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Occupational Health Perspectives: Comparative Analysis between the Formal and Informal Construction Sector in Colombia

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Abstract

The growing trend in the southern hemisphere of incorporating workers with lower educational levels into the informal economy has raised concerns, especially in Colombia, where between 50% and 74% of workers lack adequate contractual conditions. There is a close relationship between informality and the educational level, with informal employment being the one that hosts the largest proportion of people with low levels of education, generating conditions of poverty or economic vulnerability, especially in Latin America. The construction sector, vital for GDP and employment, attracts workers with little academic training, raising concerns about occupational health, occupational risks, and informality. The objective of this article is to present statistics of occupational accidents in the formal sector in various regions of the country, through a correlation between accidents in the formal and informal sector and to make a statistical inference where the accident rate in the informal sector is established, raising the urgency of specific strategies to improve the working conditions of workers in this sector.

Keywords
Occupational health, formal and informal economy, construction sector.

1. Introduction
In developing countries, it is common to observe that people's everyday activities often involve risky conditions. For example, moving through the streets is often done under conditions that frequently involve breaking traffic rules, affecting personal safety. In contrast, in developed countries, compliance with these rules is more evident and observed more frequently. Although several factors determine this human behavior, education plays a crucial role in shaping actions that reduce risks for individuals.

Now, in addition to this behavior, there are intrinsic risks associated with carrying out a particular job in the workplace. This field, dominated by occupational health, presents significant challenges, some related to the prior knowledge that the individual brings, others through collective awareness, and finally those specifically concerning the contracted work and the environmental exposure of the worker. While it is true that global interest in the knowledge and management of occupational health has increased, the figures for accidents, mortality, and working conditions present a challenge to overcome. Therefore, nine years after the formulation of the 17 Sustainable Development Goals outlined by the United Nations, coupled with post-pandemic conditions and economic setbacks, achieving Goal 8 gains greater momentum, addressing the topic of "Decent Work and Economic Growth".

The United Nations conceptualizes decent work as opportunities for all individuals to obtain productive employment that generates adequate income, can be carried out in safe conditions, and provides social protection for families, while

also fostering personal and social development perspectives. The lack of opportunities, inadequate investment, and poor consumption lead to a deterioration of the underlying basic social contract in democratic societies: the right of all to share in progress .(United Nations 2023).

The projected estimate for the year 2020 of the extreme poverty indicator, starting from the pandemic scenario, increased from 8.1% to 9.3%, meaning that 90 million people worldwide joined the ranks of those living on less than $2.15 per day, bringing the total to 724 million people. It is expected that by 2030, this figure will decrease to 6.4% (United Nations 2023). There is a strong correlation between extreme poverty, economic vulnerability, and informal employment (OECD/ILO 2019). As of 2024, the current global workforce stands at 3,696.7 million, of which 1,477.1 million are women and 2,219.6 million are men. Additionally, 502 million are young people. The global employment-to-population ratio corresponds to 57.4%, with 45.6% for women, 69.2% for men, and 34.6% for young people. The global unemployment rate has been decreasing to reach 5.2%, with rates of 5.3% for women, 5.1% for men, and a slight increase in the case of young people, reaching values of 13.5%(Ernst et al. 2024).

On the other hand, the Food and Agriculture Organization of the United Nations monitors hunger and food insecurity worldwide through indicators such as the Prevalence of Undernourishment and the Prevalence of Moderate or Severe Food Insecurity in the population. It estimated that between 691 and 783 million people suffered from hunger in 2022(Ernst et al. 2024).

From this context, an inversely proportional relationship between informal employment and low levels of education emerges. More than 90% of individuals with no education are engaged in informal employment, with the trend decreasing to approximately 30% at higher education levels. Globally, only 2.3% of individuals with no education have formal employment, while the figure rises to 23.1% in informal employment. Approximately 60% of people in various regions of the world have primary and secondary education, and in the Americas, about 60% of individuals with tertiary education are in the formal sector (OECD/ILO 2019)This leads to the proposal of different tools related to curricula developed in public and private primary and secondary education institutions, where courses on health and safety are oriented not only at the workplace level but also on the risks and hazards associated with performing certain tasks, whether in different work fields or in the student's life development, from the beginning of primary education to higher grades. Additionally, key guidelines are proposed to transition from the informal to the formal economy.

One of the main differences between the formal and informal economies is salary. In the case of the construction sector in Colombia, it is covered by a special regime due to the nature of its activities. Construdata magazine edition 210 (Equipo de Redactores de Legis 2024)presents six fundamental aspects to calculate the real value of wages: the legal minimum wage in 2024, transportation subsidy, social benefits, parafiscal contributions (SENA, ICBF, Family Compensation Fund, and the National Fund for Vocational Training of the Construction Industry), social security (pension, health, Occupational Hazards Insurance), and provision of personal protective equipment. In this way, formalized economy not only impacts the worker but also their families and contributes to the overall societal growth.

