

ORIGINAL RESEARCH

Leveraging community capitals for sustainable urban development in Kenya: Evidence from invisible architects

Ivy Chumo^{1*}, Caroline Kabaria¹, Blessing Mberu¹

¹African Population and Health Research Centre (APHRC), Nairobi, Kenya

*Corresponding author: ivychumo@gmail.com

Received 20 January 2026; Accepted 27 April 2026; Published 12 May 2026

Abstract

Introduction: Formal urban planning and infrastructure systems are failing to adapt to rapid population growth and shifting economic demands, leaving about 61% of the world's workers to operate in the informal sector. These workers contribute significantly to urban life, yet their transformative potential for sustainable urban development remains invisible and untapped by mainstream planning. This research focuses on community capitals, a less documented but essential driver of informal operations. This study explored how informal workers utilize community capitals to transform urban spaces into sustainable communities in Kenya. We demonstrated how these community capitals catalyzed sustainable urban growth.

Methods: This qualitative study explored the community capitals framework (CCF) in an urban context, addressing the limitations of quantitative data regarding the CCF, which often overlooks critical social factors. This research team conducted in-depth interviews with 36 informal service providers from the education, healthcare, water, sanitation, and solid waste management sectors. Additionally, four local leaders from two urban informal settlements in Nairobi, Kenya, were interviewed. The data from the transcripts were analyzed using thematic framework analysis, guided by the community capitals framework.

Results: We identified seven forms of community capitals that benefit informal workers: natural, cultural, human, social, political, financial, and built. The study revealed that human capital, focusing on individual skills and qualities, was most often mentioned and valued, while social capital, which concerns connections and relationships, was the second most frequent. Despite being the least implemented, cultural capital was identified as valuable for representing community knowledge and traditions. Examples of these capitals in action included solid waste workers, manual pit emptiers, education providers, health workers, and water service providers, who all contributed to urban development and well-being through waste management, sanitation, education, healthcare, and access to clean water.

Conclusion: Service providers use community capitals as a planning tool to understand dynamics, refine strategies, and build trust for urban development. Each form of community capital functions as a shared resource that provides both immediate support and future development opportunities for the community. Despite that cultural capital was identified as a priority by the few participants, it warrants further research to explore its drivers. Additional research is required to fully grasp the relationships among the various capitals and their impact on service delivery.

Keywords: Urbanization, capital, community, informal settlements, Kenya.

Abstract in Español at the end of the article

INTRODUCTION

The increasing size of the informal sector is a primary concern for governments in both developed and developing countries, including Kenya [1,2]. Consequently, it

is vital to understand the existing forms of capitals that flourish within this sector. By identifying these forms, such as social networks, human skills, and localized financial strategies, policymakers can better understand

the internal resources and resilience strategies that informal workers already utilize [3,4]. This understanding is a necessary precursor to creating formal policies that effectively integrate, rather than disrupt, these established systems [6]. In Kenya, the informal industry emerged as a critical alternative source of employment for a growing number of individuals transitioning from educational institutions [5,6]. The expansion of this sector is largely linked to liberalization and privatization policies that reduced job opportunities in the formal public sector, while the formal private sector subsequently failed to absorb the increasing number of job seekers [2,7]. Currently, informal workers account for approximately 61% of the global workforce, operating as waste collectors, landscapers, day laborers, taxi drivers, and cooks [5,6]. These roles often exist outside the reach of labor legislation, taxation, benefits, and social protection [3,4]. In the Global South, the sector's impact is even more pronounced, accounting for 50% to 80% of urban employment and generating 25% to 50% of the Gross Domestic Product (GDP) [5,6]. Given this massive economic footprint, the informal sector should be supported as a foundational element of sustainable urban development [2].

Sustainable urban development relies on the strategic distribution of capitals in all their forms including human, social, financial, political, natural, built, and cultural assets [8]. The accumulation of diverse forms of capitals dictates the structural functioning of a society and its systems [9]. Community capital functions as more than a legal or financial strategy; it serves as the foundational resource for community empowerment and shared growth [10,11,12]. At its core, community capital is about equity, inclusiveness, empowerment, and shared prosperity [13]. When individuals or groups own community capital, they can control and use the labor of others in society [9,12]. It is both a force embedded in structures and a guiding principle for how society operates [12]. The capital takes time to gather and has the potential to make profits, grow over time, and persist in its being [13]. The structure of the distribution of different types and subtypes of community capitals at a given moment in time represents the immanent structure of the diverse world [14]. It is impossible to account for the structure and functioning of a dynamic and diverse world unless one reintroduces capital in all its forms, and not solely in the one form recognized by economic theory through the lens of capitalism/economic capital [9]. Community capital implicitly ensures transubstantiation and different types can present themselves in the immaterial form of cultural capital and social capital, among others [12].

Community capital comes in many forms with many sources and a common need uniting a wide range of actors (including businesses, nonprofits, city governments, and consumers) who are seeking to grow and develop [10,15]. The community capitals framework reveals the interactions between different parts of a community [16].

Communities where capitals are embedded are systems that have inflows and outflows, ups and downs, progression and regression [14,16]. For example, when money is invested in a new school in the community, the system is affected either positively or negatively; more jobs, increased populations, new housing developments, and increased crime rates are just a few of the new issues to be dealt with [14]. From an economic development perspective, bringing a new school to town seems like a great solution, but it must be understood that the school will affect other facets of the community [16]. While the capitals are separated into seven categories, each has a connection with the others. For example, if a community wants to build a new school, it must invest in several of the community capitals such as social networks to reach that goal [15,16]. Our study explored community capitals, targeting informal workers in diverse service delivery in an urban setup. The impetus for this study lies in the need to examine the community capitals framework (CCF) in settings that extend beyond rural contexts [17]. This study is targeted at informal workers in diverse service delivery roles, who are often invisible, as they are rarely documented [18,19]. Quantitative data on CCF often ignore critical social and cultural factors [17,19]. Excluding the social aspects of the CCF risks economic and environmental sustainability [20,21], as such, our study was qualitative in nature. This study will explore how informal workers utilize community capitals to navigate urban governance challenges.

Conceptual framework

The community capitals framework is a widely proposed tool to comprehensively identify community assets [9,10]. By assessing both the physical and non-physical resources and understanding how they are linked, the CCF intends to generate a positive cumulative effect that results in the accumulation of further capital [10]. To support a detailed evaluation, the CCF groups these assets into seven thematic categories: natural, cultural, human, social, political, financial, and built capital (see Figure 1).

Natural capital encompasses environmental assets specific to a location, such as climate, geographic setting, natural resources, scenery, and visual appeal [10]. Cultural capital refers to understanding of the world, including their traditions and language [21,22]. Human capital includes demographic characteristics along with individuals' abilities, knowledge, and skills [23]. Social capital is defined by the connections, networks, and relationships among people and organizations that enable them to achieve shared goals [4]. Political capital relates to influence, representation, participation, resource distribution, and organizational structures [10]. Financial capital refers to economic resources like loans, investments, and assistance [24]. Built capital, or infrastructure, includes the equipment and facilities that support human activities [24].

