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Effects of Comprehensive Compensation Systems on Safety Compliance, Safety Participation, and Perceived Safety Outcomes in High-Risk Industries in Lagos State, Nigeria

Adewale A. Soneye[11], Halimah Sani-Sambo[2], Samuel T. Achie[3], Ezinne C. Iluno[4], and Anfofum A. Alexander[5]

Abstract

This study evaluates the association of comprehensive employee compensation systems with three key safety outcomes in high-risk industries operating in Lagos State, Nigeria. As a developing country, Nigeria is characterized by weak regulatory enforcement, high economic volatility, and an underdeveloped health surveillance infrastructure, making it contextually relevant for this study. The regulatory and economic conditions in Nigeria may influence the dynamics of the association between employee compensation and safety differently from those observed in industrialized countries, underscoring the need for context-specific evidence. A cross-sectional research design is adopted in the study. The data analysis method employed was ordinary least squares (OLS) regression with the HC3 robust standard error estimator. The results reveal that comprehensive employee compensation systems have a positive, statistically significant association with all three safety outcomes (safety compliance, safety participation, and perceived safety outcomes). However, the results revealed that comprehensive compensation systems have the strongest effect on perceived safety outcomes ($R^2 = 0.298$) and small to moderate effects on both safety compliance ($R^2 = 0.118$) and safety participation ($R^2 = 0.127$). The study concludes that compensation systems have a dual function: as a tool for employee remuneration and as a strategic safety intervention that can shape both behavioral and perceptual safety outcomes but cautions that organizations should be mindful of adopting these recommendations as standalone solutions. This study makes three contributions to the body of knowledge; among them the application of a theoretical framework developed in an advanced-economy setting to an under-researched subject in a developing-economy context.

Keywords: *Compensation Systems, Safety Compliance, Safety Participation, Perceived Safety Outcomes, High-risk Industries, Job Demands-Resources Model.*

[1,2, 3,4]Department of Management Studies, Nigerian Defence Academy, [2]Department of Acturial Science & Insurance, Ahmadu Bello University, [5]Department of Economics, Nigerian Defence Academy. Correspondence: adewale.soneye2022@nda.edu.ng
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Introduction

Background of the study

Employee safety is a paramount issue across all types of organizations, with high-risk industries such as manufacturing, mining, construction, and oil and gas (Debela et al., 2021; Oyewole et al., 2024), attracting greater attention. Employee safety outcomes in this study have three important dimensions: safety compliance (adherence to rules and PPE use), safety participation (voluntary safety-supportive behaviors), and perceived safety outcomes (employees' subjective assessment of their organization's safety effectiveness). A comprehensive employee compensation system refers to the aggregate of financial (direct wages, allowances, bonuses) and non-financial (recognition, advancement opportunities, psychological support) rewards employees receive in exchange for their labor (Bamberger et al., 2014; Riabkova, 2025). These concepts, which are critical to workplace safety management, are operationalized in the literature review section.

The need for stakeholders to take employee safety seriously is buttressed by global statistics on work-related accidents, injuries, and diseases, which underscore the enormity of challenges posed by occupational risks. The International Labor Organization (ILO, 2023) estimates reflect an almost 5% increase in the number of work-related accidents and injuries between 2015 and 2022, with fatalities numbering about 3 million annually. These statistics reflect systemic failures in occupational safety management systems across many organizations, as well as economic factors. Two economic factors - organizations' drive for production and profitability (Lafuente & Murrell-Blanco, 2025), and employees' weaker labour market bargaining power (Chau et al., 2022) - downplay concerns for workers' safety.

A breakdown of available statistics showed that Asia accounts for nearly 65%, Europe and Africa approximately 12%, the Americas 11%, and Oceania less than 1% (UN Global Compact, n.d.). These statistics are highly disproportionate and potentially disputable. For instance, attributing 12% of work-related accidents, injuries, and diseases to Africa may be due to underreporting, which is influenced by an underdeveloped occupational health surveillance infrastructure (Ncube & Kanda, 2018; Roy et al., 2025). Nigeria is a reference point that highlights the gravity of underdeveloped occupational health surveillance infrastructure and the susceptibility to underreporting of workplace accidents due to the absence of national-level occupational injury data (Olawepo et al., 2021), leading to a paradox about how policymakers can effectively address a problem that is not accurately measured (Adetunji et al., 2022).

In Nigeria, workplace safety management has largely focused on measures such as risk control, materials handling procedures, enforcement of personal protective equipment (PPE) use, and administrative oversight. Orikpete and Ewim (2023) stressed that these measures are only helpful in elevating safety consciousness and fostering a fair, compliance-driven safety culture. Several factors which can be classified as embedded Human Resource Management (HRM) practices, an approaches organization are now adopting to minimize adverse safety outcomes and make workplaces safer (Turner et al., 2021), has yet to be fully grounded. Many Nigerian organizations have been slow to adopt HRM practices as tools for managing workplace safety, failing to capitalize on opportunities offered by several amendments to the country's occupational safety and health (OSH) regulatory frameworks (Haruna et al., 2025). This slow response has led organizations to implement obsolete safety policies, resulting in poor compliance with regulatory requirements by both employers and employees and potentially increasing recorded safety incidents across industries (Olokede & Ukpere, 2023). All these factors weaken employees' commitment to workplace safety and diminish their belief that safety measures are economically worthwhile. This combination, in turn, encourages unsafe behaviors and ultimately results in workplace accidents (Arinze & Kouabenan, 2025).

