (This includes streets, health facilities, sanitation, public transport facilities, etc.).	45 m² of usable area per person (Sphere Association, 2018)
3.2.Square metres of living space per person, excluding service areas (cooking space, bathing area and sanitation facilities).	Minimum 3.5m2 of living space per person (excluding cooking and bathing space) (Sphere Association, 2018).
3.3. Location of dwellings and facilities in at-risk areas.	Dwellings and facilities located in safe areas, mantaining adecquate buffer zone from or avoiding known hazard zones such as flood plains, landslide-prone areas. near industrial sites or hazardous facilities and ensuring accessibility (Sphere standards, 2018).
3.4. % of dwellings with permanent construction.	100% of the dwellings with permanent construction (UN, 2015).
B. SOCIO-ECONOMIC DIMENSIONS	
4. Security of tenure	
Key Indicators	**Recommendation**
4.1. % of households/individuals who have a document guaranteeing security of tenure for their housing option.	100% of the households with a document guaranteeing security of tenure (UN, 2015).
4.2. % of households with legal electricity connection.	100% of the households with legar electricity connection (UN, 2015).
5. Economic income	
Key Indicators	**Recommendation**
5.1. Average monthly income	Minimum montly salary: 13,471 KSh (Country Economy, 2012)
5.2. % of residents dependent on the informal sector.	0% of residents dependent on the informal sector (ILO, 2015).
5.3. % of income spent on purchasing water for basic services (access to drinking water, water for domestic hygiene and sanitation).	Less than 5% of monthly income dedicated to basic services (Sphere Association, 2018)
6. Health status	
Key Indicators	**Recommendation**
6.1. % of women reporting good health.	Minimum 75% of the people reporting (Ministerio de Sanidad, 2020; Organización Panamericana de la Salud, 2018)
6.2. % of women reporting illness related to water and sanitation	0% of the illness reported might be related to water and sanitation (UN, 2015)
6.3. % of mothly income dedicated to access healthcare services	0% of monthly income dedicated to healthcare access (UN, 2015).
6.4. % of the population that can access a primary healthcare centre walking less than one hour from their dwellings.	Minimum 80 % (Sphere Association, 2018)

Table 1. Key indicators and recommendations of the dimensions of women's health. Source: Author. Note: The Sphere standards (2018) recommend 50m; author reduces to 30m due to the dense environment.

For each sub-dimension, the existing policy literature has been reviewed to identify key measurable indicators with (minimum) recommendations. Specifically, the indicators presented draw on the Sphere standards (2018), Sustainable Development Goals and targets as well as other relevant documents.
Data collection[1] relating to Malthare case study and the minimum recommendations for each of the key indicators is based on a literature review of documentation related to this research work such as UN Habitat, NGDOs and reference groups of local self-produced settlements such as Slum Dwellers International, especially the study "Mathare Valley Collaborative Upgrading Plan" (MuST, Slum Dwellers International, University of Nairobi & University of California Berkeley; 2011). This study was conducted in collaboration with the MuST and the Department of Regional and City Planning and the School of Public Health of the University of Berkeley, which has academic experts on health in the self-produced settlements and has thoroughly analysed the issue in Nairobi. In addition, census documents and other demographic reports such as the Kenya Demographic and Health Survey (KDHS) developed by the Kenya National Bureau of Statistics (KNBS, 2015) and the Nairobi Urban Demographic and Health Surveillance System (Nairobi Urban HDSS-NUHDSS) have also been reviewed.
Moreover, efforts have been made to incorporate the voices of Kenyan women as much as possible, including in the bibliography works by Kenyan authors as well as through testimonies collected by other studies, from women in Nairobi's human settlements.

4. Case study: Mathare (Nairobi)

The colonial past and the segregation policies in Nairobi greatly shaped the challenges of the self-produced settlements of Nairobi. The declaration of Kenya as a British colony in 1920 led to the denial of political participation for Africans and Asians (until 1944), the expropriation of local lands in favour of settlers and the exploitation of the region's resources (Vecino, 2020). The city of Nairobi was founded due to its strategic location during the construction of the railway that would connect Mombasa and Kampala, to transport resources easily (Vecino, 2020). Europeans settled in the higher, fertile parts of the city to avoid tropical diseases, and colonial policies enforced the separation of Europeans from Indians and natives (Corburn & Riley, 2016). Segregation policies in Nairobi allocated 80% of the city's land to only 10% of its residents, contributing to the establishment of Mathare, one of Nairobi's oldest self-produced settlements, resulting from colonial displacement (Anyamba T.J.C., 2006; Abad, 2020). This historical exclusion persisted after independence, worsening housing shortages and rising prices driven by speculation, pushing many into informal sectors despite Nairobi's population doubling since 1990. Despite self-produced settlements occupying just 5% of residential land, they accommodate more than half of Nairobi's population, highlighting the disparity in access to formal housing, services, and infrastructure (Corburn & Riley, 2016; Kenya National Bureau of Statistics, 2019).This stark contrast is set against the backdrop of Nairobi's broader socio-economic landscape, where the city, home to 4.4 million people, faces

[1] Refer to the cited studies for more details on data collection. Despite the difference in year of data collection, it is assumed that the context has changed little enough for the different data to be cross-referenced.

growing class inequality, making it one of the continent's most unequal cities (Dianova, 2017).
Notwithstanding poor living conditions, Mathare as well as other self-produced settlements keep attracting rural migrants seeking job and housing opportunities (Ren et al., 2020; Mitullah, 2002). Furthermore, the female population in the self-produced settlements of Nairobi has increased from 20.4% in 1948 to 50.1% in 2019, yet women remain politically underrepresented (KNBS, 2019; Kinyanjui, 2014). In Mathare, women constitute 48,4% of the total population (KNBS, 2019) and more than half of them are unemployed. Among those who are working, only a few had jobs with non-relatives, while others were either self-employed or engaged in family businesses (Darkey, 2013). However, in Mathare as in the rest of the self-produced settlements, women dominate markets. They often work as street vendors in there and peri-urban areas and as maids in wealthier neighbourhoods. This trend has led to the growth of self-produced settlements near these areas, mirroring patterns in other parts of the world. These jobs are crucial for household economies and provide social benefits and self-esteem and mobility is essential for their economic participation, but limited access and freedom of movement marginalise them in public spaces (Kinyanjui, 2014).

5. Analysis and Evaluation of Mathare

This section presents an analysis of how the Mathare case study meets the recommendation minimums for each of the key indicators presented in Table 1. The results are contextualised and supported by other relevant data to help understand the relationship between the different dimensions in the analytical framework.