Marginalized workers depend on community capi-

tals as primary survival mechanisms when formal economic opportunities are unavailable. Evidence across multiple contexts demonstrates this pattern. Street vendors in Harare used social capital across three levels: personal relationships, supplier-buyer networks, and organizational membership as essential livelihood resources [10, 17]. Immigrant workers relied heavily on bonding social capital through family and ethnic networks as initial “survival” resources [13]. Gulag survivors in Africa depended on community capitals for continued survival despite marginalization [17]. Freelance audiovisual workers accumulated social and knowledge capital to gain employability and bargaining power in precarious conditions [10]. However, effectiveness varies by context [13, 25]. There are three principles of community capitals [10,13,17,25] applicable to our study:

1. Inclusive access: It opens doors for everyone to invest in and grow their local economy.
2. Equity and fairness: It levels the playing field by offering returns on investment
3. Shared prosperity: It balances the needs of all stakeholders to ensure that when a local business succeeds, the entire community thrives together.

CCF cannot generate an effect as it is not an active agent. However, alignment and investment of these capitals by actors including the informal workers generates cumulative effects, with the CCF serving as the analytical lens.



Figure 1. Community capitals framework.

METHODS

We present our study findings according to the set of standardized Consolidated Criteria for Reporting Qualitative Research (COREQ) [26]. COREQ is a 32-item checklist designed to ensure the transparency and quality of qualitative research reports. It covers three main

areas: research team, study design, and data analysis. COREQ includes items such as information about the research team’s experiences, methodological approach, participant selection and recruitment, data collection methods, and data analysis techniques. By adhering to COREQ, researchers can enhance the credibility and reproducibility of their qualitative studies, making it easier for others to understand, evaluate, and build upon their findings [26].

Study design

This was a case study design using a qualitative approach. We designed this study guided by the community capitals framework. As such, questions in the study tools probed the community capitals framework: natural, cultural, human, social, financial, political, and built capitals. Community capitals formed the basis for our objectives, research questions, data collection, analysis, and interpretation of findings.

Study setting

From a population of 350,000 in the 1962 census to 4,397,073 in the 2019 census, Nairobi typifies the rapid urbanization and population explosion in sub-Saharan Africa [27]. We conducted this study in Nairobi, which is the capital and largest city of Kenya. Informal settlements in Nairobi are characterized by unmet needs in access to basic amenities of healthcare, sanitation, water, solid waste management and education [28] by the marginalized and vulnerable groups like people with a disability, older persons, and children [28]. The consequence of the rapid and uncontrolled population explosion is the proliferation of informal settlements in Nairobi, with upwards of 60 percent of Nairobi residents estimated to be living in slums and contributing to increasing urbanization and the need for employment opportunities. Our study covered two informal settlements: Korogocho and Viwandani informal settlements in Nairobi, in the regions covered by Nairobi Urban Health and Demographic Surveillance System (NUHDSS) initiated in 2002 by the African Population and Health Research Center (APHRC) (Figure 2).

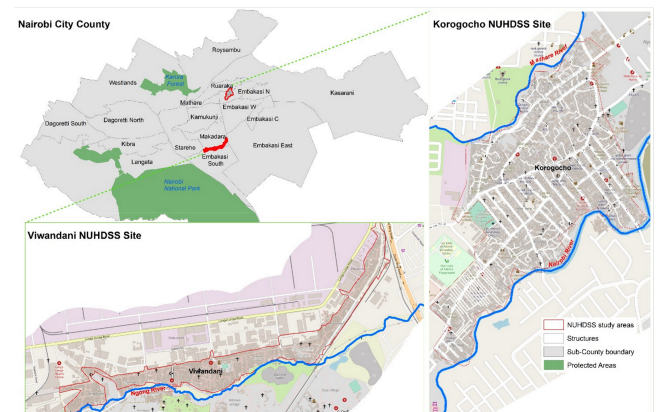


Figure 2. Study sites (source: authors, 2022).

Target population, sampling, and sample size

The populations of interest were service providers in five sectors that were identified and described in the governance diaries as priority basic needs [28]. The sectors included education, healthcare, water, sanitation, and solid waste management. Through a stakeholder mapping exercise, we developed a stakeholder database that depicts actors/service providers [30]. The stakeholder mapping exercise was a critical step in our study, designed to identify and categorize key actors and service providers involved in community development within the study area. The identification of prospective stakeholders necessitated a review of scholarly works, conversations with leaders within the community, and dialogues with knowledgeable local individuals. The initial compilation of stakeholder information was later improved and confirmed through discussions with individuals participating in the governance diaries data collection [28] with marginalized and vulnerable groups and during community advisory consultations with community leaders [31]. This ensured that the stakeholder database accurately represented the key actors and their roles within the community. From the service providers in the validated database, we purposively selected providers who had the longest tenure (on average 8 years). Longer time in service delivery meant more depth in knowledge on the subject matter. Consequently, we selected 4 education providers, 2 healthcare providers, 4 water providers, 4 sanitation providers, and 4 solid waste management providers as study participants in each of the study sites. Two sub-County officials in each study site were also selected purposively as study participants if they had vast experience in the study sites, portrayed by their longer stay in serving the studied communities. After collecting data from 40 participants who had worked in their respective fields for over eight years, we found that no additional significant information emerged, indicating that saturation had been reached. This enabled us to understand community capitals.

Data collection process

We collected data from March 1 to May 25, 2022, using in-depth interview guides. We selected Research Assistants with support from community advisory committees [31]. Specifically, they were chosen if they were endorsed by community in the study sites and if they had some experience in qualitative research. We opted for Research Assistants from the community who are insiders. Insider researchers are native to the setting and are sometimes perceived to be too close and thereby do not attain the distance and objectivity necessary for valid research [32]. To ensure the integrity and depth of our data collection, we incorporated a dedicated reflexivity process focused on our use of community-embedded Research Assistants. To safeguard analytical objectivity, we maintained a rigorous supervision structure, including regular debriefing sessions and a collaborative thematic

review process. This allowed us to critically examine how the Research assistants' positionality influenced the interviews while ensuring that our final interpretations remained grounded in the authentic lived experiences of the service providers. We challenged the limitations of using insider Research Assistants in this study. Insider knowledge in whatever research tradition is not only valid and useful but also provides important knowledge, which approaches used by outsiders may not uncover [33]. In our view, insider research is not problematic in itself and is respectable research in whatever paradigm it is undertaken.

Given the often marginalized and vulnerable status of residents in these communities, it was essential to establish trust and build rapport. We engaged community leaders and gatekeepers to gain access and facilitate introductions to the community and to the study participants. We were flexible and adaptable to accommodate rapidly changing circumstances in informal settlements, including changes in operational hours due to fire outbreaks, overwhelmed service providers, and closure of service provision. Data were collected through in-depth interviews (IDIs) [26], using an IDI guide which had questions on community capitals in the workplace, including the seven capitals. We conducted face to-face interviews in English or in Swahili as needed at a quiet location convenient to the participants, which were mainly at their workplaces, and for the convenience of the study participants. Research Assistants recorded the interviews using a digital recorder and backed them up with handwritten records. These interviews lasted for approximately 1 hour. The study was designed to answer the following three overarching questions (Table 1):

- i. Asset forms and prioritization of capitals: How do informal service providers in Nairobi's settlements identify, mobilize and prioritize different forms of community capital to deliver essential services?
- ii. System navigation: In what ways do these capitals enable workers to navigate the structural and governance challenges inherent in informal urban environments?
- iii. Capital Interplay: How do specific capitals interact (e.g., "spiraling up") to create sustainable outcomes or "leveraged" solutions in neglected urban spaces?

