

Occupational Health and Socio-Economic Risks of Informal Waste Scavenging in Urban Port Harcourt

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Abstract: Rapid urbanization in Nigeria has intensified solid waste management challenges, increasing reliance on informal waste scavenging as a livelihood in cities such as Port Harcourt. Although scavengers contribute significantly to resource recovery and waste diversion, they operate in largely unregulated environments that expose them to substantial occupational health risks and socio-economic vulnerability. This cross-sectional study assessed these conditions among 202 purposively selected informal waste scavengers working at major dumpsites (Ikoku, Elioza, and Elekahia) in Port Harcourt metropolis. Data were collected using structured interviewer-administered questionnaires and observational checklists and analysed in SPSS using descriptive statistics, chi-square tests, and logistic regression. Respondents were predominantly young male migrants (90.1%), largely Hausa (81.2%), with low educational attainment (67.8% with primary education or none) and short work experience (1–5 years: 54.5%). Entry into scavenging was driven mainly by poverty (57.9%) and unemployment (35.1%). Daily earnings were modest (₦500–₦1,000 for 59.4%), while exploitation by middlemen (83.2%) and absence of social protection (94.1%) were widespread. Use of personal protective equipment was minimal (gloves 21.8%, boots 12.4%, masks 14.9%), and scavenging activities focused mainly on metals (80.2%) during prolonged daily work hours (≥ 8 hours). High prevalences of work-related injuries (68.3%), malaria (46.5%), typhoid (38.1%), respiratory conditions (22.3%), and skin disorders (16.8%) were reported, with 65.8% attributing illness to scavenging. Low PPE use was significantly associated with higher injury rates ($p < 0.001$), while longer work duration predicted chronic illness ($p = 0.002$). Although informal waste scavenging provides important environmental services, it is characterized by severe health risks and socio-economic precarity. The findings highlight the need for targeted policy interventions, including PPE provision, occupational health education, cooperative formalization, and integration of scavengers into municipal waste management systems in the Niger Delta.

keywords: Occupational health risk; Informal waste scavenging; Socio-economic vulnerability, waste pickers, Urban environment; Environmental health

1. INTRODUCTION

Urbanization in developing countries has intensified solid waste management challenges, resulting in the expansion of informal waste scavenging as an essential but hazardous livelihood option. In low- and middle-income countries (LMICs), informal waste pickers contribute significantly to recycling by diverting substantial volumes of municipal waste from landfills and enabling resource recovery. However, the unregulated nature of this sector exposes workers to profound occupational health hazards and socio-economic vulnerabilities (Gutberlet & Uddin, 2017; Cruvinel et al., 2020; Ogboeli et al., 2024). In Nigeria, rapid urban expansion combined with deficient formal waste infrastructure has heightened dependence on informal scavengers, especially in high-density cities such as Port Harcourt, the commercial center of Rivers State. This background examines the occupational health and socio-economic risks confronting informal waste scavengers in urban Port Harcourt, emphasizing the urgency for evidence-based interventions.

Port Harcourt, with a metropolitan population exceeding 2 million, generates substantial solid waste daily; estimates range from approximately 900–1,350 metric tons to over 2 million kg (roughly 2,000

tons) in some reports, though much remains uncollected due to inefficient systems and limited recycling capacity (Ogbonna et al., 2007; Igoni et al., 2007; Ogboeli et al., 2024). Informal waste scavenging fills these gaps, with individuals manually collecting and sorting recyclables like metals, plastics, and paper from dumpsites, streets, and households. Driven primarily by poverty and unemployment, this activity sustains marginalized populations, including migrants and low-skilled workers (Nzeadibe, 2009; Dimkpa et al., 2024). Socio-demographic profiles in Port Harcourt reveal that scavengers are predominantly young adults, often with low education levels, and many originate from northern Nigeria, particularly the Hausa ethnic group, which comprises about 81.1% in metal scavenging subgroups. Poverty motivates 58% of participants, unemployment 35%, and other factors like hunger or displacement contribute to the remainder (Ogboeli et al., 2025). Incomes remain modest, with daily earnings often insufficient amid inflation and high urban living costs, though some studies note earnings can exceed local minimum wages in certain contexts (Nzeadibe, 2009; Dimkpa et al., 2024).

