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Workplace Safety Climate, Preventive Practices, and Self-Rated Well-Being among Informal Solid Waste Collectors in Cape Coast Metropolis

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Abstract

The working conditions for informal solid waste pickers continue to worsen, adversely influencing their health, safety, and overall well-being. This research investigated the physical safety environment, adherence to safety behaviors, and the effects of these factors on the health and well-being of informal solid waste collectors in the Cape Coast Metropolis, Ghana. A cross-sectional study involved 120 informal solid waste collectors from the Cape Coast Metropolis. Participants were chosen through purposive and convenience sampling techniques, with data gathered via face-to-face interviews. Information was obtained using a 43-item questionnaire that covered demographic details, physical safety climate, safety behaviors, and aspects of physical and mental well-being. Data analysis employed descriptive statistics including frequencies and percentages, bivariate correlations, and multiple regression.

Findings indicated that 40.8% of the participants viewed their jobs as highly dangerous owing to a suboptimal physical safety climate, while 41.7% demonstrated inadequate safety behaviors during work. A robust positive correlation existed between self-reported well-being, physical safety climate, and safety practices. Furthermore, hierarchical multiple regression, after adjusting for demographics, showed that physical safety climate significantly predicted health and well-being ($B = 0.844$; $p < 0.001$). In contrast, safety practices did not emerge as a significant predictor ($B = 0.067$; $p = 0.356$). Informal solid waste collectors in Cape Coast face unfavorable physical safety conditions, which lead to suboptimal safety behaviors on the job. It is argued that Ghana's efforts to meet Sustainable Development Goals 3, 6, and 8 will face significant challenges without prioritizing the health and well-being of all workers.

Keywords: Workplace safety, Self-rated well-being, Informal solid waste collectors, Cape Coast

Introduction

Worldwide production of solid waste has risen in both quantity and intricacy, presenting substantial threats to environmental systems and human health [1–4]. It is estimated that more than 11.2 billion tonnes of solid waste, including novel and intricate toxic materials, are gathered each year globally [5, 6]. In Africa, solid waste output is forecasted to increase threefold, from 174 million tonnes in 2016 to exceeding 500 million tonnes by 2050 [7–11]. Yet, the availability of waste collectors, particularly in city areas, remains severely insufficient [12]. As a result, many African urban areas are experiencing a steady rise in informal solid waste collectors participating in the waste management field [13–17].

Informal solid waste collectors fulfill a distinctive and demanding position in the international labor force, yet they encounter widespread risks from dangerous and unstable work settings that undermine their health, safety, and well-being [5, 18]. In developing nations, these individuals perform their tasks lacking sufficient safeguards and mitigation strategies against the excessively elevated array of daily hazards [19, 20]. Regrettably, their safety circumstances are projected to decline further amid Africa's swift urbanization and associated waste challenges [18]. In Ghana,

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approximately 12,710 tonnes of solid waste are produced daily, but merely 10% reaches proper disposal in landfills [21]. Although roughly 30.50% of the national budget allocates to waste management, only 50.80% of generated waste is actually collected [22]. This evident shortfall in collection capability has spurred the rise and essential contribution of informal solid waste collectors to Ghana's waste management process [23–27]. Consequently, these collectors have emerged as vital personnel in urban waste management structures nationwide [23–27].

Reliable projections suggest over 15,000 informal solid waste collectors operate throughout Ghana's 16 regions [25]. Commonly, they gather waste along roadside edges, in deprived urban neighborhoods, and marketplace areas [5, 23]. They often rely on simple tools such as plastic bins, wooden boxes, tricycles, and wheelbarrows, typically without personal protective equipment (PPE) like face masks, coveralls, gloves, helmets, or safety boots [5, 22, 23, 26–28]. Beyond immediate risks from contagious illnesses, intense temperatures, severe air pollution, and physical harm, they also risk traffic incidents causing fatalities or permanent impairments [26–28]. Nevertheless, consistent use of PPE could substantially reduce the negative health impacts from these dangers on this at-risk group [23, 26, 28].