Data quality control

Project researchers reviewed all audio files in real time to ensure the completeness and depth of the interviews and provided feedback to the Research Assistants, who were trained for 5 days on study aims, data collection procedures, study tools, and study ethics. The training also enlightened the Research Assistants on objectivity in data collection despite their insider perspectives. Researchers and Research Assistants held daily debriefing sessions to determine the key emerging themes, probing techniques, and general progress.

Data management and analysis

Audio recordings from the IDIs were converted from Swahili to English through translation and transcription, with each interview saved as a separate Microsoft 365 Word file. To maintain privacy and prepare for analysis, these outputs were labeled with numerical codes. Subsequently, the transcripts were loaded into NVivo version 12 software (QSR International, Chadstone, Australia) for the purpose of coding and analysis. Each transcript was assigned a distinct identifier that included the participant group, research location, and gender to further protect anonymity and facilitate nuanced analysis.

Our analytical approach employed framework analysis [34], drawing upon the principles of community capitals [26,35] (Figure 1). Framework analysis is suitable for studies with defined research questions, a predeter-

mined sample, and key areas of interest [34]. The initial phase of our framework analysis involved researchers listening to the recordings to gain familiarity with the data related to community capitals. To ensure consistency in coding, two researchers (a seasoned qualitative researcher and an anthropologist) along with five co-researchers who were involved in data collection, collaboratively developed a coding framework by independently reviewing the transcripts in NVivo 12 to establish intercoder reliability. Following the creation of the initial coding framework, the research team convened to discuss the identified themes, with discrepancies resolved through consensus-building sessions. We adopted a deductive coding process based on the seven capitals. Two researchers then proceeded with the coding, charting, mapping, and interpretation of the transcripts.

Table 1. Interview questions

Research Question	Specific interview questions included in the study guide	Contribution
i. Asset forms and prioritization	<ul style="list-style-type: none"> • Among the resources you use (skills, networks, tools), which one did you prioritize as the foundation to start your service, and why was it more critical than others? • When resources are scarce, which capital do you rely on most to keep your service running? • How do you identify 'hidden' assets in the settlement (like waste streams or community trust) that others might overlook? 	Identified lead capitals that informal workers used or preferred as a starting point for development.
ii. System navigation	<ul style="list-style-type: none"> • How do your community connections (Social Capital) or your reputation (Cultural Capital) allow you to operate in areas where formal government services are missing? • Describe a time you used your influence with local leaders (Political Capital) to protect your business/work from being shut down or relocated. • In what ways do these community assets help you overcome the lack of formal land titles or business/work licenses? 	Provided evidence of how workers use capitals as navigational tools to survive within restrictive urban governance.
iii. Capital interplay (Leveraging)	<ul style="list-style-type: none"> • Can you provide a specific example of how a social relationship (Social Capital) was leveraged to help you acquire a physical tool or building (Built Capital)? • How has your successful service delivery increased your status in the community, and how does that status help you negotiate for better infrastructure (Spiraling Up)? • How do you combine your technical skills (Human) with local natural resources (Natural) to create a service that is both affordable and sustainable for the settlement? 	Demonstrated the multiplier effect showing that informal development is a dynamic process of asset conversion.

Ethical considerations

AMREF Health Africa's Ethics and Scientific Review Committee (ESRC), REF: AMREF-ESRC P747/2020, approved this study. We obtained a research permit from the National Commission for Science, Technology and Innovation (NACOSTI), REF: NACOSTI/P/20/7726. Ap-

proval was also sought from the Liverpool School of Tropical Medicine (LSTM) and APHRC internal ethical review committees as part of the larger Accountability and Responsiveness in Informal Settlements for Equity (ARISE) Hub funded by UK Research and Innovation (UKRI). Before participating in an interview, all

participants provided informed written consent from Research Assistants. The interviews were conducted in quiet spaces for privacy and confidentiality and for the quality of the audio files.

RESULTS

We present findings on community capitals with two key themes i.) Forms of capital and ii.) How

and why informal workers drive urban transformation through community capital. Study participants included employers or service providers in the two study sites. Specifically, four education providers, two health-care providers, four water providers, four sanitation providers, four solid waste management providers, and two community/local leaders in each of the study sites took part in our study (Table 2).

Table 2. Summary of the study's sample coverage

Study Participants	Korogocho	Viwandani
Education service providers	4	4
Health service providers	2	2
Water service providers	4	4
Sanitation service providers	4	4
Solid waste management service providers	4	4
Community/local leaders	2	2
<i>Subtotal</i>	20	20
Total	40	

Theme 1: Forms of community capitals

The CCF included seven forms of community capitals, natural capital, cultural capital, human capital, social capital, political capital, financial capital, and built capital. Specific examples of each form of capital summarized from the literature can be seen in Figure 1. For all cases studied, human capital was most frequently leveraged and valued, followed by social capital, financial capital, and political capital. In particular, human capital concerns the retention of a skilled workforce. The second most frequently valued type of capital employed was social capital. To get things done in their communities, the study participants drew heavily on their networks of like-minded service providers, and individuals had to raise funds and obtain some sort of political support for their efforts in order to achieve their goals. Cultural and built capitals were the least frequently mentioned (Figure 3). The low implementation of cultural capital may have been the reason some forms of development and service delivery were stagnating in the informal settlements. Although this interpretation is relatively simplistic, it does give us a sense of the interrelatedness of the community capitals.

Human capital

Human capital refers to skills, competencies and qualities possessed by individuals which can be leveraged to enhance resources within and beyond the community. This includes their capacity to earn income, foster community cohesion, and contribute to community organizations, their families, and personal development [13,36]. The attributes encompass educational and technical skills, maintaining a healthy lifestyle, and personal

traits such as honesty, leadership, and a strong work ethic [10,36].

This was the most valued and leveraged capital among the study participants (Figure 3). Solid waste workers demonstrated human capital by efficiently managing waste disposal and recycling, contributing to environmental cleanliness and public health. Manual pit emptiers leveraged human capital by reducing health hazards through physical skills and health-related risk management, thereby promoting sanitation within the community. Education service providers contributed to human capital by imparting knowledge and skills, empowering community members with education and training opportunities. Health providers showcased human capital by offering medical services, improving the overall healthcare of residents, and reducing the prevalence of disease. Water service providers contributed to human capital by ensuring access to clean and safe water, promoting hygiene, and preventing waterborne diseases in the community.

“Various community workers, such as solid waste handlers, manual pit emptiers, education providers, health workers, and water service providers, demonstrate human capital through their respective roles, contributing to environmental cleanliness, sanitation, education, healthcare, and access to clean water, thus improving overall community well-being. (KII, local leader)”

Social capital

Social capital refers to the connections and relationships between community members and organizations

that enable them to come together and effect change [37]. It can be understood in terms of norms of reciprocity and mutual trust [4,36]. Building social capital involves encouraging community adaptability, responsibility, and initiative, as well as fostering interactions that strengthen members' commitment to their group's values and goals [36].