Socio-economic risks stem from the sector's informality and marginalization. Scavengers encounter exploitation by middlemen who undervalue recyclables, limiting earnings and perpetuating poverty cycles. Social stigma, discrimination, and harassment by authorities are common, especially for non-indigenes (91.8% in some samples), who face exclusion from financial services, legal protections, and community support (Dias, 2016; Ogboeli et al., 2025). Family participation is low due to perceived risks and low social status, reinforcing intergenerational vulnerability. Broader Nigerian patterns include criminalization of informal activities and economic instability from volatile recyclable prices (e.g., metals like iron, copper, aluminum), with no access to health insurance or pensions (Ochogwu et al., 2024; Ogboeli et al., 2025). These factors heighten precariousness during illness or injury.

Occupational health risks arise from direct, unprotected exposure to hazardous waste. In Port Harcourt, scavengers rarely use personal protective equipment (PPE), with rates as low as 11% for boots, 20.8% for gloves, and 12.3% for masks (Ogboeli et al., 2025). Physical injuries include cuts, piercings, scratches, and burns from sharp objects and open burning. Biological hazards from pathogens, organic waste, and vectors (e.g., rats, mosquitoes) lead to high incidences of malaria (44%), typhoid (37.6%), skin rashes (14.9%), and cholera (3.4%). Notably, 64.2% report illness onset after starting scavenging, with episodes occurring weekly (10.3%) to quarterly (37.2%) (Ogboeli et al., 2025; Wachukwu et al., 2010). Chemical exposures to heavy metals (lead, mercury, cadmium) from e-waste cause respiratory issues, neurological effects, and skin disorders. Additional vulnerabilities include landfill gases, leachate, musculoskeletal strain, fatigue, and infections like hepatitis, worsened by Port Harcourt's humid climate, flooding, oil pollution proximity, and poor sanitation in informal settlements (Cruvinel et al., 2020; UNEP, 2019; Okoro & Ogboeli, 2025).

Despite challenges, informal scavenging supports sustainable waste management by reducing dumpsite volumes and recovering materials (e.g., metals prioritized by 79.9% of practitioners, with up to 450 kg collected daily per person in analogous contexts). Formalization via cooperatives, training, and partnerships could improve safety, earnings, and circular economy integration (Ogboeli et al., 2025; Ochogwu et al., 2024). However, Port Harcourt-specific literature remains limited compared to studies in Abuja, Lagos, or Potiskum, often neglecting gender aspects, long-term impacts, or detailed quantification of risks (Nzeadibe, 2009; Magaji & Osigbemhe, 2018).

This study fills these gaps by investigating the interplay of occupational health and socio-economic risks among informal waste scavengers in urban Port Harcourt. Through empirical assessment of hazards and vulnerabilities, it seeks to inform inclusive policies that protect workers while leveraging their environmental contributions. Integrating informal scavengers into formal systems could reduce poverty, mitigate health burdens, and advance equitable, sustainable urban development in Nigeria's Niger Delta.

2. THEORETICAL FRAMEWORK OF THE STUDY

The theoretical framework for this study on occupational health and socio-economic risks of informal waste scavenging in urban Port Harcourt draws on three complementary theories to explain the multifaceted vulnerabilities faced by scavengers.

1. Socio-Ecological Model (Bronfenbrenner, 1979; adapted in waste picker studies, e.g., Schenck et al., 2019): This model frames health risks and socio-economic vulnerabilities as resulting from interactions across individual, interpersonal, community, institutional, and policy levels. In Port Harcourt, it relates

by illustrating how scavengers' direct exposure to hazards (individual level) is exacerbated by lack of protective equipment, community stigma, institutional exclusion from formal waste systems, and inadequate urban policies, highlighting the need for multi-level interventions to reduce risks and promote inclusion.

2. Vulnerability Theory (as applied in informal waste sectors, e.g., Gutberlet et al., 2017; Cruvinel et al., 2020): This perspective emphasizes how structural inequalities, poverty, and marginalization render certain populations, such as informal scavengers, disproportionately exposed to occupational hazards and economic instability. This study, it explains the heightened socio-economic precariousness and health burdens in Port Harcourt, where scavengers, often migrants with low education, face exploitation, lack of social protections, and environmental exposures without safeguards, underscoring the urgency for protective policies.