5.1 Results of the indicators

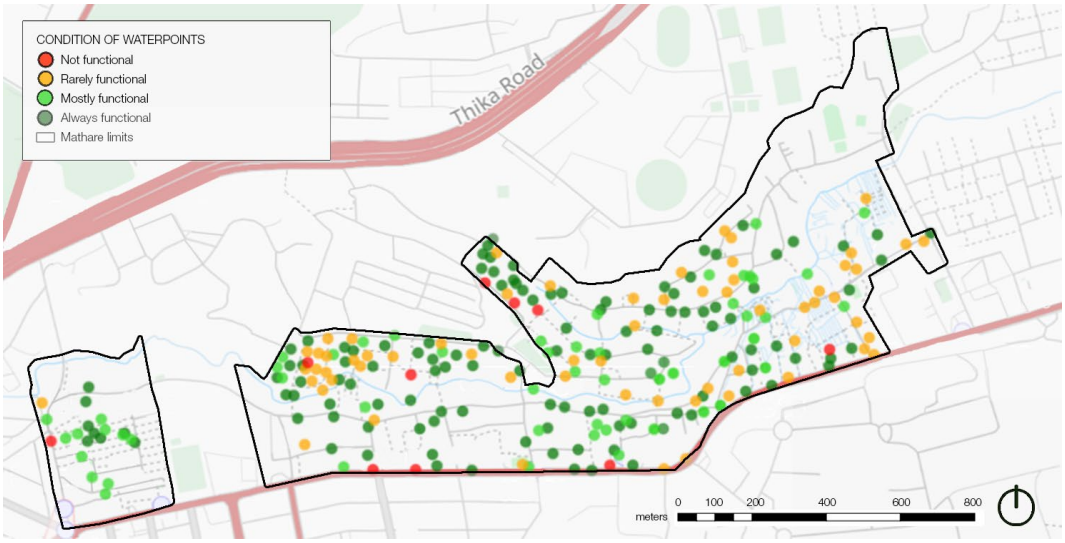
a. Access to safe water

a.1. Percentage of households with piped water inside the dwelling

In Mathare, only 10% of households have piped water at home (MuST et al., 2011); a figure that is far from the 100% recommended to ensure basic household habitability. Most households without piped water rely on public and backyard taps or purchase water from tankers (MuSTt et al., 2011) making public spaces crucial for accessing this basic commodity.
Furthermore, as Map 1 shows, the quality and reliability of water is variable. The infrastructure suffers from frequent contamination due to vandalised pipes, over-demand and supply cuts. Women and children, in particular, face long waits to access water. Moreover, community water points are controlled by cartels, resulting in price increases, especially during droughts (MuST et al., 2011).

a.2. Distance (metres) from any household to the nearest water point

The geographical distribution of water points in Mathare is uneven, heterogeneous as shown in Map 1. Relating this to the analytical framework, the scenario is positive as 100% of households are within 300 m of the nearest water point (UN Habitat, 2020).



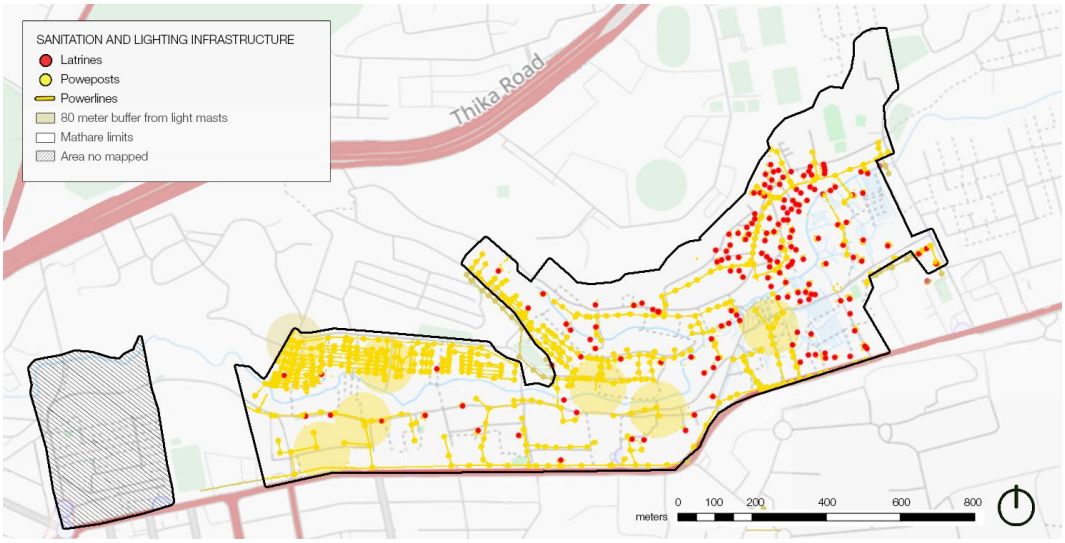
Map 1. Map of the reliability of the functioning water points in Mathare. Source: Author. Data from UN Habitat, 2020.

a.3. No. of people per water point
The total number of water points (taps) is too low to serve communities adequately and effectively, as each water point covers, on average, 315 people (MuST et al., 2011). This is 65 people above the recommendations of the Sphere standards (2018).

<u>b. Access to safe and dignified sanitation</u>
b.1. Percentage of households with private sanitation
Only 17% of households in Mathare have private sanitation infrastructure (Corburn & Karanja, 2016). The remaining 83% use public toilets which vary greatly in type and spatial distribution. Most of these 'functional' sanitation blocks are not connected to the wider sewerage system, leading to wastewater discharge into streets, rivers, and even the households themselves, polluting the riparian area and posing health risks, especially during floods (MuST et al., 2011).

b.2. Distance (metres) from any household to a public latrine
Only 29% of households live within 30 metres of a functioning public latrine block (MuST, 2011), as shown in Map 2. This is particularly problematic for women and girls who are forced to walk long distances in unsafe public spaces at night with no or insufficient lighting in order to use a public toilet or latrine. This distance poses significant safety risks for women and girls who face risks of violence and sexual abuse when accessing these facilities (Winter et al., 2018).

b.3. No. of people per latrine
The number of users per latrine varies widely, from 17 people per latrine to 232 depending on the district, with an average of 70 people per latrine (MuST et al., 2011). This exceeds three times the Sphere Standards recommendation referenced in the analytical framework.



Map 2. Map of location of public sanitation points and street lighting. Source: Autor. Data from: MuST, 2011.