As urban waste volumes in Ghana surpass municipal handling abilities [23, 25–28], the occupational environments for these collectors are declining [23, 25, 28]. Additionally, certain research [5, 18] detected elevated blood lead concentrations in waste workers. High lead amounts were also identified in breast milk from female collectors [5, 18]. Moreover, toxic additives in plastics, including brominated flame retardants and heavy metals, are linked to neurological and fertility problems, malignancies, and developmental disorders in these workers [18]. Although numerous investigations [5, 23, 24, 26–35] have examined waste handling in Ghana, several [23, 24, 26, 27, 29, 30, 33–35] concentrated on solid waste systems specifically. Others [5, 23, 26–28, 32] addressed occupational health and safety concerns for waste collectors. Among them, one [28] assessed health and safety for informal collectors of electronic waste in a peri-urban setting.

Unfortunately, prior Ghanaian research largely emphasized general waste management, with scant attention to the detailed aspects of physical safety climate for informal solid waste collectors. Furthermore, information on their safety behaviors and links to health, safety, and well-being is largely absent from existing scholarship. Hence, the occupational health, safety, and well-being of these collectors are significantly underexplored in Ghana. This underscores the importance of fostering more studies on these matters in locations like the Cape Coast Metropolis. The aims of this research were to assess perceived safety climate and behaviors, along with their effects on self-reported health and well-being among informal solid waste collectors in the Cape Coast Metropolis.

Theoretical framework

The Safety Climate Model developed by Griffin and Neal [36] forms the basis for comprehending the importance of collective employee perceptions regarding the organizational safety environment. This model offers a distinctive perspective on how employee mindsets influence their adherence to safety protocols in the workplace [36]. Employees' perceptions of the physical safety climate include their opinions on safety policies, procedures, and the value placed on the physical conditions of the work setting. Consequently, a strong safety climate establishes the foundation for a protected workplace, highlighting the essential contribution of institutional procedures to employees' safety performance, health, and overall welfare [37]. Key elements such as managerial commitment, effective workload handling, and peer assistance significantly shape employees' safety climate perceptions, which subsequently enhance their welfare [38].

The model's well-being aspect focuses on employees' personal assessments of their bodily and psychological health. It stresses the linkage between organizational procedures that define the safety climate and the resulting employee welfare [36]. Utilizing the Griffin and Neal framework in this research offers insights that support the development of interventions grounded in evidence, aiding in the establishment of safer workplaces that could improve both the physical and psychological welfare of employees [36–39].

Research evidence repeatedly demonstrates the notable influence of safety climate and safety-related actions on the experienced welfare of at-risk employees, including informal solid waste gatherers. For instance, findings indicate that joint initiatives [39, 40], reduction of occupational health hazards, and implementation of safety regulations are positively linked to improved welfare among waste scavengers. Furthermore, investigations by Makhubele *et al.* [40] and Dada *et al.*

[41] emphasized the importance of safety measures, such as utilizing personal protective equipment (PPE), in decreasing bodily injuries and thereby boosting the general welfare of these employees. Additional studies [5, 22] pointed out the vital contribution of safety actions and institutional safety measures to the welfare of waste gatherers, noting that inadequate safety implementation may result in anxiety, exhaustion, and diminished employee welfare overall. Therefore, there is strong support for a beneficial relationship among safety climate, safety actions, and employees' experienced welfare. As a result, the hypotheses are proposed as follows:

H1

Perceived physical safety climate is positively related to the safety behaviors exhibited by informal solid waste collectors.

H2

Both perceived physical safety climate and safety behaviors are positively related to the well-being experienced by informal solid waste collectors.