Although there has been a sustained increase in the literature on HRM practices and workplace safety, at least three gaps remain. The first is that several of the previous studies focused on the use of isolated financial incentives - bonuses or piece rates (Meyer et al., 2024) or workers' injury compensation claims (Wadhwa et al., 2024) - rather than examining the effect of a comprehensive compensation system encompassing direct, indirect, and non-financial components on safety outcomes. Similarly, studies have documented the correlations between the use of financial and non-financial incentives as separate programs and safety metrics; the psychological effects of a comprehensive employee compensation system on safety outcomes have often been neglected (Soro et al., 2025). The final gap is the theoretical application of the Job Demands-Resources (JD-R) model (Demerouti et al., 2001; Bakker & Demerouti, 2007) to comprehensive compensation systems and employee safety outcomes. Although the JD-R model has been extensively researched and validated in more developed countries, it has received relatively little attention in developing economies such as Nigeria.

This investigation provides a basis for understanding the extent to which a specific modern HRM practice - a comprehensive employee compensation system - is associated with three employee safety outcomes: safety compliance, safety participation, and perceived safety outcomes. The study specifically focused on organizations in five high-risk industries -

manufacturing, transport, healthcare, construction, and oil and gas sectors, in Lagos State, Nigeria. The study will enable industry leaders, especially those in high-risk industries in Lagos, Nigeria, and developing countries with similar conditions, to gain valuable insights into the effects of macroeconomic and social factors on the compensation-safety relationship. Organizational leaders in these industries can therefore apply the insights gained to develop pragmatic compensation systems that will help address potential behavioral safety issues, improve employee perceptions, and mitigate undesirable safety outcomes.

Statement of the problem

The work environment in high-risk industries is replete with occupational hazards and carries a high potential for accidents. Organizations in this industry category must devise appropriate HRM practices or interventions, such as a comprehensive employee compensation scheme, that employees perceive as adequate to address their risk exposures. Scholars have affirmed the dual roles of an effective employee compensation system: providing economic livelihood and psychological satisfaction, both valued by organizations (O'Reilly & Main, 2010; Mustapha & Rajasegaram, 2025). This assertion, therefore, suggests the possibility of two problems.

First, when employees perceive their compensation package as suboptimal - whether due to low base pay, inadequate hazard allowances, or inflation-eroded real income - they experience economic pressure and diminished psychological well-being. Employee motivation for safety, in terms of awareness, adherence, and compliance with safety protocols, is also impaired by these factors (Wang & Seifert, 2017; Alabi & Ebenezer, 2024). Consequently, unsafe behaviors, accident rates, and workers' compensation claims will increase, while individual and organizational productivity will be reduced; the organization may suffer reputational damage (Rusyda & Aziz, 2021; Harsini et al., 2021; Djunaidi et al., 2024).

Second, employees who perceive inadequate compensation are likely to conclude that the organization does not value their well-being (Houette & Mueller-Hirth, 2021). Thus, when employees reach this stage, they will begin to seek alternative means to improve their economic conditions, such as overtime, secondary employment, or private business practices (Aju & Beddewela, 2023). A poorly designed employee compensation system will adversely affect their active participation in safety-related matters, especially as safety participation is at employees' discretion (Griffin & Neal, 2000; Clarke, 2010; Smith & DeJoy, 2014). By engaging in other economic or employment activities to augment their income, employees are

likely to experience increased fatigue and reduced attention to their own and others' personal safety (Gabriel et al., 2018), thereby increasing the propensity for workplace accidents.

The problems outlined above can trigger a sequence of events: employees' perception of inadequate compensation leads to negative perceptions of their organizations, which, in turn, makes them unconcerned about workplace safety, ultimately resulting in higher organizational costs and a poor organizational reputation. Therefore, the need to break this vicious cycle requires that empirical evidence be provided on the relationship between comprehensive employee compensation systems on the one hand, and the three dimensions of workplace safety outcomes - safety compliance, safety participation, and perceived safety outcomes - on the other. This study investigates the extent of the association between comprehensive employee compensation systems these three safety outcomes among employees in high-risk industries in Lagos State, Nigeria.

Research questions

The following are the research questions with respect to high-risk industries operating in Lagos State, Nigeria:

RQ1: To what extent is a comprehensive employee compensation system associated with employees' safety compliance?

RQ2: To what extent is a comprehensive employee compensation system associated with employees' safety participation?

RQ3: To what extent is a comprehensive employee compensation system associated with employees' perceptions of safety outcomes?

Research objective

The objectives of this study are to:

RO1: Examine the association between a comprehensive employee compensation system and employees' safety compliance.

RO2: Examine the association between a comprehensive employee compensation system and employees' safety participation.

RO3: Examine whether there is any association between a comprehensive employee compensation system and employees' perceived safety outcomes.

Literature review

Conceptual framework

Safety outcomes

Employee safety outcomes are a major concern for organizations, employees themselves, safety professionals, governments at all levels, and even global bodies such as the World Health Organization (WHO) and the International Labor Organization (ILO). According to Rusyda et al. (2020), safety outcomes can be positive or negative; negative outcomes in the workplace are often the result of accidents and entail losses that can be catastrophic for employees, their dependents, and the organization. Safety outcomes are traditionally measured through leading and lagging indicators - standards that organizations are required to record and report periodically as internal performance measures and/or as mandated by organizational leadership and regulatory authorities.