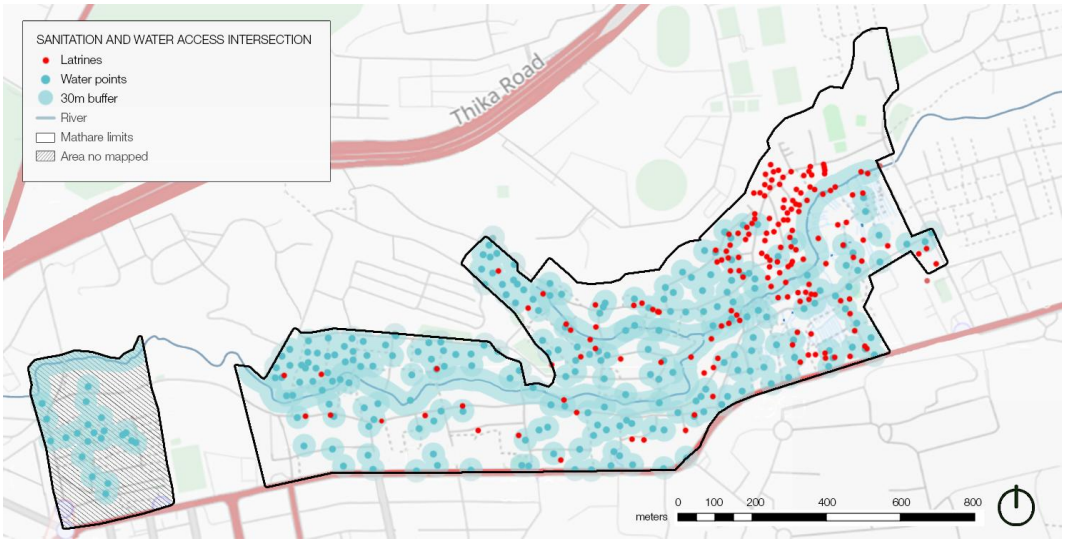
b.4. Percentage of households served by a waste collection system

Only 28% of households have waste collection services (formal or informal), resulting in widespread waste dumping and burning in public spaces. Corburn and Karanja (2016) estimate that 86% of households dump wastewater on the streets, posing health risks, especially for children (MuST et al., 2011). In Nairobi's slums, poor waste management leads to environmental hazards like water and air pollution, blocked drainage causing flooding and waterborne diseases, and accumulated waste fostering disease vectors and soil contamination affecting food security (The New Humanitarian, n.d., UN Habitat, 2007).

b.5. Location of public latrines and sanitation facilities in at-risk areas

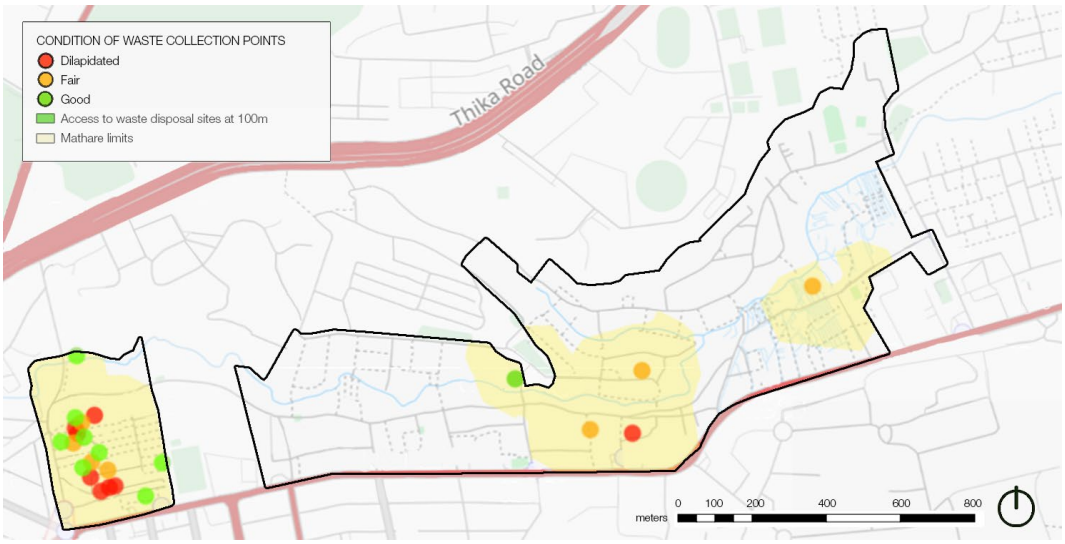
The Mathare River significantly affects the infrastructure and health of the neighbourhood. Located in a valley, Mathare experiences frequent flooding during the rainy season and receives pollutants from surrounding areas. Furthermore, its past industrial activity has left the soil without topsoil, preventing water seepage. Although limited, there are agricultural and livestock activities along the riverbank that further pollute the river ecosystem and wastewater. Lastly, the poor waste management creates exposed dumps, increasing bacterial concentration and affecting residents' health (MuST et al., 2011).

In this respect, the situation in Mathare is assessed negatively, based on the analytical framework. On the one hand, as shown in Map 3, the excreta containment facilities have not been located in suitable areas or at an adequate distance (at least 30 metres) from water sources, either surface or groundwater; what increases the likelihood of disease outbreaks, as contaminated water and soil become breeding grounds for pathogens (Bird et al., 2017; Population Matters, n.d.).



Map 3: Map of latrines and water points. Source: Author. Data from UN Habitat, 2020.

On the other hand, as shown in Map 4, the urban centre is surrounded by several solid waste collection and disposal points, 70% of which are open dumps (UN Habitat, 2020) and therefore do not comply with health recommendations.



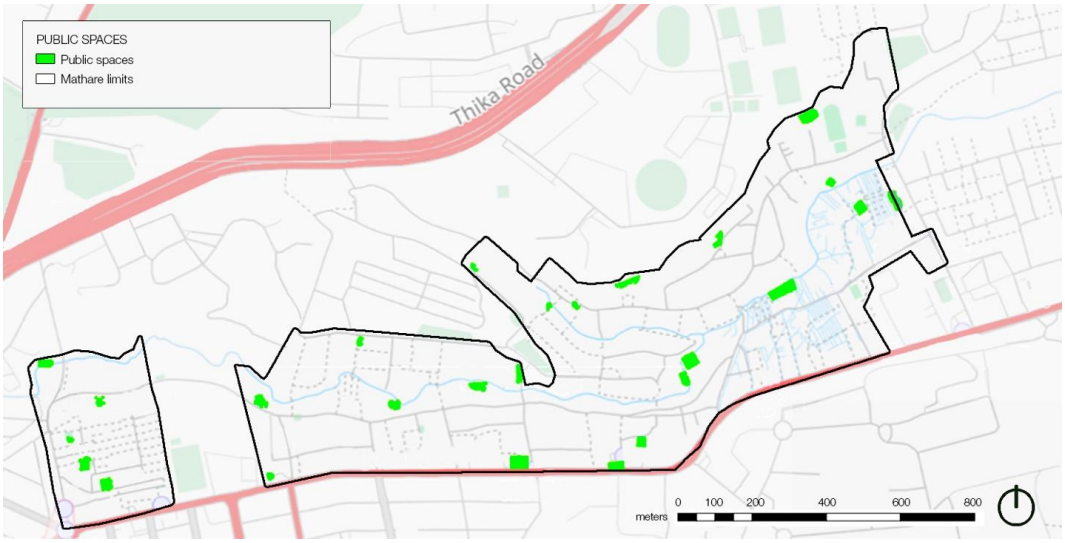
Map 4. Map of waste collection points. Source: Author. Data from UN Habitat, 2020.

c. Housing and environment

c.1. Sufficient usable area per person for private and public outdoor activities

Mathare houses around 200,000 people, being the densest (68,940 people per km²) of Nairobi's 180 settlements (Mwau, 2020). Its attraction lies in its proximity to the business centre, which has led to an increase of the built-up area from 76% to 82% since 2009, reducing open space from 12% in 2003 to 3.8% in 2019 (Mwau, 2020).