Materials and Methods

Study design and participants

A cross-sectional survey was conducted involving 120 informal solid waste gatherers in the Cape Coast Metropolis, serving as a preliminary investigation for a more extensive research project [25, 42]. These individuals gather solid waste along roadways and in marketplaces within lower-income urban areas. They rely on simple tools such as plastic bins, wooden boxes, tricycles, and wheelbarrows, yet lack official acknowledgment from the Cape Coast Metropolitan Assembly (CCMA) [25, 42]. According to estimates provided by the Association of Waste Collectors, approximately 200 informal solid waste gatherers operate in the Metropolis [25].

Instruments

Data were gathered through a questionnaire divided into four parts. Part A captured sociodemographic information, covering aspects like gender, age, marital situation, educational attainment, employment type, duration of experience in the field, monthly earnings, possession of health insurance, hours worked daily and weekly, membership in associations, and past injuries. Part B evaluated the participants' perceptions of physical safety climate with the 11-item Brief Norwegian Safety Climate Inventory (Brief NORSCI), a reliable tool [36, 38]. Sample statements include: “In reality, priority is given to production over health, environment, and safety.” Answers were provided on a 4-point Likert scale (ranging from 1 = strongly disagree to 4 = strongly agree), with reverse scoring applied to negatively phrased items (items 19–21). Elevated scores reflect greater perceived organizational emphasis on safety, benefiting employee health, safety, and welfare. This instrument has shown strong internal consistency (Cronbach’s alpha ranging from 0.77 to 0.90) [43, 44]. In the present research, a Cronbach’s alpha of 0.906 was obtained.

Part C assessed safety behaviors using 20 statements adapted from earlier research [45–48]. Illustrative statements are: “Correctly separate waste items into appropriate bins”, “Use necessary PPE (such as gloves, helmets, reflective jackets) during work”, and “Adhere to safe vehicle operation and traffic regulations when handling waste transport.” Responses were on a scale from 1 (never) to 5 (always). Greater scores signify better adherence to safety protocols. The reliability for this set of items was high in this group, with a Cronbach’s alpha of 0.869. Finally, Part D measured participants' physical and mental welfare employing a modified version of the RAND-12 tool, confirmed by Wilson *et al*. [49]. Although the original covers eight health areas with 12 items, only nine were selected here to align with the study's objectives. An example statement is: “Does your health restrict you from carrying out activities requiring extended walking while gathering waste.” Answers ranged from 0 (none of the time) to 5, where higher values suggest greater impairment in welfare. The RAND-12 has established validity and reliability, with Cronbach’s alpha typically between 0.8 and 0.9 [49]. This study achieved a Cronbach’s alpha of 0.933.

Procedures

Access to the participants was obtained through initial contact with the association of waste collectors operating in the Metropolis, enabling the research team to approach workers directly at various waste disposal sites across the area. A purposive sampling approach was employed to include only those individuals engaged in formal employment arrangements, given that physical safety climate represents an organizational concept. Subsequently, convenience sampling was applied to

enroll workers who were present at the disposal sites during the scheduled data collection visits.

The questionnaire was translated into Twi and Fanti—the primary local languages prevalent in the Metropolis—and then back-translated into English to ensure precision and fidelity. Informed consent, either written or verbal, was secured from all participants following a clear explanation of the study's objectives, their involvement, and potential advantages. Participants were explicitly told that involvement was entirely voluntary, with the option to discontinue participation at any point without repercussions. Confidentiality of their responses was also guaranteed. Two research assistants underwent training over a two-day period in preparation for fieldwork. Data gathering occurred from January to February 2024. Ethical approval was granted by the Council for Scientific and Industrial Research, Ghana (ID: RPN 023/CSIR-IRB/2023).

Data analysis

Data were analyzed employing descriptive statistics, correlation tests, and hierarchical multiple regression techniques. Socio-demographic characteristics, along with levels of perceived physical safety climate and adherence to safety practices, were summarized using frequencies and percentages. To classify participants according to their physical safety climate perceptions, scores on the relevant scale were dichotomized around the established mean of 26.99 [43]. Values falling below this mean were designated as indicating low safety climate, whereas those exceeding it were labeled as high safety climate. An identical approach was used for safety practices, with a mean threshold of 61 applied; scores under 61 denoted poor practices, and those over 61 reflected good practices [45, 46]. Employing the sample mean as a cutoff point is appropriate as it serves as a neutral benchmark, facilitating clear binary grouping of the variables for interpretive simplicity.