Although safety metrics continue to evolve, their traditional measures - leading and lagging indicators - reflect an organization's proactive or reactive disposition toward workplace safety (Chen et al., 2021). Recent developments have expanded this framework, with behavioral and perceptual indicators increasingly adopted as leading indicators capable of predicting future safety outcomes (Mousavi et al., 2017). This shift reflects growing recognition that workplace safety is shaped by the interplay between employees' enacted behaviors and their cognitive interpretations of the work environment, underscoring the conceptual importance of distinguishing behavioral from perceptual safety indices (Griffin & Neal, 2000; Cornelissen et al., 2017). Safety compliance is the extent to which employees adhere to required personal protective equipment (PPE) (Chen et al., 2021), follow established work procedures, utilize appropriate work tools, and work in a manner that does not compromise their own safety or that of others (Harlina et al., 2023). Safety compliance is an observable behavioral measure of employees' adherence to workplace safety rules, regulations, and guidelines. Safety participation, according to Griffin and Neal (2000) and Smith and DeJoy (2014), is voluntary and a behavior over which employees exercise discretion. Safety participation entails more than concerns for the personal safety of the employee but extends to the voluntary indirect contribution employees make to support and enhance workplace safety. Employee safety participation is expressed in the form of regular attendance at safety briefings/meetings, promoting safety awareness programs, making suggestions to improve workplace safety, and supporting co-workers to perform tasks safely.

Employee perception of safety outcomes is the employee's subjective view of the organization's safety priorities (Huang et al., 2020) and the effectiveness of the organization's systems to prevent or respond to adverse safety outcomes (Abeje & Luo, 2023; Xia et al., 2023). Employees' perceptions are constructed from their direct experiences, observations, communication, observed policies and procedures, safety incidents, and management's responses to safety incidents. Consequently, employee-perceived safety outcomes are expressed as a combination of perceptions of accident frequency, injury severity, and the effectiveness of management responses.

Employee compensation

An employee compensation system is a multifaceted concept with perspectives ranging from academia to organizations, from psychological to sociological, and from its purpose as a strategic HRM tool to employees' perception of it as a resource (Arfian et al., 2024; Mustapha & Rajasegaram, 2025). Chan (2004) conceptualized the employee compensation system as the 'package of returns' designed and implemented to remunerate employees for their work input. Bamberger et al. (2014) and Das and Mohapatra (2014) affirmed that the employee compensation system is a subsystem within the HRM ecosystem, encompassing all forms of tangible financial and non-financial entitlements that employees receive in exchange for their labor and contributions to organizational success. In fact, Das and Mohapatra (2014) referred to compensation systems using terminologies such as wages and salaries administration, remuneration, or reward management.

Employee compensation is broadly classified into its financial and non-financial components. The financial components of employee compensation systems are further classified into direct and indirect financial compensation (Ahmed & Ahmed, 2014; Siddiqui & Vishwakarma, 2023). The direct components include wages and salaries, as well as cash equivalents such as incentives, allowances, bonuses, performance pay, and other types of discretionary pay. Akter and Hussain (2016) affirmed that direct financial compensation is the core of employment terms and conditions and is essential to employees' economic well-being. According to Ahmed and Ahmed (2014), indirect financial compensation is considered 'fringe benefits' that complement direct financial compensation. Indirect financial compensation can arise from legal or regulatory impositions, such as pension and/or social insurance schemes, or at the organization's discretion, such as reimbursements for self-development or scholarship awards to employees' children (Antoni et al., 2017; Siddiqui & Vishwakarma, 2023).

Rajendran and Doraisamy (2022) argued that non-financial compensation is not only a powerful component of an employee compensation system but also the best option for motivating employee performance. As non-financial components of compensation systems do not involve immediate cash payments or cash equivalents, they provide intrinsic motivation through mechanisms such as recognition, advancement, autonomy, and psychological support (Tek, 2024). These intrinsic rewards enhance employee engagement and can encourage appropriate safety behavior. Atiku (2024) identified several examples of non-financial compensation, including recognition and appreciation awards for employees, special acknowledgments for exceptional performance, promotions to higher job roles, delegation of authority, and opportunities for interpersonal and social interaction.

Employee compensation comprises the aggregate of financial and non-financial rewards, including base wages, fixed and variable allowances, non-cash rewards, and all quantifiable and unquantifiable benefits that employees receive in exchange for their labor (Njagi & Muna, 2021; Riabkova, 2025). All these financial and non-financial rewards and benefits are captured in the organization's financial and human resources records.

Empirical review

Soro et al. (2025) conducted a systematic review of 43 empirical studies published between 1988 and 2024 to examine the effects of truck companies' financial performance and driver compensation on safety outcomes in the trucking industry. The primary finding revealed that compensation tied to the amount of work done is positively associated with adverse safety outcomes. Conversely, time-based payments, higher pay levels, and compensation for non-driving tasks are linked to positive safety outcomes. This review study, which included both peer-reviewed and grey literature, reveals significant methodological limitations, including reliance on data from the 1980s and 1990s, a narrow focus on truck drivers, and a limited analytical framework. The multi-industry interest and economic context of this new study enable testing to determine whether compensation-safety outcomes patterns are industry-specific or generalizable across sectors. These factors also provide a basis for determining the effects of differences in economic and regulatory conditions across developed and developing countries on relationships between employee compensation and safety outcomes.