As shown in Map 5, less than 2% of Mathare's area is now public open space, far below the recommended 15-20% (UN Habitat, 2015). Additionally, public open spaces are small, averaging 350 m², with the largest around 1,200 m² (UN Habitat, 2015).
Mathare's extreme density hampers services like public latrines and water pumps and strains public services and facilities, especially schools, health centres, and markets (Mwau, 2020). The Covid-19 pandemic exacerbated this situation, with high population density and limited infrastructure facilitating disease spread (UN AIDS, 2020).



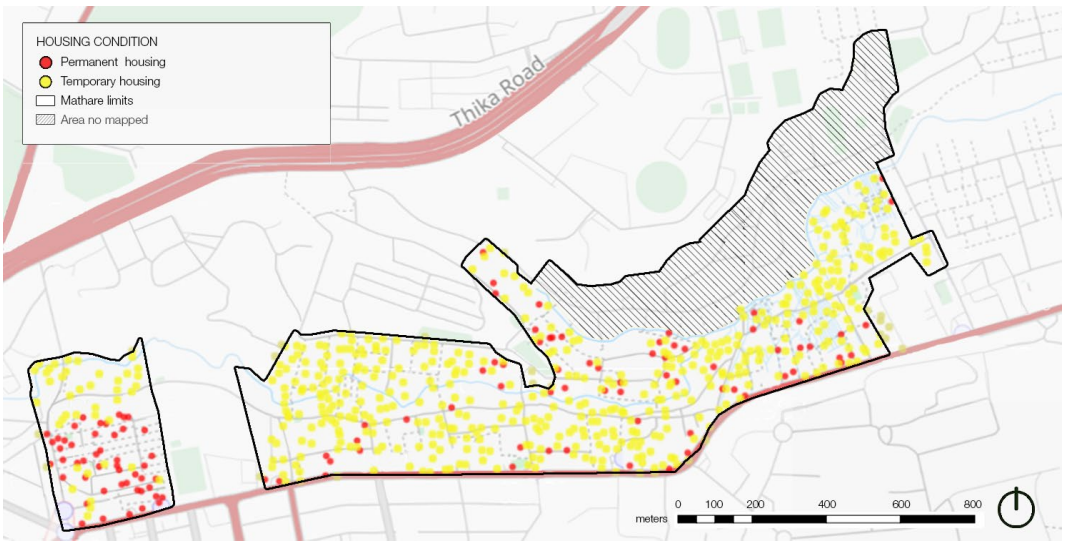
Map 5: Map of public open spaces. Source: Author. Data from UN Habitat, 2020.

c.2. Square metres of living space per person, excluding service areas
A typical Mathare dwelling is 3x3 m, which often accommodates about 5 people (Kamau & Njiru, 2018). This is 1.8m2 per person including cooking area; again considerably less than the 3.5m2 recommended per person (excluding service areas) reflected in the Sphere standards. This overcrowding seriously impacts women's health, as it greatly increases their exposure to various diseases, especially respiratory diseases, due to cooking with charcoal (Corburn & Hildebrand, 2015).

c.3. Location of dwellings and facilities in at-risk areas
Planning and interventions in Mathare have aggravated erosion and conditions in the valley, especially along the riverbanks, which are prone to flooding and pollution. Although the settlement is bordered by two major roads, internal access is challenging, hindering movement between districts and adversely affecting social and economic interactions and security. Streets are narrow and few are accessible to vehicles, making emergency management difficult. In addition, steep slopes and river crossings are dangerous, especially for children and the elderly. For all these reasons, the location of housing in Mathare is considered unsuitable (MuST, 2011).

c.4. Percentage of dwellings with permanent construction
Housing in Nairobi's self-produced settlements is generally precarious, with a lack of security of tenure leading to a sense of temporariness and reducing the safety and quality of

public space. In Mathare, 53% of residents live in floor structures and 80% of houses lack permanent sand construction walls (MuST et al., 2011) as shown in Map 6. Most homes have corrugated steel roofs, corrugated steel or mud walls, are supported by wooden posts and have poor ventilation. These single-room houses, measuring 3x3m, serve as the bedroom and living room-kitchen for entire families (APHRC, 2014; Kamau & Njiru, 2018). The precariousness of their construction makes them very vulnerable to collapse, especially during heavy rains or winds, and have a high fire risk due to their construction with flammable materials and inadequate electrical connections (Obermayr, 2017) that can also spread the fire and affect the surrounding houses and public space (MuST, 2011). Common fuels for cooking and lighting are paraffin and charcoal, with negatively impact on the health of the occupants of the house, especially the women (Dianatli et al, 2019), especially in terms of respiratory diseases (Corburn & Hildebrand, 2015) and the environment (UN Habitat, 2006).



Map 6: Map of the temporality of housing construction in Mathare. Source: Author. Data from: MuST, 2011.

d. Security of tenure

d.1. Percentage of households/individuals who have a document guaranteeing security of tenure for their housing option.

Residents of Nairobi's informal settlements face significant challenges due to insecure tenure, leading to frequent forced evictions. In Mathare, a majority of households rent their homes, with only 17% being homeowners, typically residing in the same house for an average of 8 years (MuST, 2011). This insecurity disproportionately affects women, discouraging investments in home improvements such as private latrines or better electrical systems, which impacts their health and well-being (Cities Alliance, 2021; MuST, 2011).

d.2. Percentage of households with legal electricity connection

In Mathare, electricity access is severely limited, with only 9% of households having formal connections, while 68% rely on informal connections and 22% have no access at all (MuST et al., 2011). The prevalence of illegal connections, which are expensive and

unsafe, exemplifies the poverty penalty in these contexts (UN Habitat, 2003). This precariousness in electricity provision also impacts public safety and health, as informal connections erode public lighting. The lack of adequate lighting in homes increases darkness, heightening the risk of aggression, hindering mobility, and contributing to accidents, thereby damaging social cohesion (Amnesty International, 2010; Sakketa, 2023).