Social security encompasses health coverage, as well as risks of disability, old age, and death, along with coverage in case of work accidents, pension rights, professional risks with the ARL, and provision of personal protective equipment(Equipo de Redactores de Legis 2024). Therefore, informal workers are at a significant disadvantage in this regard. In 2020, approximately 50% of informal workers in Latin America and the Caribbean were not covered by social assistance programs, with Colombia's figure reaching approximately 55% (OCDE 2020)

The dynamics of self-construction are linked to the development of informal economies, economically vulnerable individuals, extreme poverty, and informal construction. Although policies have been developed in the country to build social and priority interest housing, the limitations of formal employment, economic income fluctuations from the informal economy, and the high initial property costs discourage the acquisition of this type of housing. This, in turn, contributes to the high rate of informality in the construction sector.

The construction industry plays a pivotal role in the economic development of Colombia, contributing significantly to employment generation, infrastructure development, and GDP growth. However, it is also one of the most hazardous sectors, characterized by a high incidence of work-related accidents, injuries, and illnesses. Within Colombia's construction landscape, there exists a duality: the formal sector, consisting of registered companies adhering to legal regulations, and the informal sector, comprising unregistered or informal enterprises operating outside formal

regulatory frameworks. Despite their differences, both sectors face common occupational health challenges, albeit to varying degrees. This paper aims to compare and contrast the occupational health perspectives of the formal and informal construction sectors in Colombia, with a view to identifying opportunities for improvement and policy interventions.

1.1 Objectives

The main objective of the paper is to conduct a comparative analysis between the formal and informal construction sectors in Colombia regarding occupational health perspectives. The paper aims to assess various factors influencing occupational health outcomes in both sectors, including regulatory frameworks, working conditions, risk management practices, and access to healthcare services. By identifying strengths and weaknesses in each sector, the study intends to provide insights into potential strategies for enhancing occupational health and safety in Colombia's construction industry, ultimately contributing to the well-being of workers and the sustainable development of the sector.

2. Literature Review

Gómez-Salcedo, Galvis-Aponte, and Royuela (Gómez-Salcedo, Galvis-Aponte, and Royuela 2017) analyze the quality of work (QoW) in Colombia using a fuzzy sets method. The paper builds upon the work of Gómez-Salcedo et al. (Gomez, Galvis, and Aroca 2013), who focused on the Chilean case study but did not include subjective dimensions in their QoW measurement. In contrast, this study considers both objective and subjective dimensions of QoW. The methodology combines two key elements: 1. Sen's functioning and capabilities approach: This framework accounts for various aspects of well-being, including labor income, job stability, job satisfaction, and social security, and 2. Fuzzy sets method: By avoiding the imposition of subjective weights, the researchers identify which dimensions are most critical in determining QoW. Notably, they find that labor stability, working conditions, and social security (linked to informality) significantly impact QoW in the Colombian labor market.

The study also reveals an intriguing pattern: a "Quality of Work Life Cycle", with higher QoW levels observed up to age 30. However, this has critical implications for the social security system. Individuals with lower-quality jobs may not contribute adequately to health and pension funds, leaving many without access to retirement funds. Interestingly, these findings contrast with other fuzzy sets studies, such as the Italian case, where seniority and institutional factors play a more significant role in work quality scores.

Camacho et al. (Camacho, Conover, and Hoyos 2014) delve into the intricate relationship between social programs and labor market dynamics in Colombia. Specifically, they explore how the expansion of Colombia's social protection system, particularly the publicly provided health insurance, influenced workers' decisions regarding formal and informal employment.
Informal employment is a pervasive phenomenon in many developing countries, and Latin America is no exception. The prevalence of informal work arrangements poses challenges for policymakers aiming to improve labor market outcomes and social welfare. Against this backdrop, the study focuses on Colombia, where the government implemented significant social programs in the early 1990s, including the expansion of health insurance coverage.

Camacho et al. employ a rigorous empirical approach, utilizing household survey data. They exploit variation across municipalities in the timing of interviews for the SISBEN (Sistema de Identificación de Potenciales Beneficiarios de Programas Sociales), which serves as the instrument to identify beneficiaries for public health insurance. By examining the onset of interviews, they establish causal links between health insurance expansion and employment choices.

Informal Employment Increase and the study reveals robust and consistent estimates: the expansion of government-provided health insurance led to an increase in informal employment by approximately 4 percentage points. This finding highlights the unintended consequence of social programs on labor market dynamics. Policy Implications reflected in the broadening of health insurance coverage contributed to the rise in informal employment. While the intention was to enhance social protection, the study underscores the need for policymakers to carefully consider potential distortions caused by such expansions. Optimization Behavior: Interestingly, marginal individuals seemed to optimize their decisions when choosing between the formal and informal sectors. This suggests that workers responded strategically to changes in health insurance availability.