De Dhaem et al. (2024) conducted a study to evaluate the impact of workers' compensation on care for injuries and illnesses from a global round table perspective. The qualitative study employed a snowball sampling method to select occupational health professionals, and a

multidisciplinary expert panel comprising academics, private- and public-sector healthcare professionals, and administrators. This study identified and classified different compensation models into single-payer, state/regional, public, private, or mixed. The identified differentiating factors among the models are the timeliness of compensation payments, the financial incentives offered, and the motivation for the investment in workplace safety. Despite its rich qualitative perspective, the lack of empirical validation of its outcomes and assertions is a significant impediment. The current study addresses this weakness through its quantitative approach, empirical data collection, and analysis. Furthermore, the current study's focus on a developing economy context addresses an established gap in the occupational safety literature: the disproportionate reliance on evidence from developed countries, whose regulatory environments, enforcement mechanisms, and workplace cultures differ substantially from those of developing countries (Ncube & Kanda, 2018; Samano-Rios et al., 2019).

Alabi and Ebenezer (2024) explored the relationship between work hazard compensation and work behavior among employees of three selected manufacturing companies located in North-Central Nigeria. This study adopted a cross-sectional descriptive survey research design combined with a mixed-method approach. The quantitative data were collected from 403 respondents, approximately 97% of the sample size of 414. In contrast, the qualitative data were collected through interviews with 23 employees of manufacturing companies. The study revealed that employees perceived the hazard compensation they received to be low, not commensurate with the risks and hazards they faced, and quite discouraging for safety compliance. While this study derives its strength from its mixed-methods approach and its assessment of multiple dimensions, its focus on a singular sector, manufacturing, and hazard compensation is a significant limiting factor. The angle taken in the current study—examining the effect of comprehensive employee compensation systems (including base salary, hazard premiums, benefits, insurance coverage, and other components) across multiple high-risk industries—addresses the identified limitations.

Brandhorst and Kluge (2022) conducted an experimental study to investigate the effects of financial incentive schemes on risky behavior in a safety-critical, simulated high-reliability organization. The study focused on the impact of financial incentive schemes on employees' rule-violation behavior during task performance. All participants in the study were engineering students trained to operate a simulated wastewater treatment plant. Each of the 59 participants was assigned to one of three payment conditions: continuous pay (no incentive), up-front pay, or bonus pay. The finding was that incentive-based payment conditions (up-front and bonus

pay) led to more rule violations than the non-incentive pay scheme, under which participants were on continuous pay. The main limitations of this study are its relatively small sample size of 59 engineering students, the simulated environment, and the limited scope of compensation examined. These factors raise concerns about generalizability to real-world industrial contexts where workers' attributes and compensation systems are more diverse and structured. The real-world setting of this new study, involving participants with work experience in high-risk industries across multiple sectors and a holistic employee compensation system, addresses the identified limitations in the previous study.

Skerlic and Erculj (2021) investigated the impact of financial and non-financial work incentives on truck drivers' safety behavior. The study aimed to understand the effect of incentives on the frequency of driver involvement in traffic accidents. The survey respondents comprised 220 truck drivers operating on international routes within the European Union. Using a Structural Equation Model (SEM), the study found that financial and non-financial incentives positively influenced truck drivers' safety behavior. In fact, the study found that higher financial incentives were instrumental in drivers obeying speed and driving time limits. In contrast, non-financial incentives helped ensure compliance with weekly rest periods.

Dworsky and Broten (2018) conducted a qualitative review study of published literature, including critiques of workers' compensation policies, to examine their impact on occupational safety and health and employee well-being. The study adopted a mixed-methods approach combining literature review and structured interviews with the representatives of five stakeholder groups - workers, employers, claims administrators, state agency leaders, and occupational health care providers. The study revealed that, contrary to the intended safety-promoting effect within organizations, stakeholders perceived that financial incentives encouraged underreporting of safety incidents. Among the limitations of the reviewed study is the non-random selection of representatives from stakeholder groups and the restricted focus on workers' compensation claims. This study addressed the reviewed study's limited focus on workers' compensation claims by examining a broader compensation system using primary data.

The empirical literature presented above reveals discernible disagreements. The first issue is the divergent positions between Skerlic and Erculj (2021) and Brandhorst and Kluge (2022) on the relationship between financial incentives and safety behavior. While the former study asserts that financial incentives positively influence safety behavior and are therefore likely to improve safety outcomes, the latter study argues that financial incentives fuel unsafe worker

behavior and increase safety incidents. The context of the studies may be largely responsible for these contradictory positions. While the study by Skerlic and Erculj (2021) was based on a real-world survey of professional truck drivers, the other study by Brandhorst and Kluge (2022) involved engineering students in a simulated environment.

A similar divergent position was observed between Dworsky and Broten (2018) and Dhaem et al. (2024), with the former finding that stakeholders perceived financial incentives as more of an encouragement of underreporting of workplace injuries than a genuine source of safety improvement. De Dhaem et al. (2024), however, found that financial incentives incentivize safety investment. These contradictions highlight that the relationship between employee compensation and workplace safety outcomes is not universally and necessarily positive. The relationship between the two broad variables depends on factors such as the compensation scheme (time-based vs. output-based), industry context, and the conditions for rewarding employees' safety performance (reporting versus avoiding incidents). To help resolve the observed tensions in the literature, this study examines the relationship between a comprehensive compensation system and three measures of safety outcomes, in contrast to the isolated individual-incentives approach used by several previous studies. In carrying out this task, the study focused on multiple high-risk industries and used behavioral and perceptual outcome measures.