e. Economic income

e.1. Average income

The average monthly household income is KSh 8,500 (€70)[2], which falls below Kenya's minimum wage of KSh 13,471 (€111) in 2012 (MuST et al., 2011; Country Economy, 2012). This income level is considered insufficient according to the analytical framework, highlighting widespread economic challenges. Additionally, women in Mathare are disproportionately paid below the minimum wage compared to men (Country Economy, 2012).

e.2. Percentage of residents dependent on the informal sector

In Kenya, 83% of labour is informal Statista, 2022). In Mathare, 87% of residents are casual workers or have informal businesses (MuST et al., 2011), often in public spaces, running small stalls. The analytical framework assesses this negatively, since labour informality profoundly impacts the health and food security of families. When work is scarce, resources have to be divided between food, water and medical care (MuST et al., 2011).

e.3. Percentage of income spent on purchasing water for basic services

The WHO recommends 50 litres of water per person per day for basic needs. For a family of 5 in Mathare, this translates to 250 litres per day, costing approximately KSh 750 per month if purchased from private vendors at KSh 2 per 20-litre jerry can (MuST et al., 2011). Additionally, the cost of using a latrine is around KSh 5 per use (Corburn & Karanja, 2016), amounting to another 750 KSh monthly assuming one use per family member per day. Consequently, households need to spend at least 1,500 KSh monthly on water and sanitation, which constitutes 17% of their average monthly income, significantly exceeding recommended expenditure levels. This disparity, where the most vulnerable urban households pay 10 to 20 times more for water of poorer quality than wealthier residents, is referred to as the poverty penalty (UN-Water, 2019).

f. Health status

f.1. Percentage of women reporting good health

Only 45% of women surveyed during a study in Mathare reported good health, compared to 62% of the men surveyed (Corburn & Hildebrand, 2015).

f.2. Percentage of women reporting illness related to water and sanitation

As shown in Table 2, seven of the nine diseases most frequently reported by women in a study of Mathare are directly related to water and sanitation: violence (68%), diarrhoea

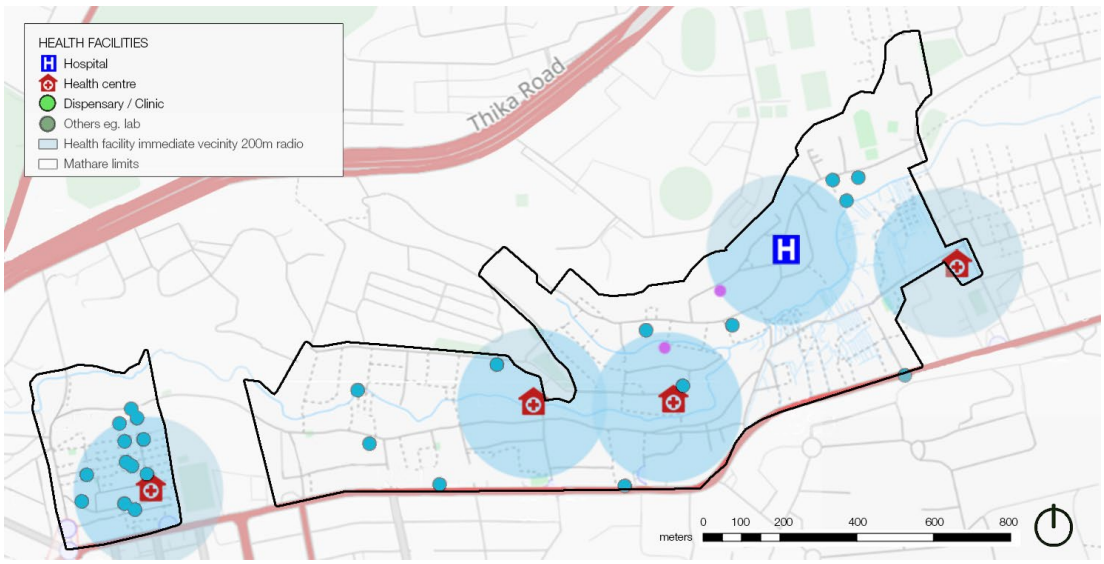
[2] The Ksh-Euro exchange rate in the document has been updated with the official rate as of 13 September 2022.

(30%), fever (22%), malaria (23%), typhoid fever (17%), rash (15%) and HIV (14%), as stated by Corburn and Hildebrand (2015).

Women's physical condition	Frequency (% of total women in Mathare sample that reports)
Violence	68%
Respiratory disease (cough)	46%
Diabetes	33%
Diarrhoea	30%
Fever	22%
Malaria	23%
Typhoid Fever	17%
Skin rash	15%
HIV	14%

Table 2. Physical condition reported by women in Mathare. Source: Corburn & Hildebrand, 2015.

f.3. Percentage of the population that can access a primary healthcare centre within one hour's walk from their dwelling in Mathare, based on the observation of Map 7, 100% of the dwellings are less than one hour's walk from a primary healthcare centre, as a distance of 1 km (as shown in the graphical legend) takes approximately 15 minutes.



Map 7. Map of healthcare facilities in Mathare. Source: Author. Data from UN Habitat, 2020.

f.4. Percentage of income dedicated to medical expenses

SDG 3 targets universal free healthcare, as indicated by the analytical framework. However, a Mathare household spends on average 6% of monthly income on health care according to the MuST (2011) study. Government health centres, though affordable, often lack supplies and over demand means long wait times, which drives residents to more expensive private clinics (Mitullah, 2022; MuST, 2011).

5.2 Summary of the evaluation

Diagram 1 provides a graphic visualisation of the analytical framework's main dimensions and sub-dimensions of health as they apply in the case study of Mathare. Each symbol in the diagram relates to one of the dimension indicators of the analytical framework.

It shows that except for the proximity to a water point and proximity to a health centre (green), all the indicators are below the recommendation (red), shaping a greatly negative scenario for Mathare's women's health condition.