This was the second most valued capital among the study participants (Figure 3). Solid waste workers contributed to social capital by collaborating with residents and community organizations to manage waste effectively, fostering cooperation and trust within the community. Manual pit emptiers built social capital by engaging with residents to address sanitation issues, promoting shared responsibility and collective action for improving public health. Education service providers enhanced social capital through their interactions with learners, families, and community groups, fostering a sense of trust and cooperation in the pursuit of educational goals. Healthcare providers contributed to social capital by establishing rapport with community members, promoting health-seeking behaviors, and encouraging collective efforts to address healthcare challenges. Water service providers strengthened social capital by engaging with residents to ensure access to clean water, fostering a sense of community ownership and responsibility for water resource management.

“We work in groups while desludging a toilet, we also need to liaise with residents here to know the facilities that need emptying. And it is not only us, solid waste handlers, education providers, health workers, and water service providers also work in groups. Oftentimes, workers in this setting foster cooperation, trust, and shared responsibility among residents and community organizations, thereby promoting collective action and improving urban development and overall community well-being. (IDI, sanitation service provider)”

Further discussions with manual emptiers who put more emphasis on social capital described how they could not operate independently. From their illustration, when a pit latrine was full, the latrine owner would inform an emptier, who would in turn contact other manual emptiers through informal means and existing peer contacts. There appeared to be no formal advertising procedures. Study participants described that the size of a team was a minimum of two people for a household pit, but a team could be up to five people for a public latrine. A team could include both men and women, although they did not carry out the same tasks and were not equally rewarded.

“We, the emptiers, know ourselves. We are usually friends from the same tribe. When one of us gets information about emptying they inform two or more other friends to assist in the emptying. (IDI, sanitation service provider)”

“One of us gets into the pit through an inserted ladder to dig and/or collect the fecal matter and other non-fecal stuff into a bucket which is then pulled by one or two persons. In a team of two persons, there is exchange of roles between the two. When exhausted, a digger inside the pit will come up to replace the collector on the top of the pit who then descends into the pit to replace the first digger, until the task is completed. (IDI, sanitation service provider)”

Type of Capital	Frequency
Human capital	22
Social capital	19
Financial capital	17
Political capital	16
Natural capital	14
Built capital	13
Cultural capital	10

Figure 3. Number of unique group of participants who identified a particular capital, as it related to service delivery.

Financial capital

Financial capital refers to the resources available for investing in community capacity building, creating new businesses, accumulating wealth for future development, and promoting entrepreneurship [10,17]. While financial capital is often associated with money, it encompasses more than just currency, including resources that can be converted into monetary instruments, making them highly liquid and easily transferable into other forms of capital [9,25].

This was the third most valued capital among the study participants (Figure 3). Solid waste workers contributed to financial capital by generating income through waste management services, which could be reinvested in community projects or personal development. Manual pit emptiers accumulated financial capital through their sanitation services, potentially reinvesting earnings into improving their equipment or expanding their operations. Education service providers played a role in financial capital by attracting funding for educational programs and initiatives that enhanced human capital within the community. Healthcare providers contributed to financial capital by securing funding for healthcare services and facilities, which in turn improved community health and well-being. Water service providers invested in infrastructure and technologies to ensure access to clean water, thus contributing to community development and well-being.

“I think everyone is working to generate income, like me, I work for money and to improve our water collection. In this community, various community workers, including solid waste collectors, manual pit emptiers, education providers, health workers, and water service providers, contribute to financial capital by generating income,

attracting funding, and investing in services and infrastructure that benefit the community's development and well-being. (IDI, solid waste worker)"

Political capital

Political capital includes community members' abilities to engage in community betterment and to make their voices heard regarding community issues [9]. It reflects how power is distributed and the access that community members have to organizations, shared resources, and power brokers [9]. It also entails the ability of community members to engage in improving their community and influencing decision-making processes regarding community issues [10].

Solid waste workers contributed to political capital by participating in community meetings and advocating for improved waste management policies, thereby influencing decisions that could affect their work and the community. Manual pit emptiers built political capital by organizing with other community members to address sanitation issues, advocating for better infrastructure and services from local authorities. Education service providers enhanced political capital by empowering students and parents to advocate for educational resources and improvements in school facilities through community engagement and activism. Health providers contributed to political capital by advocating for healthcare access and resources, participating in policy discussions, and mobilizing community members to influence health-related decisions. Water service providers strengthened political capital by working with residents to advocate for improved water infrastructure, regulations, and access to clean water, ensuring that community voices are heard in decision-making processes.

"In Nairobi's informal settlements, solid waste handlers, manual pit emptiers, education providers, health workers, and water service providers contribute to political capital by actively participating in community engagement, advocacy efforts, and policy discussions to address issues such as waste management, sanitation, education, healthcare, and water access, thereby influencing decisions that impact the community's well-being. (IDI, education service provider)"

Natural capital

Natural capital consists of assets that are tied to specific locations and include geographic location, natural resources, climate, amenities, and natural beauty. Existing definitions of natural capital can be broken down into four categories: (1) a stock of resources used to produce market goods and services [38], (2) those that add ecosystem services to the resources or goods production [24], (3) those that identify the spiritual and aesthetic aspects of the natural environment [39], and (4) those

that recognize the role natural capital plays in supporting life and survival [40]. For this study, we derived our definition from researchers who described it as assets tied to specific locations, encompassing geographic location, natural resources, climate, amenities, and natural beauty [38].

Informal solid waste workers, water providers, education providers, and sanitation workers all related to this concept. For instance, informal solid waste workers relied on the natural capital of waste streams, which they would collect and recycle or dispose of. Water providers depended on the natural capital of water bodies to supply clean water to communities. Education providers benefited from the natural capital of green spaces and outdoor environments, which enhanced learning experiences. Sanitation workers utilized the natural capital of ecosystems to manage waste and maintain public health.

Solid waste workers collected recyclable materials from the environment, such as plastic bottles and scrap metal, which were then sold for income and served as a resource, which could be repurposed or recycled. These then contributed to the local economy while also managing waste generated by the community.

"Informal solid waste workers rely on the natural waste streams. We collect the waste and recycle or dispose of it. In this area waste management is a crucial issue, and informal waste workers play a vital role in utilizing the natural capital of waste resources to maintain cleanliness and hygiene. (IDI, solid waste worker)"

Water providers in Nairobi faced challenges in supplying clean water to informal settlements due to limited infrastructure and resources. They often depended on natural water bodies such as rivers and boreholes. However, these water sources were polluted due to inadequate sanitation and waste management practices within the settlements. In some cases, water providers implemented filtration and purification systems to make the water safe for consumption.

"Water providers in Nairobi face challenges in supplying clean water to informal settlements due to limited infrastructure and resources. They often depend on the natural capital of water bodies such as rivers. (IDI, water service provider)"

Education providers in the study sites benefited from the natural green spaces and outdoor environments to enhance learning experiences. Despite the challenges of limited space and resources, some schools incorporated outdoor learning activities into their curriculum. For example, teachers took learners on nature walks and organized gardening projects to teach them about environmental sustainability and biodiversity. Additionally, green spaces within the settlements provided opportunities for learners on recreational activities, contributing to social cohesion and well-being.