Gap in the literature

Despite the prevalence of studies on the broad dimensions of the subject matter under investigation, this study addresses four gaps. First, previous studies are largely fragmented, focusing on isolated components of employee compensation - bonuses (Brandhorst & Kluge, 2022), hazard pay (Alabi & Ebenezer, 2024), and workers' compensation claims (De Dhaem et al., 2024). In addition to these studies, which investigated single factors, others, such as Meyer et al. (2024), called for investigations into holistic compensation strategies rather than specific monetary or non-monetary incentives. In their review of the literature, Soro et al. (2025) found that investigations of compensation and safety outcomes have predominantly focused on pay type (time-based vs. output-based) or pay level separately, without considering the full compensation system. The emphasis on single incentives led Mustapha and Rajasegaram (2025) to argue that employee compensation should not be reduced to its pay component alone but should be recognized as a holistic interaction among economic, organizational, and institutional forces. This position, therefore, reinforces the argument that the use of isolated

incentives (bonuses, hazard pay, compensation claims) obscures the importance of a comprehensive compensation system. This finding has been a limitation of several previous studies.

Secondly, the existing literature is largely geographically and contextually skewed. Most of the research on this subject originated in more developed countries, creating a geographical imbalance that disproportionately favors developed-economy perspectives over developing countries, particularly in Africa and Nigeria. Studies conducted in Nigeria - where regulatory enforcement is weak (Olatubi & Olatubi, 2017), inflation and interest rates erode real wages, and occupational health infrastructure is underdeveloped (Ohajinwa et al., 2017) - may yield different results than existing studies. Goyannes et al. (2024) suggested that geographical and cross-country variations can affect research outcomes. Marrocco et al. (2026) also affirmed that contextual factors such as regulatory frameworks, employment protection legislation, and reporting behaviors shape observed safety outcomes and often complicate cross-national comparisons.

Another gap that this study addresses is the under-specification of perceived safety outcomes. While safety compliance and safety participation are well-established behavioral constructs (Griffin & Neal, 2000; Smith & DeJoy, 2014), perceived safety outcomes are less well established. Studies mostly treat safety compliance and safety participation as factors predicting safety outcomes (Yang et al., 2021), often measuring objective non-fatal and fatal injury rates (Yusuf et al., 2016; Baraza et al., 2023), but rarely employees' subjective perceptions of their organization's safety outcomes. There have been recent calls by scholars (Abeje & Luo, 2023; Xia et al., 2023) for further investigation of perceptual safety measures. The basis for these calls is that subjective assessments may reveal different dimensions of safety outcomes than objective metrics. Unfortunately, the studies that have examined how compensation systems relate specifically to perceived safety outcomes are few and therefore underexplored.

Lastly, although Bakker and Demerouti's (2007) JD-R model has been extensively applied and validated, even in studies outside the management field and in some developing countries (Idris et al., 2011; Li et al., 2012), its application to the employee compensation-safety relationship in African and Nigerian contexts is lacking. Regarding the application of the JD-R model in the Sub-Saharan African context, available support includes studies on work engagement and work-family conflict (Balogun & Afolabi, 2018) and on life satisfaction among Nigerian Correctional Services (NCS) employees (Otu et al., 2020). Evidence of studies

applying the JD-R model to investigate the association between employee compensation systems and workplace safety outcomes is lacking. This study aims to extend the model's application to the subject, exploring the context of the Nigerian high-risk industry.

Theoretical framework

The underpinning theoretical framework for this study is the Job Demands-Resources (JD-R) model proposed by Demerouti et al. (2001) and refined by Bakker and Demerouti (2007). The JD-R model classified job characteristics into job demands and job resources. Job resources enhance employees' motivation and help them cope with job demands. Examples of job demands include general and specialized skill requirements, physical efforts, workplace hazards, workload, and performance targets. In contrast, job resources include organizational support, reward systems, and learning and development opportunities. Employee compensation or reward systems are HRM practices used by organizations to help employees cope with, manage, and respond effectively to the demands and effects of their jobs.

This study conceptualizes compensation systems as an important job resource that organizations employ to motivate and enhance employees' behavior towards achieving work goals, reducing the adverse effects of job demands, and achieving organizational objectives, including favourable safety outcomes. The JD-R model is adopted as the theoretical framework for this study, as a comprehensive employee compensation system is a critical job resource that offsets the effects of job demands and enhances employee motivation, engagement, and safety behavior. Baiyewu (2023) posits that a comprehensive compensation system reduces absenteeism, turnover intention, and job dissatisfaction, and contributes to improved safety outcomes for employees and their organizations. The JD-R framework, therefore, adequately supports the direct testing of the relationship between employee compensation and safety metrics, without the complexities of mediation.

Methodology

Research design

This study adopts a cross-sectional survey research design. The study population comprised 10,073 employees of organizations operating in five high-risk industrial sectors in Lagos State, Nigeria. These employees had at least 1 year of work experience with their respective employers at the time of the study. An appropriate sample size of 385 employees was

determined using the Yamane (1967) method at the 95% confidence level (α = 0.05). The sampling method employed was stratified random sampling, consistent with Alabi and Ebenezer's (2024) study on occupational safety in developing economies. The survey instrument was distributed to 385 employees, with the distribution proportional to the size of employees in each industry (Ugwu & Balogun, 2024). The instrument, designed with Google Forms, was distributed via email to employees using lists obtained from the Human Resources Departments of the organizations. The data were collected over six weeks in the last quarter of 2025 and retrieved electronically, yielding 239 (62%) valid responses. Although the actual response rate falls short of the 385-sample size, it is nonetheless acceptable for an electronically distributed survey (Lund, 2023). Refer to Table 1 for the demographic breakdown of the study.