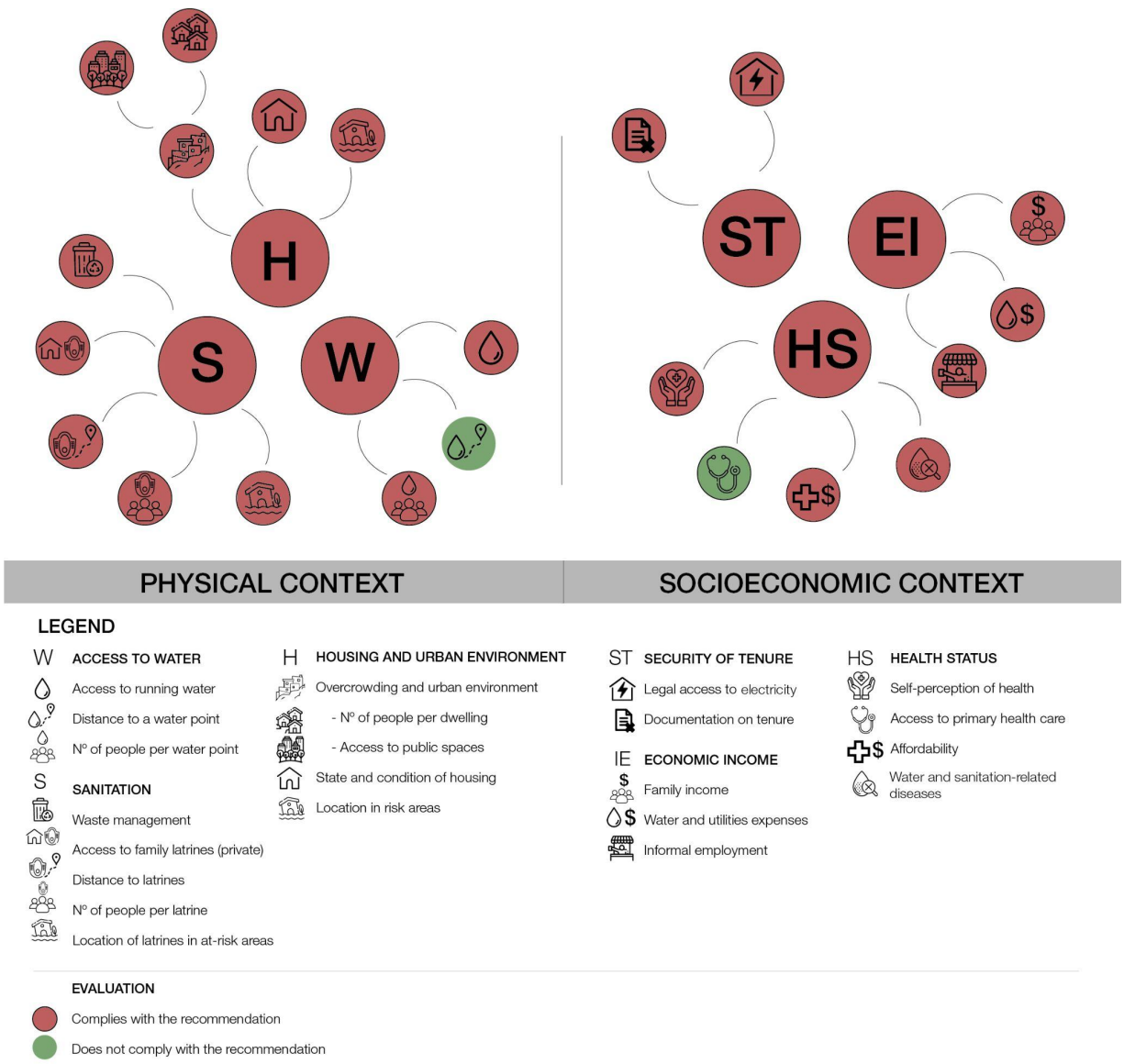


Diagram 1. Graphic representation of the analytical framework Prepared by the author.

5.3 Cross-checking data

There is a strong interconnection between the defining dimensions of the Mathare context and the self-assessment of health outcomes of women and other vulnerable groups. While women report good health in just 45% of cases compared to 62% of men (Corburn & Hildebrand, 2015), other discrepancies are shown according to variables in which women are generally discriminated against.

As shown in the previous section, just 10% of households in Mathare have piped water at home (MuST, 2011), forcing the remaining 90% to use unreliable public yard taps. This severely affects health as only 12% of those using an unreliable tap declare good health (Corburn & Hildebrand, 2015), compared to 72% of those who use a reliable tap. Similarly, the analysis shows how only 17% of households have a private toilet, with 37% of those reporting good health. However, only 7% of those lacking privacy in sanitation blocks and 12% practising open defecation (a common practice among women in Mathare) declare good health (Corburn & Hildebrand, 2015). Furthermore, only 33% living more than 30m from a sanitation block report good health, compared to 92% living within a 30m radius (Corburn & Hildebrand, 2015). Given that only 29% of the people in Mathare live less than 30m away (MuST, 2011), this precarious situation greatly impacts the health of thousands, especially women, who face higher risks of sexual violence when accessing public toilets.

Additionally, in Mathare, only 28% of households are served by a waste collection group (MuST, 2011). According to Corburn and Hildebrand (2015), 82% of those served by organised waste management report good health, in contrast to 47% of those not served. Thus, the built environment and the characterisation of some public spaces have a significant impact on the health of the inhabitants of self-produced settlements.

From a socioeconomic standpoint, we can also find illustrative results. In Mathare, only 17% of households are homeowners (MuST, 2011), with 87% of those reporting good health (Corburn & Hildebrand, 2015). Conversely, only 19% of renters report good health (Corburn & Hildebrand, 2015). Lastly, 58% of those who earn less than 10,000 KSh/month (82 euros/month) and 71% of those who earn more than that report good health (Corburn & Hildebrand, 2015). With average monthly income below the minimum wage (KSh 8,500 or €70) and women often paid below minimum wage, low income greatly impacts women's health in Mathare, highlighting the importance of socioeconomic conditions on health status."

6. Conclusion

This article has discussed the significant challenges confronting self-produced settlements in Sub-Saharan Africa and their impact on women's health, with Mathare serving as a key case study. While previous studies have examined factors affecting women's health in similar contexts, this research contributes to an understanding of the interconnected nature of these factors by analysing in detail how access to safe water and sanitation intersects with the other dimensions and their relationship with the nature of the public space. It reveals the complexities of discrimination against women and emphasises the crucial role these factors play in their health and well-being. By providing new evidence on their intersectional impacts, the study advances the debate on equitable access to the city and informs policy recommendations aimed at improving urban health outcomes. The article has endeavoured to underscore how the extreme urban density and acute

shortage of space exacerbates the provision of essential services such as public latrines and water pumps (Mwau, 2020) and how lack of tenure security prevent families from investing in home improvements to reverse this situation (Cities Alliance, 2021; MuST, 2011). These challenges stem from inadequate urban planning and discriminatory policies, which underscore the neglect faced by the population. This study concludes that failure to uphold the "right to the city," particularly in relation to access to safe water and sanitation, significantly affects the health of residents in self-produced settlements. Particularly women, who bear primary responsibility for household caretaking duties, are therefore more vulnerable to waterborne diseases and violence. In Mathare, those who cannot afford regular access to clean water and sanitation, or live far from access points, report poorer health and a higher incidence of diseases related to water and sanitation (Corburn & Hildebrand, 2015). The article has also explored the coping mechanisms women have to avoid the risk of violence in public spaces, as women experience public space differently than men and are more vulnerable to sexual abuse (Chant, 2013). In this regard many women reduce liquid intake or use "flying toilets", which contaminate surface water and aquifers and pose great threats to individual and collective health (Winter et al., 2018).