"For example, educators(teachers) took learners on nature walks and organized gardening projects

to teach them about environmental sustainability and biodiversity. Additionally, green spaces within the settlements provided opportunities for learners on recreational activities, contributing to social cohesion and well-being. (IDI, education service provider)"

Sanitation workers in Nairobi's informal settlements utilized the natural capital of ecosystems to manage fecal waste and maintain public health. Ecosystems were often under threat from pollution and encroachment. Organizations worked to rehabilitate and protect these natural assets while also engaging communities in waste management initiatives, such as clean-up campaigns and recycling programs.

"Sanitation workers in Nairobi's informal settlements utilize the natural capital of ecosystems to manage fecal waste and maintain public health. Ecosystems were often under threat from pollution and encroachment. (IDI, sanitation service provider)"

Built capital

Built capital consists of built infrastructure that supports all capitals and related activities [10]. Built infrastructure supports the various capitals described earlier [9]. This includes buildings for housing and businesses, roads for transportation of goods and people, and power plants for energy production [17].

Solid waste workers relied on built capital such as waste management facilities and transport infrastructure to carry out their duties effectively. Manual pit emptiers required proper sanitation infrastructure, including safe disposal sites to carry out their work safely and efficiently. Education service providers utilized built capital like classrooms to deliver educational services to the community. Health providers depended on healthcare facilities to offer medical services and support community health. Water service providers relied on built infrastructure like water treatment plants, water kiosks and distribution networks to ensure access to clean water for the community.

"What I can say is that solid waste workers, manual pit emptiers, teachers, health providers, and water service providers all rely on infrastructure such as waste management facilities, sanitation systems, schools, clinics, hospitals, water treatment plants, and distribution networks in service delivery and to support the well-being of the community. (KII, local leader)"

Cultural capital

Cultural capital shapes what is considered knowledge, how knowledge is obtained, and how it is validated within a community's power structure [21]. It encompasses values, language, traditions, and worldviews of

community members, and influences perception and interpretation of surroundings based on cultural identities [21,41].

Cultural capital was evident in the practices of solid waste workers, who relied on community knowledge and traditions to navigate waste management. They used local knowledge and expertise passed down through generations to sort, recycle, and dispose of waste effectively, contributing to the cleanliness and health of their neighborhoods. Manual pit emptiers also drew on cultural capital when performing sanitation duties, as they employed traditional techniques and knowledge to safely empty pit latrines while respecting community norms and beliefs. Education service providers leveraged cultural capital to foster learning. For example, educators used storytelling and drama as teaching tools, drawing on the rich traditions of the community. Healthcare providers relied on cultural capital to deliver effective healthcare by understanding cultural beliefs and practices of the community, which influenced healthcare-seeking behavior and treatment acceptance. For instance, traditional healers in the community used traditional healing methods alongside modern medicine to address health issues. Water service providers used cultural capital to build trust and cooperation within communities. They respected local customs and beliefs when implementing water supply projects, working closely with community leaders to ensure alignment with cultural practices and values.

"Water, sanitation, education, solid waste and healthcare providers use cultural capital to build trust and cooperation within communities. They respect local customs when offering services, working closely with community leaders and elders to ensure alignment with cultural practices. These fosters acceptance and sustainability of services. (IDI, education service provider)"

Theme 2: How and why informal workers drive urban transformation through community capital

In our analysis of community capitals, we move beyond merely identifying their presence to emphasize the how and why behind their mobilization, illustrating that informal workers acted as intentional agents of urban transformation.

Service providers mobilized human capital by applying specialized technical skills and personal qualities like honesty and a strong work ethic to fill gaps in essential service delivery. This mobilization was critical because, in the absence of formal state support, the individual competencies of workers became the primary engine for community survival. As one education provider noted,

"Success in our work depends on using every skill and bit of knowledge we possess. (IDI, education service provider)"

Workers mobilized social capital by cultivating deep seated networks of trust and norms of reciprocity which

allowed them to undertake tasks that were impossible in isolation. This mobilization was essential to navigate high risk environments, a sentiment echoed by a sanitation provider who explained that

“We, the emptiers, know ourselves. When one of us gets information about emptying, he informs two or more other friends to assist. (IDI, sanitation service provider)”

Financial capital was mobilized not just as currency but as liquid resources generated through service fees and reinvested into community capacity. This occurred because constant reinvestment was the only way to sustain operations. A solid waste worker emphasized this necessity by stating,

“I think everyone is operating to create income and to improve our investing in services and infrastructure that benefit development. (IDI, waste worker)”

Providers mobilized political capital by participating in community meetings and advocating for improved policies to protect their operations from marginalization. This was mobilized to secure a voice in urban governance, with one participant highlighting that:

“I actively participate in community engagement to address issues such as waste management and healthcare, thereby influencing decisions. (KII, community leader)”

Natural capital was mobilized by utilizing local environmental assets, such as waste streams or boreholes, as the accessible raw materials in neglected spaces. Workers relied on these resources because they served as the foundational stock for service delivery.

“Informal solid waste workers rely on the natural waste streams to maintain cleanliness and hygiene. (IDI, solid waste worker)”

Built capital was mobilized through the creation and maintenance of physical infrastructure, such as classrooms and water kiosks, which anchored all other community activities. It was mobilized as a physical necessity for safety and stability.

“Manual pit emptiers required proper sanitation infrastructure, including safe disposal sites, to carry out their work safely. (IDI, sanitation service provider)”

Though least leveraged, cultural capital was mobilized by drawing on community traditions and collective knowledge to ensure services were culturally appropriate. This mobilization was necessary to bridge the gap between modernization and heritage.

“Valuing the meaning and aspirations behind cultural capital was vital for fostering deep rooted community resilience. (IDI, health care service provider)”

DISCUSSION

This study examined community capital through the lens of various service providers in two urban sites, Korocho and Viwandani. Studies conducted in other contexts described how the CCF provides a holistic model for understanding and facilitating community development, depicting a need to conduct this study in a different context [21, 24]. We identified seven forms of community capital, natural, cultural, human, social, political, financial, and built capitals, evident in practices like waste management, sanitation, education, healthcare, and water supply in Nairobi’s informal settlements. Our findings presented demonstrate the multifaceted nature of community capital.

We found that human, social and financial capital were the most frequently mentioned, while cultural and built capital were least mentioned. These results corroborate established research concerning community development. For instance, other researchers [4,10] emphasized the role of human capital in fostering community development through enhanced competencies of labour force. Human capital was ranked highly, as success in communities depended on using every available asset to its fullest potential, including the development of skills, knowledge, and abilities that service providers or communities possessed. Human capital had one of the strongest ties to each of the other capitals because it represents who got things done [13]. Social capital was illustrated as key in building trust and cooperation [4,13]. Cooperatives and associations of informal workers have the potential to play crucial roles in poverty alleviation and disaster preparedness efforts in urban informal settlements, leveraging their collective power to overcome marginalization and extend worker rights [15]. These studies collectively suggest that communities equipped with skilled individuals, strong social networks, and adequate financial resources are better positioned to address local challenges and achieve desired outcomes. Cultural capital was ranked the lowest. To modernize, some service providers did not take culture into consideration in their operations, suggesting a potential neglect of cultural considerations in their operations. This contrasts with studies emphasizing the growing importance of cultural policy in broader development agendas [14]. We argue that to value and implement cultural capital, policy actors and service providers ought to understand the meaning and aspirations behind cultural capital. Decision makers frequently refer to notions such as cultural value without being specific about how it is conceived or how it relates to economic value [42]. A well-defined concept of cultural capital, with a clear delineation of its value, could assist in sharpening the policy articulation process, especially in the heritage and overall development of other aspects of community capital [21,22].