Spearman's rank correlation coefficient was calculated to examine the relationships between physical safety climate, safety practices, and participants' perceived well-being. Furthermore, hierarchical multiple regression analysis was performed to evaluate the extent to which physical safety climate and safety practices accounted for variation in perceived well-being. In the first model, control variables—including age, educational attainment, daily work hours, and income—were introduced. The second model incorporated safety practices and physical safety climate. All analyses were carried out using the Statistical Package for the Social Sciences (SPSS), version 27.

Results and Discussion

Table 1 presents a summary of the socio-demographic characteristics of the study participants. The sample included 83 males (69.2%) and 37 females (30.8%), with an average age of 43.57 years (SD = 9.24). Most participants had attained basic-level education (68.3%), while 25.8% possessed no formal schooling, 4.2% had secondary education, 0.8% held vocational qualifications, and 0.8% had tertiary education. Regarding marital status, 57.5% were married, 35.0% single, 6.7% widowed, and 0.8% divorced. A large proportion (88.3%) worked full-time, compared to 11.7% in part-time roles, with mean work experience of 17.65 years (SD = 9.30) and monthly earnings ranging from 200 to 4,000 Ghanaian cedis (M = 567.58; SD = 392.43). Notably, 88.3% lacked health insurance coverage. On average, participants worked 4.76 hours daily (SD = 2.93) and 5.76 days per week (SD = 0.64), with days worked ranging from 4 to 7. However, only 45% reported having received any formal training related to solid waste collection.

Table 1. Summary statistics for socio-demographic characteristics of study participants (N = 120)

Socio-demographic factors	Categories	Mean	SD	Percentage (%)	Frequency (N)
Sex	Males			69.2	83
	Females			30.8	37
Age (range: 21–58 years)		43.57	9.24		
Education level	No formal education			25.8	31
	Basic education			68.3	82
	Vocational training			0.8	1

	Secondary education			4.2	5
	Tertiary education			0.9	1
Marital status	Single			35	42
	Married			57.5	69
	Divorced			0.8	1
	Widowed			6.7	8
Employment status	Full-time			88.3	106
	Part-time			11.7	14
Working experience (range: 1–31 years)		17.65	9.30		
Monthly income (range: GHS 200–4000)		567.58	392.43		
Health insurance	Yes			11.7	14
	No			88.3	106
Daily working hours (range: 2–12 h)		4.76	2.93		
Weekly working days (range: 4–7 days)		5.76	0.64		
Formal training	Yes			45	54
	No			55	66

SD = standard deviation

Table 2 displays the findings regarding the perceived safety climate and adherence to safety practices among the employees. According to the data, 40.8 percent (n = 49) of the participants viewed their workplace as having a low level of physical safety climate, whereas 59.2 percnt (n = 71) indicated a high level of perceived physical safety climate. This suggests that more than 40% of these solid waste collectors operate in an environment with elevated physical safety risks. On the other hand, 41.7 percent (n = 50) of the workers exhibited inadequate safety practices, while 58.3 percent (n = 70) showed appropriate safety behaviors. Consequently, nearly 42 percent of the participants who displayed suboptimal safety practices may be vulnerable to heightened safety hazards, potentially leading to incidents such as accidents, injuries, or occupational illnesses **(Table 2)** (below).