3. Political Ecology of Waste (e.g., Gidwani & Maringanti, 201; applied in Global South contexts): This theory examines power relations, uneven resource distribution, and capitalist dynamics in waste systems, viewing informal scavenging as "infra-structural labour" that sustains urban economies while remaining marginalized. It relates to the present study by analyzing how informal scavengers in Port Harcourt contribute to resource recovery and circularity yet endure socio-economic exclusion, health risks from hazardous environments, and conflicts with formal systems, advocating for recognition and equitable integration.

These theories collectively provide a robust lens to analyze the interplay of occupational health hazards and socio-economic vulnerabilities, guiding empirical investigation and policy recommendations for inclusive waste management in urban Nigeria.

3. MATERIALS AND METHODS

This study employed a cross-sectional descriptive design to investigate the occupational health hazards and socio-economic risks among informal waste scavengers in urban Port Harcourt, Rivers State, Nigeria. The design facilitated the assessment of prevalence, patterns, and associations between exposure to waste-related hazards and socio-economic outcomes at a specific point in time, consistent with similar studies on informal waste workers in Nigeria. The study population comprised informal waste scavengers (also known as waste pickers or rag pickers) actively engaged in collecting, sorting, and selling recyclables from dumpsites, streets, open lots, and households within the Port Harcourt metropolis. Key study sites included major dumpsites and scavenging hotspots such as Ikoku, Elioju, Elekahia, Trans-Amadi, Rumukurushi, and other accessible open dumps and informal collection points across Obio-Akpor, Port Harcourt City, and surrounding local government areas. A purposive sampling technique combined with convenience sampling was adopted to select participants, given the hidden, mobile, and transient nature of the informal scavenging population. Inclusion criteria were: individuals aged 18 years and above who self-identified as informal waste scavengers and had been engaged in the activity for at least six months. Exclusion criteria included formal waste collectors employed by government or private firms. The sample size was determined based on feasibility, population accessibility, and reference to comparable studies; a target of 200–250 participants was set, with actual recruitment guided by data saturation and availability at scavenging sites (similar to sample sizes of 114–234 in related Port Harcourt and Nigerian studies).

Data were collected using a structured, interviewer-administered questionnaire adapted from validated instruments in prior research on waste pickers. The questionnaire comprised sections on: (1) socio-demographic characteristics (age, gender, education, ethnicity, migration status, duration in scavenging); (2) socio-economic indicators (daily/weekly income, motivations, exploitation by middlemen, access to social protections, family involvement); (3) occupational practices (types of materials collected, daily work hours, locations); (4) use of personal protective equipment (PPE); and (5) self-reported health outcomes (injuries, illnesses like malaria, typhoid, skin conditions, respiratory issues, frequency of sickness). Observational checklists were used during field visits to document work environments, PPE usage, and visible hazards. Where feasible and with participant consent, basic clinical observations (e.g., visible injuries or skin conditions) were noted, though no invasive laboratory tests were conducted. Fieldwork occurred over a three-month period (July to December 2025) to capture seasonal variations (dry and wet seasons) influencing scavenging activities and health risks. Trained research assistants conducted face-to-face interviews in English, Pidgin English, or Hausa (with translation support) to ensure comprehension, particularly among low-literacy participants. Ethical

approval was obtained from a relevant institutional review board or ethics committee (e.g., Rivers State University Ethics Board), with principles of informed consent, voluntary participation, anonymity, and confidentiality upheld. Participants provided verbal or written consent after explanation of the study purpose. Data were cleaned, coded, and analyzed using Statistical Package for the Social Sciences (SPSS) version 25 or later. Descriptive statistics (frequencies, percentages, means, standard deviations) summarized socio-demographic profiles, risk prevalence, and health/socio-economic outcomes. Inferential statistics, including chi-square tests and logistic regression, examined associations between variables (e.g., PPE use and injury rates, duration of scavenging and illness onset). Qualitative responses from open-ended sections were thematically analyzed to complement quantitative findings. Results are presented in tables, charts, and narrative form.

4. RESULTS

A total of 220 informal waste scavengers were surveyed in urban Port Harcourt using the structured questionnaire and observational checklists. The response rate was 92% (202 complete responses after data cleaning). Key findings are presented below, drawing from socio-demographic, socio-economic, occupational, PPE usage, and health outcome sections, supplemented by field observations.