The analysis conducted illustrates how the lack of adequate water and sanitation services places a heavy economic burden on households, perpetuating their poverty and/or vulnerability. The economy of most households in Mathare is precarious, with monthly household income below the minimum wage and high levels of informal employment. In this regard, deteriorated health condition poses a double threat to women's economic status, as they must bear the extra costs of care and treatment, that of not working. Additionally, poor health status of the population also has consequences for a country's economy through lost productivity (WSP, 2012).

This study concludes, firstly, that women's health in self-produced settlements is affected by several spatial and socioeconomic determinants, with access to safe water and sanitation being one of the most relevant ones. Secondly, it highlights the primordial need of adopting multidisciplinary policies and a specific perspective to improve women's health and wellbeing in self-produced settlements.

Further research could expand the analytical framework by broadening the dimensions of analysis and incorporating updated, gender-disaggregated data for each indicator, providing a more nuanced understanding of the impact on women. This additional study could also include a comparative analysis across different neighbourhoods. Additionally, a longitudinal follow-up study is recommended to evaluate the indicators over time, particularly in relation to the impact of potential slum upgrading programs.

Only with an intersectional and multidisciplinary approach will it be possible to address the structural causes that perpetuate inequality and precariousness (WHO & UN Habitat, 2010), ensuring access to basic services without putting the lives of the most vulnerable at risk every day and achieving Sustainable Development Goals for all.

References

Abad, J. (2020) Co-Production of the space. Case Study of Mukuru Special Planning Area. Master's thesis. Universidad Politécnica de Madrid.

African Population and Health Research Center (APHRC) (2014) Population and Health Dynamics in Nairobi's Informal Settlements. Nairobi: African Population and Health Research Center.

Amnesty International (2009) Kenya: The Unseen Majority. Nairobi's Two Million Slum-Dwellers. London: Amnesty International.

Anyamba, T.J.C. (2006) Diverse informalities: Spatial transformations in Nairobi. A study of Nairobi's urban process. Oslo: Oslo School of Architecture and Design.

Anwar, N.H., Sawas, A. & Mustafa, D. (2020) 'Without water, there is no life': Negotiating everyday risks and gendered insecurities in Karachi's informal settlements. Urban Studies, 57(6), pp.1320–1337. Available at: https://www.jstor.org/stable/26959510 [Accessed 30 June 2024].

Bird, J., Montebruno, P. & Regan, T. (2017) Life in a slum: Understanding living conditions in Nairobi's slums across time and space. Oxford Review of Economic Policy, 33(3), pp.496-520. doi: 10.1093/oxrep/grx036.

Chant, S. (2013) Cities through a 'gender lens': A golden 'urban age' for women in the global south? Environment and Urbanization, 25, pp.9–29.

Corburn, J. & Hildebrand, C. (2015) Slum sanitation and the social determinants of women's health in Nairobi, Kenya. Journal of Environmental and Public Health, 2015, pp.1-6. doi: 10.1155/2015/209505.

Corburn, J. & Karanja, I. (2016) Informal settlements and a relational view of health in Nairobi, Kenya: Sanitation, gender, and dignity. Health Promotion International, 31(2), pp.258-269. doi: 10.1093/heapro/dau100.

Corburn, J. & Riley, L. (2016) Slum Health: From the Cell to the Street. Oakland: University of California Press.

Corburn, J. & Sverdlik, A. (2017) Slum upgrading and health equity. International Journal of Environmental Research and Public Health, 14(4), pp.342. doi: 10.3390/ijerph14040342.

Country Economy (2012) Kenya—Minimum Wages 2012. Country Economy. Available at: https://countryeconomy.com/national-minimum-wage/kenya [Accessed 30 June 2024].

Darkey, D. & Kariuki, A. (2018) A study on quality of life in Mathare, Nairobi, Kenya. Department of Geography, Geoinformatics and Meteorology, University of Pretoria.

Dianati, K. et al. (2019) Household air pollution in Nairobi's slums: A long-term policy evaluation using participatory system dynamics. Science of The Total Environment, 660, pp.1108-1134. doi: 10.1016/j.scitotenv.2018.12.430.

Dianova (2017) En Kenia, los retos y el potencial son tan grandes como en África. Dianova. Available at: https://www.dianova.org/es/advocacy-articles/en-kenia-los-retos-y-el-potencial-son-tan-grandes-como-africa/ [Accessed 30 June 2024].

Ezeh, A. et al. (2017) The history, geography, and sociology of slums and the health problems of people who live in slums. Lancet, 389(10068), pp.547-558. doi: 10.1016/S0140-6736(16)31650-6.

FAWCO, n.d. What is life like for women and girls in Mathare? Federation of American Women's Clubs Overseas. Available at: https://www.fawco.org/global-issues/human-rights/human-rights-articles/4855-what-is-life-like-for-women-and-girls-in-mathare [Accessed 30 June 2024].

Harris, L.M. et al. (2017) Intersections of gender and water: Comparative approaches to everyday gendered negotiations of water access in underserved areas of Accra, Ghana, and Cape Town, South Africa. Journal of Gender Studies, 26(5), pp.561-582. doi: 10.1080/09589236.2016.1150819.

Harvey, D. (2008) The right to the city. New Left Review, (53), pp.23-40.

Heise, L., Ellsberg, M. & Gottmoeller, M. (2002) A global overview of gender-based violence. International Journal of Gynaecology and Obstetrics, 78, pp. S5-S14.

Sakketa, T.G. (2023) Urbanization and Social Cohesion: Theory and Empirical Evidence from Africa. IDOS. Available at: https://www.idos-research.de/fileadmin/migratedNewsAssets/Files/DP_16.2023.pdf [Accessed 30 June 2024].

International Labour Organization (ILO) (2015) Recommendation No. 204. ILO. Available at: https://normlex.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID,P12100_LANG_CODE:3243110,es [Accessed 30 June 2024].

Kamau, N. & Njiru, H. (2018) Water, sanitation, and hygiene situation in Kenya's urban slums. Journal of Health Care for the Poor and Underserved, 29(1), pp.321-336. doi: 10.1353/hpu.2018.0022.

Kenya National Bureau of Statistics (KNBS) (2015) Kenya Demographic Health Survey 2014. Nairobi: KNBS.

Kenya National Bureau of Statistics (KNBS) (2019) 2019 Kenya Population and Housing Census: Volume I: Population by County and Sub-County. Nairobi: KNBS.

Kinyanjui, M.N. (2014) Women and the Informal Economy in Urban Africa: From the Margins to the Centre. London: Zed Books.