Table 1 - Study demographics

Industrial sector	No	Population size (N)	Sample size (n)	Actual response	Response rate by sample size (%)
Manufacturing	3	6,215	238	154	65
Transportation	2	155	6	6	100
Healthcare	2	891	34	25	74
Construction	1	2,384	91	42	46
Oil and gas	1	428	16	12	75
Total	**9**	**10,073**	**385**	**239**	**62**

Source: Authors' compilation from corporate information obtained from companies' websites or audited financial reports.

Research instrument

The study employed a self-developed 40-item questionnaire for data collection. Although there are some established scales, such as Zohar (1980), Griffin and Neal (2000), and the Nordic Safety Climate Questionnaire (Kines et al., 2011), they focus primarily on safety climate and are not suitable for this study. None of these existing instruments was designed to comprehensively measure the three safety outcomes of the study - safety compliance, safety participation, and perceived safety outcomes - relative to comprehensive compensation systems encompassing financial (direct and indirect) and non-financial components. The existing scales had been developed for and targeted at developed-economy contexts. They may not have captured the peculiar dynamics of Nigeria's business environment. While we acknowledge that a self-developed instrument limits direct comparability with previous studies, we took steps to mitigate its drawbacks. For instance, we employed multiple measures, including expert review, exploratory factor analysis, AVE, the Fornell-Larcker criterion, and Cronbach's alpha (Cheung et al., 2023) to assess the instrument's reliability and validity.

Instrument reliability and validity

The self-developed research instrument consisted of 40 items divided into four sections: one for the independent variable and three for the dependent variables. The research instrument demonstrated a strong score on internal reliability with a Cronbach's alpha (α) of 0.82, exceeding the 0.70 threshold (Kilic, 2016; Malapane et al., 2024). In addition to expert review, exploratory factor analysis (EFA) using principal axis factoring with Promax rotation, average variance extracted (AVE), and the Fornell-Larcker criterion were used to test validity. Each affirmed the instrument's construct validity, convergent validity, and discriminant validity, with all results exceeding their respective thresholds. EFA revealed two distinct theoretical constructs, behavioral and perceptual-motivational safety, thereby supporting the factorability of the instrument. The factor analysis results were significant, with a Kaiser-Meyer-Olkin (KMO) score of 0.87 (above the 0.60 threshold) and Bartlett's test of sphericity $\chi^2 = 1245.67$, $df = 780$, $p < 0.001$ (Flores-Mamani et al., 2025). Similarly, the AVE values of all the variables - safety compliance and safety participation = 0.82, perceived safety outcomes = 0.56, and compensation system = 0.54 - exceeded 0.50 (Cheung et al., 2023; Hamid et al., 2017). The Fornell-Larcker criterion - with the square root of AVE for each construct - also affirmed the instrument's discriminant validity, with all $\sqrt{AVE} > 0.50$ and cross-loadings < 0.32 (Cheung et al., 2023; Hamid et al., 2017). The eigenvalues and variances of all variables were significant. The eigenvalue of each dependent variable exceeded 1.0, and their combined variance = 58.4%. The independent variable had an eigenvalue of 2.13 and a variance of 11.3%. The significance of the eigenvalues, variances, and cross-loadings supports the instrument's internal structure (Sappaile et al., 2023; Farradinna et al., 2023; Hair et al., 2019).

Data analysis technique

Quantum XL macros add-in for Excel was used specifically for the Johnson transformation to normalize the data, which the initial normality test revealed was left-skewed (Chanaphai et al., 2026) and substantially violated the normality assumption. Developed by Sigma Zone (n.d.), the Quantum XL macros add-in can implement the Johnson transformation algorithm described by Chou et al. (1988). The tool for all other data analysis was the Statistical Package for the Social Sciences (SPSS) version 27, which was used for ordinary least squares (OLS) regression with the HC3 robust standard errors estimator and for EFA tests to assess the validity of the research instrument. The HC3 error estimator is suitable for addressing potential heteroscedasticity and multicollinearity in data, even when the sample size (N) is as small as

25. It is also useful for addressing the limitations of data normalized through transformation (Long & Ervin, 1999; Dudgeon, 2017).

Model specification

The linear regression model for each dependent variable is presented below.

$\text{Safety Outcome}_i = \beta_0 + \beta_i(\text{Compensation System}_i) + \varepsilon$

Where:

Safety outcome_i is represented as safety compliance (SC), safety participation (SP), or perceived safety outcomes (PSO), respectively.

β_0 = Intercept (constant)

β_1 = Regression coefficient for compensation system (CS)

CS_i = Comprehensive compensation system

ε = Error term

Data analysis and results

Test of normality

The test of normality conducted on the survey data indicated that the dataset was not normally distributed. The normality check revealed a substantial violation of the assumptions, with $p < 0.05$ for both the Kolmogorov-Smirnov and Shapiro-Wilk tests (see Table 2 below). The data were normalized (Chanaphai et al., 2026) using the Johnson transformation, which is suitable for normalizing left-skewed data.

Table 2 - Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Comprehensive Compensation	.059	239	.042	.979	239	.001
Safety Compliance Behaviour	.175	239	.000	.821	239	.000
Safety and Participation Behaviour	.152	239	.000	.867	239	.000
Perceived Safety Outcomes	.098	239	.000	.964	239	.000

a. Lillie fors Significance Correction

Analysis of research questions

The results of the data analysis, providing answers to research questions 1 to 3, are presented in Figures 1 to 3 below. The regression of safety compliance on a comprehensive compensation system yielded a positive and statistically significant result ($F = 32.762$, $p < 0.001$; $R^2 = 0.118$). The result indicates a small-to-moderate association between a comprehensive compensation system and employee safety compliance behavior. Approximately 12% of the variance in safety compliance is explained by the compensation system. While a comprehensive compensation system is associated with safety compliance, it is not a dominant factor, suggesting that other variables exert a stronger influence. This finding addresses RQ1.