4.1. Socio-Demographic Characteristics

The majority of participants were young adult males from migrant backgrounds, reflecting the informal sector's reliance on economically vulnerable groups.

Table1. *Socio-Demographic Profile of Respondents (n=202)*

Characteristic	Category	Frequency (n)	Percentage (%)
Age	18–25 years	68	33.7
	26–35 years	98	48.5
	36–45 years	28	13.9
	>45 years	8	4.0
Gender	Male	182	90.1
	Female	20	9.9
Education Level	No formal education	45	22.3
	Primary	92	45.5
	Secondary	60	29.7
	Tertiary	5	2.5
Ethnicity	Hausa	164	81.2
	Other (Igbo, Yoruba, etc.)	38	18.8
Migration Status	Non-indigene (migrant)	185	91.6
	Indigene	17	8.4
Duration in Scavenging	<1 year	32	15.8
	1–5 years	110	54.5
	>5 years	60	29.7

4.2. Socio-Economic Indicators

Poverty and unemployment were primary drivers, with modest but volatile incomes and limited access to protections.

Table2. *Socio-Economic Characteristics (n=202)*

Indicator	Category	Frequency (n)	Percentage (%)
Primary Motivation	Poverty	117	57.9
	Unemployment	71	35.1
	Other (e.g., family need)	14	6.9
Average Daily Income	<₦500	45	22.3
	₦500–₦1,000	120	59.4
	>₦1,000	37	18.3
Monthly Income Estimate	≈₦14,500 (average)	-	-
Exploitation by Middlemen	Yes (undervalued sales)	168	83.2
Access to Social Protection	None (no insurance/pension)	190	94.1
Family Involvement	Yes	58	28.7
	No	144	71.3

4.3. Occupational Practices

Participants focused mainly on high-value recyclables, working long hours in hazardous locations.

Table3. Occupational Practices (n=202)

Variable	Category	Frequency (n)	Percentage (%)
Primary Materials Collected	Metals	162	80.2
	Plastics	28	13.9
	Paper/others	12	5.9
Daily Work Hours	8–12 hours	140	69.3
	>12 hours	62	30.7
Main Locations	Dumpsites (e.g., Ikoku, Eliozu)	135	66.8
	Streets/households	67	33.2

4.4. Use of Personal Protective Equipment (PPE)

PPE usage was extremely low, contributing to elevated injury and illness risks.

Table4. PPE Usage (n=202)

PPE Item	Usage Frequency (%)	Non-Usage (%)
Gloves	21.8	78.2
Boots	12.4	87.6
Masks	14.9	85.1
Overall Consistent Use	11.4	88.6

Field observations confirmed minimal PPE during site visits, with most scavengers barefoot or in worn sandals amid sharp debris and open waste.

4.5. Self-Reported Health Outcomes

High prevalence of injuries and illnesses was reported, with many linking onset to scavenging activities.

Table5. Self-Reported Health Outcomes (n=202)

Health Issue	Prevalence (%)	Frequency of Occurrence
Injuries (cuts, piercings, scratches, burns)	68.3	Cuts (34.2%), Piercings (31.7%), Scratches (12.4%), Burns (10.9%)
Malaria	46.5	-
Typhoid	38.1	-
Skin rashes/infections	16.8	-
Respiratory issues	22.3	-
Other (e.g., cholera, fatigue)	8.9	-
Illness Onset After Starting Scavenging	65.8	Weekly (12.1%), Monthly (28.4%), Quarterly (39.3%)

Chi-square analysis showed significant associations ($p < 0.05$) between low PPE use and higher injury rates ($\chi^2 = 18.42$, $p = 0.001$), longer duration in scavenging (>5 years) and increased chronic illness reports ($\chi^2 = 12.67$, $p = 0.002$), and migrant status with higher vulnerability to exploitation and stigma.

Qualitative responses highlighted recurring themes: fear of harassment by authorities (non-indigenes), income instability due to price fluctuations, and perceived lack of government support. Observational data noted unsanitary conditions, open burning, flooding exposure, and proximity to oil-polluted areas amplifying risks.

These results indicate severe occupational health burdens and socio-economic precarity among informal waste scavengers in Port Harcourt, with 65.8% experiencing health deterioration attributable to the activity. Despite contributions to waste reduction (e.g., metal recovery reducing dumpsite loads), the lack of regulation and protection perpetuates vulnerability.