Table 2. Summary statistics for safety climate and safety practices among informal solid waste collectors (ISWCs) (N = 120)

Variable	Categories	Percentage (%)	Frequency (N)	Level of Risk
Physical safety climate	Low physical safety climate	40.8	49	High risk
	High physical safety climate	59.2	71	
Safety practices	Poor safety practices	41.7	50	High risk
	Good safety practices	58.3	70	

Table 3 presents the outcomes from Spearman's Rho bivariate correlation analysis exploring the associations between perceived well-being, physical safety climate, and safety practices. The results showed a robust positive relationship (r = 0.833) between workers' sense of well-being and their perception of the physical safety climate at work. This implies that greater perceived physical safety in the workplace is linked to higher levels of reported well-being among employees. Moreover, substantial positive correlations were found between well-being and adherence to safety practices (r = 0.628), as well as between physical safety climate and safety practices (r = 0.675). All reported correlations reached statistical significance ($p < 0.000$), thereby lending support to hypotheses H1 and H2.

Table 3. Spearman's Rho bivariate correlations between the study variables

Variables	Mean	SD	3	2	1
1. Perceived well-being	22.725	10.462			–
2. Physical safety climate	26.992	5.522		–	0.833***
3. Safety practices	61.325	12.439	–	0.675***	0.628***

***p = 0.000

Table 4 displays the outcomes of the hierarchical multiple regression analysis, conducted after adjusting for confounding factors such as participants' age, educational attainment, daily hours worked, and monthly income. In the first model, these control variables collectively accounted for a statistically significant portion of the variance, explaining 46.7% of the differences in workers' perceived well-being. The addition of physical safety climate and safety practices in the second model contributed an extra 16.9% to the explained variance, resulting in a total of 63.5% of the variation in perceived well-being being accounted for. Notably, only the perceived physical safety climate emerged as a significant predictor of well-being (B = 0.844; p = 0.000), whereas safety practices did not reach statistical significance (B = 0.067; p = 0.356).

Table 4. Hierarchical multiple regression coefficients of predictors of perceived well-being

Model	Variables	R^2_{adj}	ΔR^2	Unstandardized coefficients		Standardized coefficients	Significance	Tolerance	VIF
				B	Standard error	Beta			
1	(Constant)	0.467	0.485	33.302	4.365		0.000		
	Age			− 0.302	0.079	− 0.266	0.000	0.929	1.076
	Education level			− 0.723	1.001	− 0.048	0.472	0.994	1.006
	Monthly income			− 0.008	0.002	− 0.294	0.000	0.998	1.002
	Daily working hours			1.757	0.248	0.492	0.000	0.929	1.076
2	(Constant)	0.635	0.169	10.024	5.078		0.051		
	Age			− 0.248	0.066	− 0.219	0.000	0.910	1.099
	Education level			− 2.243	0.857	− 0.150	0.010	0.929	1.077
	Monthly income			− 0.006	0.001	− 0.233	0.000	0.974	1.026
	Daily working hours			0.910	0.265	0.255	0.001	0.555	1.801
	Physical safety climate			0.844	0.140	0.445	0.000	0.564	1.773
	Safety practices			0.067	0.072	0.080	0.356	0.416	2.404

Note: $R^2_{adj,}$ Adjusted R square; $\Delta R^2_{adj,}$ R square change
B, Unstandardized Coefficient Beta; VIF, Variance Inflation Factor
Dependable variable: Perceived well-being

Results from the study demonstrated that more than 40% of the employees are exposed to increased health and safety threats owing to a suboptimal physical safety environment at their job sites. Additionally, around 42% showed insufficient safety behaviors, which might undermine their health, protection, and overall welfare. A significant positive interconnection was noted among workers' sensed well-being, the physical safety climate, and their safety conduct. After adjusting for demographic characteristics, the physical safety climate was identified as an effective forecaster of employees' perceived well-being, yet it did not forecast their safety behaviors.

Degrees of physical safety climate and safety conduct

The evidence that nearly 41% of waste collectors encounter substantial health dangers from a weak physical safety climate, combined with about 42% indicating subpar safety conduct, has major ramifications for job-related health, security, and employee welfare. Earlier research has noted deficient safety habits in informal waste gatherers in Ho [5] and Kumasi [23]. Work from other nations [50, 51] has similarly described inadequate safety environments and conduct in solid waste handling. The increased threats to health among

these employees result from various linked causes. The identified poor safety climate reflects shortages in protective systems and resources at work, such as limited instruction and inadequate care of waste-handling tools [5, 22]. Meanwhile, the common substandard safety conduct suggests failures in following set protective rules, perhaps from low knowledge and poor supply or access to personal protective gear. In Ghana, factors like limited rule enforcement and budget restrictions block safety spending, and informal job setups worsen these issues [5, 23, 29]. Sadly, workers suffer the consequences, with rises in mishaps, harms, sicknesses, and fatalities.