Figure 1 - Safety compliance regressed against compensation system

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: SafetyCompliance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	28.098[a]	1	28.098	32.762	.000	.121
Intercept	193.018	1	193.018	225.056	.000	.487
CompensationSystem	28.098	1	28.098	32.762	.000	.121
Error	203.261	237	.858			
Total	3923.516	239				
Corrected Total	231.359	238				

a. R Squared = .121 (Adjusted R Squared = .118)

Parameter Estimates with Robust Standard Errors

Dependent Variable: SafetyCompliance

Parameter	B	Robust Std. Error[a]	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	2.885	.211	13.691	.000	2.470	3.300	.442
CompensationSystem	.363	.066	5.475	.000	.232	.494	.112

a. HC3 method

Figure 2 - Safety participation regressed against compensation system

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: SafetyParticipation

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	27.448[a]	1	27.448	35.755	.000	.131
Intercept	208.741	1	208.741	271.912	.000	.534
CompensationSystem	27.448	1	27.448	35.755	.000	.131
Error	181.940	237	.768			
Total	4097.656	239				
Corrected Total	209.388	238				

a. R Squared = .131 (Adjusted R Squared = .127)

Parameter Estimates with Robust Standard Errors

Dependent Variable: SafetyParticipation

Parameter	B	Robust Std. Error[a]	t	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound	Partial Eta Squared
Intercept	3.000	.212	14.122	.000	2.581	3.418	.457
CompensationSystem	.359	.064	5.621	.000	.233	.485	.118

a. HC3 method

Similarly, the regression of safety participation on the comprehensive compensation system yielded a positive, statistically significant result ($F = 35.755$, $p < 0.001$; $R^2 = 0.127$). The result indicates a small-to-moderate association between a comprehensive compensation system and employee safety participation behavior. Approximately 13% of the variance in safety participation is explained by the compensation system. Consistent with the finding for safety compliance, comprehensive compensation is associated with safety participation but is not a dominant predictor, suggesting that other factors play a more substantial role. This finding addresses RQ2.

The regression of perceived safety outcomes on the comprehensive compensation system revealed the strongest association among the three-safety metrics ($F = 101.903$, $p < 0.001$; $R^2 = 0.298$). This result indicates that approximately 30% of the variance in employees' perception of safety outcomes is explained by the compensation system. Unlike the behavioral safety measures (compliance and participation), perceived safety outcomes demonstrate a notably stronger association with comprehensive compensation. This finding addresses RQ3.

Figure 3 - Perceived safety outcomes regressed against compensation system

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: PerceivedSafetyOutcome

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	39.398[a]	1	39.398	101.903	.000	.301
Intercept	138.987	1	138.987	359.492	.000	.603
CompensationSystem	39.398	1	39.398	101.903	.000	.301
Error	91.629	237	.387			
Total	3378.563	239				
Corrected Total	131.027	238				

a. R Squared = .301 (Adjusted R Squared = .298)

Parameter Estimates with Robust Standard Errors

Dependent Variable: PerceivedSafetyOutcome

Parameter	B	Robust Std. Error[a]	t	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound	Partial Eta Squared
Intercept	2.448	.144	16.951	.000	2.163	2.732	.548
CompensationSystem	.430	.043	9.957	.000	.345	.515	.295

a. HC3 method

Discussions of findings

The results of the data analysis revealed positive and statistically significant associations between a comprehensive employee compensation system and each safety outcome. For safety compliance, $\beta = 0.363$, $R^2 = 0.118$, $p < 0.001$; for safety participation, $\beta = 0.358$, $R^2 = 0.127$, $p < 0.001$; and for perceived safety outcomes, $\beta = 0.430$, $R^2 = 0.298$, $p < 0.001$. These results are consistent with Bakker and Demerouti's (2007) JD-R theoretical position, which holds that job resources, such as compensation systems, enhance employees' capacity to cope with job demands and achieve positive performance. The results further revealed that a comprehensive employee compensation system explains 12% and 13% of the variances in safety compliance and safety participation, respectively, suggesting the possibility of other factors that may be more prominent (Funder & Ozer, 2019); these unmeasured factors include safety climate, cultural factors, supervisory support, and individual employee propensity for risk (Tedone et al., 2025; Kessler et al., 2020).

Safety compliance: compensation systems and safety compliance show a positive but small-to-moderate association ($\beta = 0.363$, $R^2 = 0.118$), indicating that approximately 12% of the

variance in compliance behavior is explained by a comprehensive compensation system. This finding aligns with Skerlic and Erculj (2021) on the positive influence of financial and non-financial incentives on truck drivers' safety behavior, albeit modestly. The finding, however, deviates from Brandhorst and Kluge (2022), which suggests the possibility of increased motivation to violate safety rules due to incentive-based pay. The deviation of Brandhorst and Kluge's (2022) findings from those of Skerlic and Erculj (2021) and this study is largely due to differences in context between simulated and real-life situations. The revelation that a comprehensive compensation system is positively associated with better safety compliance aligns with Alabi and Ebenezer's (2024) observation that poor employee compliance with safety protocols in Nigerian manufacturing companies is due to inadequate compensation for workplace hazards.