Matamanda, A.R., Mphambukeli, T.N. & Chirisa, I. (2024) Exploring water-gender-health nexus in human settlements in Hopley, Harare. Cities & Health, 8(1), pp.44-58. doi: 10.1080/23748834.2022.2136557.

Ministerio de Sanidad (2020) Indicadores de Salud 2020: Evolución de los indicadores del estado de salud en España y su magnitud en el contexto de la Unión Europea. Madrid: Ministerio de Sanidad. Available at: https://www.sanidad.gob.es/estadEstudios/estadisticas/inforRecopilaciones/docs/Indicadores_de_Salud_2020.pdf [Accessed 30 June 2024].

Ministry of Health (2014) Kenya Health Policy 2014-2030: Towards Attaining the Highest Standard of Health. Nairobi: Ministry of Health. Available at: https://www.ncikenya.or.ke/documents/kenya-health-policy.pdf [Accessed 30 August 2024].

Mitullah, W, (2003) Urban slums reports: The case of Nairobi, Kenya.

Miraftab, F. (2009) Insurgent planning: Situating radical planning in the global south. Planning Theory, 8(1), pp.32-50.

Muugano Support Trust (MuST) (2011) Slum Dwellers International, University of Nairobi, & University of California, Berkeley: Mathare Valley Collaborative Upgrading Plan. Nairobi.

Mwau, B. (2020) Urban transformation and informal shelter actors, interests and change in Mathare Valley: City Briefing. IIED.

Nuissl, H. & Heinrichs, D., 2013. Slums: Perspectives on the definition, the appraisal, and the management of an urban phenomenon. Journal of the Geographical Society of Berlin, pp.105-106.

Organización Panamericana de la Salud, 2018. Indicadores de salud: Aspectos conceptuales y operativos. Washington, D.C.: OPS.

Obermayr, C., 2017. Informal housing and marginal settlements. In: Sustainable City Management. The Urban Book Series. Springer. doi: 10.1007/978-3-319-49418-0_3.

Population Matters (2024) Urbanisation challenges in Kenya's Nairobi: A tangled web of issues. Population Matters. Available at: https://populationmatters.org/news/2024/01/urbanisation-challenges-in-kenyas-nairobi-a-tangled-web-of-issues/. (Accessed 30 June 2024)

Ren, H., Guo, W., Zhang, Z., Kisovi, L.M. and Das, P. (2020) 'Population Density and Spatial Patterns of Informal Settlements in Nairobi, Kenya', Sustainability, 12(18), p. 7717. doi: 10.3390/su12187717.

Roy, A. (2011) Slumdog cities: Rethinking subaltern urbanism. New Delhi: Aakar Books.

Sphera Association (2018) Sphera Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response (4th edn). Geneva, Switzerland: The Sphere Project. doi: 10.3362/9781908176226.

Statista (2022) 'Informal sector employment in Kenya by activity', *Statista*. Available at: https://www.statista.com/statistics/1134287/informal-sector-employment-in-kenya-by-activity/. (Accessed: 30 June 2024)

Sultana, F. (2020) 'Embodied intersectionalities of urban citizenship: Water, infrastructure, and gender in the Global South', Annals of the American Association of Geographers, 110(5), pp. 1407-1424. doi: 10.1080/24694452.2020.1715193.

The New Humanitarian (no date) 'Kenya's waste management challenge', The New Humanitarian. Available at: https://www.thenewhumanitarian.org/report/97638/kenya%E2%80%99s-waste-management-challenge. (Accessed: 30 June 2024)

UN Habitat (2007) UN HABITAT and the Kenya Slum Upgrading Programme. Available at: https://unhabitat.org/sites/default/files/download-managerfiles/UNHABITAT%20and%20the%20Kenya%20Slum%20Upgrading%20Programme%20%28KENSUP%29.pdf. (Accessed: 30 June 2024).

UN Habitat (2016) Participatory Slum Upgrading Programme Fund. Available at: https://unhabitat.org/participatory-slum-upgrading-programme-fund#:~:text=The%20bottom%20line%20is%20that,40%25%20of%20the%20world%20population. (Accessed: 30 June 2024).

United Nations (2015) Transforming our world: The 2030 Agenda for Sustainable Development, Resolution adopted by the General Assembly on 25 September 2015. A/RES/70/1. Available at: https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf. (Accessed: 30 June 2024).

United Nations (2022) 'Specific country data, Kenya', Human Development Reports. Available at: https://hdr.undp.org/data-center/specific-country-data (Accessed: 30 June 2024).

UNAIDS (2020) Global and regional data. UNAIDS Data 2020. Geneva: Joint United Nations Programme on HIV/AIDS (UNAIDS).

UN-Habitat (2003) The challenge of slums: Global report on human settlements. London: Earthscan Publications.

UN-Habitat (2006) UN Habitat State of the world's cities. London: UN Habitat.

UN-Habitat (2020) Informal settlements' vulnerability mapping in Kenya: The case of Mathare.

UN Water (2019) UN World Water Development Report 2019: 'Leaving no one behind'. Available at: https://www.unwater.org/world-water-development-report-2019-leaving-no-onebehind/#:~:text=In%20Sub-Saharan%20Africa%2C%20only,the%20rich%20and%20the%20poor. (Accessed: 30 June 2024).

UN-Habitat (2007) UN HABITAT and Kenya Slum Upgrading Programme (KENSUP). Available at: https://unhabitat.org/un-habitat-and-kenya-slum-upgrading-programme-kensup. (Accessed: 30 June 2024).

Vecino, E. (2020) Maji na mbegu (agua y semillas). Trabajo Final de Máster, Universidad Politécnica de Valencia.

Water and Sanitation Program (WSP) (2012) Economic Impacts of Poor Sanitation in Africa.

West, B.S., Hirsch, J.S. and El-Sadr, W. (2013) 'HIV and H2O: Tracing the Connections Between Gender, Water and HIV', AIDS and Behavior, 17(5), pp. 1675-1682. doi: 10.1007/s10461-012-0219-9.

World Health Organization (2010) Hidden cities: Unmasking and overcoming health inequities in urban settings. Available at: https://apps.who.int/iris/handle/10665/44439 (Accessed: 30 June 2024).

World Population Review (no date) 'Nairobi population 2024', World Population Review. Available at: https://worldpopulationreview.com/world-cities/nairobi-population. (Accessed: 30 June 2024).

Winter, S., Barchi, F. and Dzombo, M.N. (2018) 'Drivers of women's sanitation practices in informal settlements in sub-Saharan Africa: A qualitative study in Mathare Valley, Kenya', International Journal of Environmental Health Research, 28(6), pp. 609-625. doi: 10.1080/09603123.2018.1497778.

Yiftachel, O. and Mammon, N. (eds.) (2022) theoriSE: Debating the southeastern turn in urban theories. Cape Town: African Centre for Cities.