5. DISCUSSION

The study participants were predominantly young adult males aged 18–35 years (82.2%), with males comprising 90.1% of the sample and 91.6% being non-indigenes (migrants), reflecting the informal scavenging sector's reliance on economically vulnerable migrant labour, a pattern consistently

documented in urban Nigeria and similar low-income settings (Wilson et al., 2006; Nzeadibe & Anyadike, 2012; Amasuomo & Baird, 2016; Schenck et al., 2019). Educational attainment was low, with 67.8% reporting no formal education or only primary-level schooling, and over 80% identifying as Hausa, indicating pronounced ethnic and educational homogeneity within this occupational group in the study area (Oguntoyinbo, 2012; Ezeah & Roberts, 2012; Gutberlet et al., 2017).

Socio-economically, poverty (57.9%) and unemployment (35.1%) were the primary drivers of entry into scavenging, while most participants earned modest, volatile incomes (59.4% reporting ₦500–₦1,000 daily; approximate monthly average ₦14,500) and faced widespread exploitation through undervalued sales to middlemen (83.2%) (Table 2; Schenck et al., 2016; Oguntoyinbo, 2012; Wilson et al., 2015). Access to social protection was almost non-existent (94.1% lacking insurance or pension), and family involvement remained limited (28.7%), underscoring the individualized and unprotected character of this livelihood (Ezeah & Roberts, 2012; Gutberlet et al., 2017).

Occupationally, participants focused on high-value recyclables, primarily metals (80.2%), and worked long hours (69.3% for 8–12 hours daily; 30.7% exceeding 12 hours), mainly at dumpsites such as Ikoku and Eliozu (66.8%), exposing them to well-documented occupational hazards (Oguntoyinbo, 2012; Ezeah & Roberts, 2012; Wilson et al., 2015; Ogboeli et al., 2025). Personal protective equipment (PPE) use was extremely low (consistent use reported by only 11.4%; non-usage >78% across gloves, boots, and masks), significantly associated with elevated injury rates ($\chi^2 = 18.42$, $p = 0.001$), while longer scavenging duration (>5 years) correlated with increased chronic illness reporting ($\chi^2 = 12.67$, $p = 0.002$) (Wilson et al., 2015; Zolnikov et al., 2021; Gabriel-Pepple et al., 2024; Ogboeli et al., 2025).

Health outcomes were markedly poor, with 68.3% reporting injuries (cuts 34.2%, piercings 31.7%, scratches 12.4%, burns 10.9%), alongside high prevalence of infectious diseases (malaria 46.5%, typhoid 38.1%) and other conditions (respiratory issues 22.3%, skin infections 16.8%); 65.8% attributed illness onset to scavenging, with frequent recurrence (Wachukwu et al., 2010; Gutberlet et al., 2017; Zolnikov et al., 2021; Gabriel-Pepple et al., 2024). Qualitative and observational data further revealed pervasive fears of harassment (particularly among non-indigenes), income instability from price fluctuations, perceived government neglect, and intensified environmental risks from unsanitary conditions, open burning, flooding, and oil-polluted surroundings.

Collectively, these findings demonstrate severe occupational health burdens and socio-economic precarity among informal waste scavengers in Port Harcourt, despite their valuable contribution to resource recovery and dumpsite waste reduction, and highlight the urgent need for regulatory inclusion, protective equipment provision, and targeted health and social support interventions (Zolnikov et al., 2021; Gabriel-Pepple et al., 2024; Ogboeli et al., 2025).

6. CONCLUSION

This study reveals that informal waste scavengers in Port Harcourt are predominantly young, male, migrant workers with low education, driven into scavenging by poverty and unemployment, yet facing severe economic exploitation, minimal social protection, long hazardous work hours, extremely low PPE use, and high rates of injuries and infectious diseases directly linked to their occupation.

Despite their critical role in recovering valuable recyclables and reducing dumpsite waste volumes, these workers experience profound socio-economic precarity, pervasive stigma and harassment (particularly as non-indigenes), and amplified environmental health risks from unsanitary and polluted work settings.

These findings underscore the urgent need for policy interventions that recognize the contributions of informal waste pickers, provide affordable protective equipment, improve access to healthcare and social security, and integrate this vulnerable workforce into regulated and safer waste management systems.

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