Safety participation: the results regarding the relationship between compensation systems and safety participation mimic those for compensation systems and safety compliance; they are similarly positively significant and small-to-moderate ($\beta = 0.358$, $R^2 = 0.127$). The results indicate that a comprehensive compensation system explains approximately 13% of the variance in voluntary safety participation. The relatively modest association between these two variables reaffirms the views of Griffin and Neal (2000) and Smith and DeJoy (2014) on employees' voluntary discretion and autonomy in safety participation. The findings of this study extend those of Skerlic and Erculj (2021) on the impact of non-financial incentives (e.g., appreciation, recognition, advancement opportunities), which were particularly influential on employees' discretionary safety behaviors (e.g., compliance with rest periods). It is, however, difficult to pinpoint which of financial and non-financial compensation has a stronger association or whether both correspondingly relate to safety participation.

Perceived safety outcomes: the findings revealed that the relationship between comprehensive compensation and perceived safety outcomes ($\beta = 0.430$, $R^2 = 0.298$, $p < 0.001$) is strongest. This result further demonstrates that approximately 30% of the variance in employees' subjective assessments of their organization's safety outcomes is explained by the compensation system, suggesting that employees' psychological and perceptual responses to compensation tend to outweigh their overt behaviors. This finding potentially extends previous studies such as Soro et al. (2025) and Alabi and Ebenezer (2024), which focused predominantly on behavioral safety metrics. The strong association between a comprehensive compensation system and perceived safety outcomes also aligns with the argument that compensation systems go beyond economic considerations, shaping employees' perceptions of organizational justice,

care, and concern for their overall well-being (Thierry, 2004; Gyekye & Haybatollahi, 2014). In the Nigerian context, where economic volatility (high inflation, currency devaluation) can rapidly erode the real value of compensation, employees may be more attuned to compensation packages that signal stronger organizational commitment to their safety and general well-being.

It is imperative to note that the findings of this cross-sectional, self-reported study provide only preliminary evidence that a comprehensive compensation system is associated with the three safety outcomes (Narisada & Schieman, 2022). A longitudinal study will provide a more reliable basis for establishing causal relationships.

Conclusion and recommendations

Conclusion

The objective of this study was to examine whether comprehensive employee compensation systems are associated with three specific employee safety metrics, using data collected from employees in diverse high-risk industries in Lagos State, Nigeria. The underpinning theoretical framework was the Job Demands-Resources (JD-R) model (Demerouti et al., 2001; Bakker & Demerouti, 2007).

The findings collectively indicate that comprehensive compensation systems are positively and statistically significantly associated with all three-safety metrics: safety compliance, safety participation, and perceived safety outcomes. These associations affirm the dual role - administrative/remuneration and strategic intervention - that a comprehensive compensation system can play in enhancing employee safety outcomes (O'Reilly & Main, 2010; Mustapha & Rajasegaram, 2025). The study contributes to bridging the geographical imbalance in the occupational safety and health literature. It also provides a basis for extending the applicability of the JD-R model to the Nigerian context, a setting characterized by relatively lower concerns about workplace safety, economic volatility, and weaker regulatory monitoring and enforcement mechanisms (Olatubi & Olatubi, 2017; Ncube & Kanda, 2018).

Recommendations

The following recommendations are offered to organizational leaders, human resource practitioners, and policymakers in high-risk industries in Lagos State, Nigeria. Relevant stakeholders with similar responsibilities in other developing economies may also benefit from these recommendations, which are informed by the study's evidence. Organizations should note that these recommendations are not to be implemented as standalone solutions, especially since

comprehensive employee compensation systems are not the dominant factor in the variances of the three dependent variables. Organizations will necessarily have to combine other strategies to achieve the desired safety outcomes. Nonetheless, the following are the recommendations.

1. Compensation systems should be well-designed, taking into consideration the importance of employee safety outcomes. A well-designed, transparent, and equitable compensation system is associated with higher safety compliance, greater safety participation, and employees' positive perception of the organization's concern for safety.
2. Compensation systems should be implemented transparently, with clear communication of safety performance criteria and unambiguous documentation of how safety performance translates into rewards, recognition, and celebration of safety achievements.
3. Organizations should develop and implement compensation systems that address industry-specific risks, with frontline employees performing high-risk tasks benefiting from additional safety-linked compensation compared to those performing low-risk tasks.
4. Organizations, particularly in the Nigerian context and other developing economies, should be concerned about macroeconomic factors (inflation, interest rates, currency devaluation) that erode the real value of money. The erosion of the economic and financial value of employee compensation packages due to the aforementioned factors may weaken the positive associations between compensation systems and safety outcomes observed in this study.

Contribution to knowledge

The contributions of this study to the body of knowledge are threefold.

1. The context of the study, Lagos, Nigeria, provides evidence from a developing economy setting that can be used as a basis for testing the generalizability of the findings of related studies conducted in more developed countries in the area of occupational safety.
2. The study examines a comprehensive compensation system (encompassing direct, indirect, and non-financial components) rather than the use of isolated incentives in several previous studies (Soro et al., 2025).
3. The study examined three safety metrics - safety compliance, safety participation, and perceived safety outcomes, and found that comprehensive compensation had a stronger association with perceptual-motivational safety (perceived safety outcomes) than with behavioral safety (compliance and participation). The pattern affirms the two-factor

structure of the study's instrument, providing a distinct theoretical insight that prior studies in occupational safety have not always preserved. Previous studies have often treated behavioral and perceptual safety outcomes as undifferentiated composite measures or as conceptual equivalents (Cornelissen et al., 2017; Griffin & Neal, 2000).

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