This study moved beyond viewing assets in isolation to provide specific examples of the dynamic interplay between capitals, demonstrating how one form of capital

serves as a vital catalyst for another. For instance, we illustrate how strong social capital manifested through deep-seated networks of trust and peer relationships acts as a strategic bridge for marginalized workers to secure financial capital through the formation of savings cooperatives and self-help groups [15, 43]. This synergy is further evident when human capital, such as the specialized technical skills of waste managers, is leveraged to improve built capital by transforming neglected open spaces into functional community assets [13, 14]. By documenting these reciprocal relationships, we portrayed that the value of community capital lies not just in the presence of individual assets, but in the “leveraging” process where social cohesion and individual expertise are converted into the economic and physical resources necessary for urban survival [4, 9]. This structure of relationships is similar to that posited by Gutierrez-Montes, Emery, and Fernandez-Baca, which placed the community capitals into many categories: human (including social, human, political, and cultural capitals) and material (including natural, financial, and built capitals) [14]. For now, it would appear that there is some underlying linkage within the seven capitals in the framework that tend to be frequently deployed in a pattern of combinations. This portrays that by leveraging on existing community capital, service providers in informal settlements can build more resilient, inclusive, sustainable, and equitable communities. Lessons can be drawn from community-based organizations (CBOs) in Nairobi’s informal settlements, who have brought forth numerous initiatives leveraging community capital to enhance resilience and inclusive sustainable development. Four CBSs in Nairobi initiated community adaptation strategies and demonstrated the impact of community capital in creating awareness and developing absorptive, adaptive and transformative capacity of communities for climate resilience [43].

We interrogated the seven community capitals that had been identified in other studies as key in health and well-being [13,14]. Our findings demonstrate that service providers in Nairobi’s informal settlements actively leverage a clustered organization of community capitals to navigate deep-seated structural barriers and complex relationships with sub-county and county government tiers. Unlike the traditional “spiraling up” model, which suggests a linear interconnectedness of assets [9], our results indicate that providers should strategically “leverage” specific capitals, such as human and social capital, to compensate for the persistent deficiency in built and financial support from formal authorities [4, 13]. This creates a challenging dynamic where informal workers, despite contributing significantly to the urban economy, remain marginalized by restrictive legal frameworks that fail to recognize their specialized human capital and collective social power [15, 42]. We argue that the disconnect between grassroots initiatives such as those led by CBOs in climate resilience and official county planning creates a structural “bottleneck” that stifles trans-

formative capacity [43]. Consequently, bridging the gap between sub-county tiers and informal providers is not merely a logistical necessity but a critical requirement for moving beyond localized survival toward a resilient and inclusive urban governance model [14, 21]. Findings from other contexts highlighted the multifaceted nature of community assets and their potential to contribute to multiple forms of capital [13,14,24]. For example, in Kisumu, Kenya, religious spaces are identified as valuable resources within natural, built, social, and cultural capital. By providing green spaces, supporting community activities, fostering social connections, and promoting cultural diversity, religious spaces demonstrated their capacity to contribute to various aspects of community development [13]. This example demonstrates how community assets can be interconnected and significantly contribute to sustainable urban development and overall well-being of a community.

Strengths and limitations of the study

A key strength of the CCF lies in its inherent flexibility and compatibility, largely because the framework encompasses a comprehensive array of different domains. While our study offers critical insights into the community capitals framework within an urban setting, its reliance on a qualitative design limits our ability to quantify or draw statistical inferences from the observed phenomena. However, we adopted this approach specifically to address a deficiency in quantitative research, which often overlooks the intangible assets, such as cultural capital, that are vital to informal economies. To mitigate the specific constraints of our case study design, which focuses on only two settlements (Korogocho and Viwandani), we purposively selected these sites for their diverse socio-economic profiles to capture a broad spectrum of the informal experience. Furthermore, while the frequency counts used to rank the capitals are interpretive rather than definitive, we triangulated these metrics with in-depth qualitative narratives to provide a more nuanced and accurate context. Finally, we countered the potential for social desirability bias stemming from the use of insider Research Assistants by maintaining rigorous reflexivity throughout the data collection and analysis phases, ensuring our interpretations remained grounded in the participants’ authentic lived experiences.

Conclusion

Informal settlements are often viewed as sources of problems, but this study highlights their wealth of resources. Community capital, encompassing human, social, financial, cultural, and built capitals, offers a powerful tool for positive change. This study highlights the interconnectedness of community capitals and their potential to drive positive change. By understanding these interconnected assets, policymakers, practitioners, and communities can work together to implement effective interventions that support development and improve quality of life. When utilizing the community capitals

framework, it is essential to consider not only the assets themselves but also the stories and experiences that accompany them. These narratives provide valuable insights into the diverse perspectives and values within the community and creates a more inclusive and representative understanding of community capital.

The study offers valuable insights into the potential of community capital to enhance service delivery. When community members, policymakers and service providers recognize the interdependencies of community capitals, they can create strategies that better leverage these assets. This may involve providing capacity-development opportunities to enhance human capital, fostering social cohesion and trust, supporting community-led initiatives, preserving cultural heritage, and investing in infrastructure development. By working collaboratively with local communities and harnessing the power of community capital, it is possible to improve the effectiveness and sustainability of service delivery, ultimately leading to better outcomes for residents in informal settlements.

This study demonstrates the utility of community capital as a strategic tool for service providers. When service providers comprehend the seven capital types within their communities, they are better equipped to hone their strategies, establish rapport with stakeholders, and locate avenues for cooperation. Community capital is akin to a “community bank,” in which each capital form constitutes a precious resource that can be strategically invested, consumed, or wasted. It is from recognizing the importance of these resources and utilizing them effectively that service providers can implement more impactful and sustainable initiatives, empowering communities and enhancing service delivery. CCF offers a systemic approach to evaluation, going beyond project-specific goals to assess the overall well-being of the community and its systems.

Leveraging community capitals for sustainable urban development by necessitating moving from concrete structural shifts and recognition to action, which we have outlined through four distinct policy pathways. First, we advocate for formal certification for providers to validate the specialized human capital and essential services they already deliver to the city. Second, their active inclusion in county planning processes ensures that urban development is informed by the lived realities of informal settlements. Third, providing targeted infrastructure support—such as safe disposal sites and water kiosks—is critical to enhancing the built capital that sustains their operations. Finally, we propose legal backing for cooperatives to strengthen social capital and collective bargaining power, allowing these workers to transition from marginalized actors to recognized partners in sustainable urban governance. By adopting these pathways, policymakers can transform the “community bank” of informal assets into a cornerstone of equitable urban growth.