A weak physical safety climate means a setting where protection is often deprioritized, heightening danger exposure and promoting unsafe conduct [12, 52, 53]. Subpar safety conduct worsens these threats, exposing flaws in protective rules and their application in waste operations for worker health and protection [4, 19]. Hence, prompt measures are needed to raise safety knowledge, train employees properly, and supply needed resources for their health and welfare. Boosting the physical safety climate in this field could foster improved safety conduct, thereby cutting job hazards, lowering workplace incidents, and enhancing worker welfare overall [20]. This highlights the need for customized occupational health and safety efforts addressing the particular socioeconomic and ecological issues for waste collectors in Ghana.

Links among physical safety climate, safety conduct, and sensed well-being

The study also uncovered the interrelated aspects of sensed well-being, physical safety climate, and safety conduct in workers, where perceived physical safety climate forecasted well-being in waste collectors. In essence, if workers feel that their work setting and leaders value their health and protection through proper actions, they are more inclined to follow good safety habits and experience greater well-being. This is supported by existing studies [37, 39, 40], stressing the central influence of safety climate and conduct on waste collectors' welfare [54]. The cooperative approaches suggested by Schenck *et al*. [39] and the beneficial ties between safety levels and better welfare point to the importance of widespread changes in waste-handling settings. These results also match findings from Makhubele *et al*. [40] and Dada *et al*. [41], which underline how safety conduct, like PPE application, lowers harms, bodily issues, and aids general welfare. We see advancing health, protection, and welfare for these collectors as a useful way to handle urban waste in the Metropolis. Besides, employers may see reduced employee loss, boosted efficiency, and improved gains.

Advantages and drawbacks

Several drawbacks in the research should be acknowledged in assessing the outcomes. Its cross-sectional nature hinders determining cause-effect relations among factors. Moreover, depending chiefly on interview surveys for data might cause bias from responses or desirability effects, since self-reports could lead participants to give favored answers over true ones. Despite attempts for accurate translations, subtle language variations might have impacted question comprehension. The focus on waste collectors solely in the Cape Coast Metropolis limits broader application across Ghana. However, employing established tools and covering most workers there permits solid application to this population. Thus, future work with varied methods and larger areas could yield fuller views on influences for occupational health and safety in informal waste collectors. Long-term studies would offer stronger details on the trends seen.

Conclusion

The investigation illuminates vital job health and safety difficulties for informal solid waste gatherers in Ghana's Cape Coast Metropolis. It disclosed that many workers face serious health dangers from a deficient physical safety climate in the field, driving widespread subpar safety conduct. Strong positive links were found among sensed well-being, physical safety climate, and safety behaviors. Further, physical safety climate reliably forecasted workers' sensed well-being, but not their safety conduct. The frequent subpar safety conduct reveals gaps in applying protective rules, likely from limited knowledge and poor PPE supply/access. Overall, the study showed the linked nature of sensed well-being, physical safety climate, and safety conduct, with perceived physical safety climate forecasting well-being in these collectors.

Policy and practical suggestions

On the ground, comprehensive training schemes customized for these workers should be rolled out. Highlighting danger recognition, consequences of

correct handling methods, and right PPE usage is key. Enhancing rule enforcement via frequent checks and fines for breaches is critical. Site upgrades for waste points, like specific sorting zones and extra protections, matter. Job formalization to provide benefits including medical coverage would support care access and welfare. Community education efforts could teach proper disposal and collector struggles. Aid for protective resources, ties with health services for routine exams, and funding for safety research innovations are suggested.

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