The relevance of cultural capital, ranked last by study

participants, provides a useful area for further study to explore its drivers.

DECLARATIONS

AI utilization

AI was used minimally, solely for basic grammar and spell-checking during the final drafting phase. No AI tools were used for data analysis, interpretation, or the generation of original content.

Institutional Review Board Statement

This study was conducted in accordance with the Declaration of Helsinki and approved by the AMREF Africa Ethics and Scientific Review Committee (ESRC/P747/2019; Date: 8 February 2020) and the National Council for Science, Technology, and Innovation (NACOSTI/P/20/7726; Date: 20 November 2020).

Competing interests

The authors have no conflicts of interest to declare. The funding sponsors had no role in the design of the study in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Funding

GCRF Accountability funded the project activities through the UKRI Collective Fund award with award reference ES/S00811X/1.

Author contributions

Conceptualization, IC; methodology, IC, CK and BM; software, IC; validation, IC, CK and BM; formal analysis, IC; investigation, IC, CK and BM; resources, BM and CK; data curation, IC; writing—original draft and preparation, IC; writing—review and editing, IC, CK and BM. All authors have read and agreed to the published version of the manuscript.

Data availability

The data presented in this study are available on request from the corresponding author. The data are not publicly available because other manuscripts are still being written using the same data.

Acknowledgements

We extend our gratitude to our study participants who agreed to participate in this study. We also thank the research team, community leaders in the study settings, APHRC staff, and ARISE consortium members for their guidance and input during this project.

ORCIDiDs

Ivy Chumo  0000-0003-1235-719X

Caroline Kabaria  0000-0002-5641-5243

Blessing Mberu  0000-0002-6188-196X

ABSTRACT IN SPANISH

Aprovechando los capitales comunitarios para el desarrollo urbano sostenible en Kenia: evidencia de arquitectos invisibles

Introducción: La planificación urbana formal y los sistemas de infraestructura no están logrando adaptarse al rápido crecimiento poblacional y a las cambiantes demandas económicas, lo que ha llevado a que aproximadamente el 61% de los trabajadores a nivel mundial operen en el sector informal. Estos trabajadores contribuyen significativamente a la vida urbana; sin embargo, su potencial transformador para el desarrollo urbano sostenible sigue invisible y sin ser aprovechado por la planificación convencional. Esta investigación se centra en los capitales comunitarios, un motor menos documentado pero esencial de las dinámicas informales. El estudio explora cómo los trabajadores informales utilizan estos capitales para transformar los espacios urbanos en comunidades sostenibles en Kenia, demostrando cómo dichos capitales actúan como catalizadores del crecimiento urbano sostenible.

Métodos: Este estudio cualitativo exploró el marco de capitales comunitarios (Community Capitals Framework, CCF) en un contexto urbano, abordando las limitaciones de los datos cuantitativos, que a menudo pasan por alto factores sociales clave. El equipo de investigación realizó entrevistas en profundidad con 36 proveedores informales de servicios en los sectores de educación, salud, agua, saneamiento y gestión de residuos sólidos. Además, se entrevistó a cuatro líderes locales de dos asentamientos informales urbanos en Nairobi, Kenia. Los datos se analizaron mediante un análisis temático, guiado por el marco de capitales comunitarios.

Resultados: Se identificaron siete formas de capital comunitario que benefician a los trabajadores informales: natural, cultural, humano, social, político, financiero y construido. El capital humano, centrado en habilidades y cualidades individuales, fue el más mencionado y valorado, seguido del capital social, relacionado con las conexiones y relaciones. Aunque fue el menos implementado, el capital cultural se destacó por su valor en la representación del conocimiento y las tradiciones comunitarias. Ejemplos de estos capitales en acción incluyen trabajadores de residuos sólidos, vaciadores manuales de letrinas, proveedores de educación, personal de salud y proveedores de servicios de agua, quienes contribuyen al desarrollo urbano y al bienestar mediante la gestión de residuos, el saneamiento, la educación, la atención sanitaria y el acceso al agua potable.

Conclusión: Los proveedores de servicios utilizan los capitales comunitarios como una herramienta de planificación para comprender dinámicas, perfeccionar estrategias y generar confianza en el desarrollo urbano. Cada tipo de capital comunitario funciona como un recurso compartido que ofrece tanto apoyo inmediato como oportunidades de desarrollo futuro para la comunidad. Aunque el capital cultural fue señalado como prioritario por algunos participantes, se requiere mayor investigación para comprender sus determinantes. Asimismo, se necesitan estudios adicionales para analizar en profundidad las relaciones entre los distintos capitales y su impacto en la prestación de servicios.

Palabras clave: Urbanización, capital, comunidad, asentamientos informales, Kenia.

REFERENCES

- [1] Murunga J, Muriithi MK, Wawire NW. Estimating the size of the informal sector in Kenya. *Cogent Econ. Financ.* 2021, 9, 20. <https://doi.org/10.1080/23322039.2021.2003000>
- [2] Douglas M. Tapping into informality: The suitability of MajiVoice as a tool to improve water Service delivery and governance in Nairobi's informal settlements. 2015, pp. 1–48. Available from: <http://hdl.handle.net/11283/593377> (accessed on 1 January 2020).
- [3] Lorato T, Tadesse T Abebe Mamo Y, Getinet B. The urban informal sector as a means of livelihood improvement among youth: Evidence from Hawassa city, Ethiopia. *Cogent Econ. Financ.* 2023, 11, 21. <https://doi.org/10.1080/23322039.2023.2185346>
- [4] Ogunkan DV. Achieving sustainable environmental governance in Nigeria: A review for policy consideration. *Urban Gov.* 2022, 2, 212–220. <https://doi.org/10.1016/j.ugj.2022.04.004>
- [5] Muchiri KB. An Analysis of the Effect of the Growth of the Informal Sector on Tax Revenue Performance in Kenya; University of Nairobi: Nairobi, Kenya, 2014.
- [6] Chumo I, Mberu B, Wainaina C, Murigi W, Sumba L, Kabaria C. Sanitation services for the urban poor:

- A social capital approach to sanitation challenges in informal settlements. *PLoS Water* 2023, 2, e0000086. <https://doi.org/10.1371/journal.pwat.0000086>
- [7] Yerochewski C. *Informal Workers and Collective Action: A Global Perspective*; Eaton, A.E., Schurman, S.J., Chen, M.A., Eds.; ILR Press/Cornell University Press: Itacha, NY, USA, 2017; Volume 74, p. 412.
- [8] Hobsbawm EJ. Obituary. *Int. Rev. Soc. Hist.* 2013, 58, 1–8.
- [9] Flora C, Emery M, Fey S, Bregendahl C. *Community Capitals: A Tool for Evaluating Strategic Interventions and Projects*; North Central Regional Center for Rural Development, Iowa State University: Ames, IA, USA, 2006.
- [10] Bisung E, Elliott SJ. Toward a social capital based framework for understanding the water-health nexus. *Soc. Sci. Med.* 2014, 108, 194–200. <https://doi.org/10.1016/j.socscimed.2014.01.042>
- [11] Emery M, Flora C. Spiraling-up: Mapping community transformation with community capitals framework. *Community Dev.* 2006, 37, 19–35. <https://doi.org/10.1080/15575330609490152>
- [12] Crowe J, Smith J. The influence of community capital toward a community's capacity to respond to food insecurity. *Community Dev.* 2012, 43, 169–186. <https://doi.org/10.1080/15575330.2011.575230>
- [13] Jacobs C. Community capitals: Human capital. *SDSU Ext. Extra Arch.* 2011, 1, 1–2.
- [14] Pigg K, Gasteyer SP, Martin KE, Keating K, Apaliyah GP. The community capitals framework: An empirical examination of internal relationships. *Community Dev.* 2013, 44, 492–502. <https://doi.org/10.1080/15575330.2013.814698>
- [15] Theodos B, Hangen E, Hedman C, Meixell B. *Measuring Community Needs, Capital Flows, and Capital Gaps*. 2018, Volume 85. Available from: https://www.urban.org/sites/default/files/publication/99313/measuring_community_needs_capital_flows_and_capital_gaps_3.pdf (accessed on 16 September 2024).
- [16] Cheryl J. Measuring success in communities: Understanding the community capitals framework. *Ext. Extra* 2007, 1–16.
- [17] Mueller D, Hoard S, Roemer K, Sanders C, Rijkhoff SAM. Quantifying the community capitals framework: Strategic application of the community assets and attributes model. *Community Dev.* 2020, 51, 535–555. <https://doi.org/10.1080/15575330.2020.1801785>
- [18] Lee BH, Swider S, Tilly C. Informality in action: A relational look at informal work. *Int. J. Comp. Sociol.* 2020, 61, 91–100. <https://doi.org/10.1177/0020715220944219>
- [19] Tigges LM, Noble M. Getting to yes or bailing on no: The site selection process of ethanol plants in Wisconsin. *Rural Sociol.* 2012, 77, 547–568. <https://doi.org/10.1111/j.1549-0831.2012.00092.x>
- [20] Ballet J, Sirven N, Requier-Desjardins M. Social capital and natural resource management: A critical perspective. *J. Environ. Dev.* 2007, 16, 355–374. <https://doi.org/10.1177/1070496507310740>
- [21] Boglioli M, Mueller DW, Strauss S, Hoard S, Beeton TA, Budowle R. Searching for culture in “cultural capital”: The case for a mixed methods approach to production facility siting. *Front Energy Res.* 2022;9:772316. <https://doi.org/10.3389/fenrg.2021.772316>
- [22] Edgerton JD, Roberts LW. Cultural capital or habitus? Bourdieu and beyond in the explanation of enduring educational inequality. *Theory Res Educ.* 2014;12:193–220. <https://doi.org/10.1177/1477878514530231>
- [23] Bartel AP, Beaulieu ND, Phibbs CS, Stone PW. Human capital and productivity in a team environment: Evidence from the healthcare sector. *Am Econ J Appl Econ.* 2014;6:231–259. <https://doi.org/10.1257/app.6.2.231>
- [24] Anglin A. Facilitating community change: The community capitals framework, its relevance to community psychology practice, and its application in a Georgia community. *Glob J Community Psychol Pract.* 2015;6:1–15. <https://doi.org/10.7728/0602201504>
- [25] Pigg K, Gasteyer SP, Martin KE, Keating K, Apaliyah GP. The community capitals framework: An empirical examination of internal relationships. In: *50 Years of Community Development*. London: Routledge; 2020. p. 117–127.
- [26] Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *Int J Qual Health Care.* 2007;19:349–357. <https://doi.org/10.1093/intqhc/mzm042>
- [27] Kenya National Bureau of Statistics. 2019 Kenya population and housing census: Population by county and sub-county. 1st ed. Nairobi: Kenya National Bureau of Statistics; 2019.
- [28] Chumo I, Kabaria C, Shankland A, Mberu B. Unmet needs and resilience: The case of vulnerable and marginalized populations in Nairobi's informal settlements. *Sustainability.* 2023;15:37. <https://doi.org/10.3390/su15010037>
- [29] Chumo I, Kabaria C, Phillips-Howard PA, Gitau H, Eley H, Mberu B. Beyond a facility: Water, sanitation and hygiene service levels and informal social accountability in childcare centres in informal settlements. *J Water Sanit Hyg Dev.* 2024;14:313–324. <https://doi.org/10.3390/su15010037>
- [30] Chumo I, Mberu B, Kabaria C. Stakeholder mapping in informal settlements. *Accountability in urban health.* 2023;1:2.
- [31] Chumo I, Kabaria C, Oduor C, Amondi C, Njeri A, Mberu B. Community advisory committee as a facilitator of health and well-being: A qualitative study in informal settlements in Nairobi, Kenya. *Front Public Health.* 2022;10:1047133. <https://doi.org/10.3389/fpubh.2022.1047133>
- [32] Milligan L. Insider-outsider-inbetween? Researcher positioning, participative methods and cross-cultural educational research. *Int Educ.* 2016;46:235–250. <https://doi.org/10.1080/03057925.2014.928510>
- [33] Liu X, Burnett D. Insider-outsider: Methodological reflections on collaborative intercultural research. *Humanit Soc Sci Commun.* 2022;9:3–14. <https://doi.org/10.1057/s41599-022-01336-9>
- [34] Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol.* 2013;13:117. <https://doi.org/10.1186/1471-2288-13-117>
- [35] Lakey B. Social support: Theory, measurement and intervention. In: *Social support measures*. 2020. p. 28–52.
- [36] Coleman J. Social capital in the creation of human capital.

- Am J Sociol. 1988;94:95–120. <https://doi.org/10.1086/228943>
- [37] Evans P. Collective capabilities, culture, and Amartya Sen's development as freedom. *Stud Comp Int Dev.* 2002;37:54–60. <https://doi.org/10.1007/BF02686261>
- [38] Seliverstova NS, Iakovleva EL, Grigoryeva OV, Vorontsova LV. Dimensions of social capital. *Actual Probl Econ Law.* 2018;12:2000–2003.
- [39] Ruggeri J. Government investment in natural capital. *Ecol Econ.* 2009;68:1723–1739. <https://doi.org/10.1016/j.ecolecon.2008.11.002>
- [40] Cooper N, Brady E, Steen H, Bryce R. Aesthetic and spiritual values of ecosystems. *Ecosyst Serv.* 2016;21:218–229. <https://doi.org/10.1016/j.ecoser.2016.07.014>
- [41] Guerry AD, Polasky S, Lubchenco J, Chaplin-Kramer R, Daily GC, Griffin R, et al. Natural capital and ecosystem services informing decisions. *Proc Natl Acad Sci USA.* 2015;112:7348–7355. <https://doi.org/10.1073/pnas.1503751112>
- [42] Oude Groeniger J, de Koster W, van der Waal J, Mackenbach JP, Kamphuis CBM, van Lenthe FJ. How does cultural capital keep you thin? *Sociol Health Illn.* 2020;42:1497–1515. <https://doi.org/10.1111/1467-9566.13120>
- [43] Kais SM, Islam MS. Community capitals as community resilience to climate change. *Int J Environ Res Public Health.* 2016;13:1211. <https://doi.org/10.3390/ijerph13121211>