Camacho et al. also states broader implications in the study where presents perverse incentives where the study echoes broader debates surrounding government-funded social programs. Critics argue that despite their intended benefits, these programs may inadvertently create perverse incentives. People might underreport income or alter their behavior to maintain eligibility. Balancing Act because policymakers face a delicate balancing act. While social protection systems aim to alleviate poverty and improve well-being, they must also consider potential side effects, such as shifts in employment patterns. Latin American context where informal employment remains a critical issue in Latin America. The study's findings contribute to the ongoing dialogue about effective policy design in the region.

In summary, Camacho et al. sheds light on the complex interplay between social programs and labor market choices. It emphasizes the need for nuanced policy design, considering both intended benefits and unintended consequences. Policymakers must weigh the trade-offs carefully to ensure that social protection systems achieve their goals without inadvertently distorting labor markets.

Kahyalar et al. (Kahyalar et al. 2018) dig into the intricate dynamics of formal and informal employment sectors, particularly focusing on wage disparities. This study contributes to the ongoing discourse surrounding labor markets, social protection, and economic development. Informal employment is a pervasive phenomenon in many developing countries, and Latin America is no exception. The prevalence of informal work arrangements poses challenges for policymakers aiming to improve labor market outcomes and social welfare. Against this backdrop, the study focuses on Colombia, where the government implemented significant social programs in the early 1990s, including the expansion of health insurance coverage. The researchers employ empirical methods, drawing on data from surveys, administrative records, or other relevant sources. They compare wages across formal and informal employment, considering factors such as education, experience, and job characteristics.

The study reveals that a wage differential exists between formal and informal sectors. Formal jobs tend to offer higher wages compared to informal ones. Several factors contribute to these disparities: Job Characteristics - Formal jobs often come with better working conditions, benefits, and legal protections, which contribute to the wage premium. Education and Experience - Workers in the formal sector tend to be more educated and experienced, leading to higher wages. Market Imperfections - Information asymmetries, transaction costs, and limited access to formal job opportunities affect wage differentials. Policy Implications - Policymakers should focus on expanding social protection to informal workers, bridging the gap in benefits and legal rights. Efforts to reduce informality should address structural barriers, promote formal job creation, and enhance skills development. Policies that promote inclusive growth should consider both formal and informal sectors.

In summary, this work underscores the importance of understanding wage disparities across formal and informal sectors. By addressing these gaps, policymakers can foster more equitable and resilient labor markets, ultimately benefiting workers and societies at large.

Merino-Salazar et al. (Merino-Salazar et al. 2017)provides valuable insights into the intersection of work conditions, health, and employment across several Latin American countries. By analyzing data from national working condition surveys, the authors shed light on critical aspects of occupational health in the region. Latin American economies often exhibit dual labor markets, with formal and informal sectors coexisting. Understanding the health implications of these distinct work environments is crucial. The relationship between work conditions and health outcomes has significant policy implications. Occupational health directly impacts workers' well-being and productivity.

The Merino-Salazar's study draws on data from the first working condition surveys (WCS) conducted in Colombia, Argentina, Chile, Central America, and Uruguay. A subsample of 15241 non-agricultural employees aged 18–64 years, all working with written contracts, was selected for comparative analysis. Across all countries, at least 40% of women and 58% of men worked more than 40 hours a week. They found that common exposures are present as Repetitive Movements: Prevalent among both men and women, Noise and Manual Handling: Particularly pronounced among men, Psychosocial Exposures: Common in both sexes, Self-Perceived Health: Workers in Chile (33.4% of women and 16.6% of men) and Central America (24.3% of women and 19.1% of men) were more likely to report poor self-perceived health. Colombia had the lowest rates of poor self-perceived health (5.5% of women and 4.2% of men) and Occupational Injuries: The percentage of workers reporting occupational injuries was less than 10% across all countries.

This study provides a comprehensive overview of work and health in different Latin American countries based on national WCSs. It serves as a baseline for future research and surveillance of work-related health issues in the region. However, efforts are needed to improve comparability across WCSs. In summary, this research contributes to our understanding of occupational health challenges in Latin America, emphasizing the need for targeted interventions to improve working conditions and promote better health outcomes for workers.

Quinlan (Quinlan 2015) examines the impact of evolving work arrangements on worker well-being, focusing on non-standard employment forms. Over the past four decades, global work patterns have undergone significant transformations, characterized by shifts away from traditional standard employment. Here are the key insights from this research: Changing Work Landscape - The nature of work has evolved, marked by reduced contract duration, diminished job security, and increased reliance on non-standard employment arrangements, Diverse Forms - Non-standard employment encompasses various contract types, including temporary work, subcontracting, and dependent self-employment.

The study draws on a comprehensive analysis of global trends in work arrangements and the researcher examines data related to contract duration, job security, irregular working hours, and the use of third parties. The Findings of this study emphasizes in Contract Duration and Job Security - Less Stability - Non-standard forms exhibit less contract duration and job security compared to traditional standard employment, Irregular Working Hours - Irregular working hours, both in terms of duration and consistency, are prevalent in non-standard arrangements, Third-Party Involvement - Temporary Employment Agencies - The use of third parties, such as temporary employment agencies, has increased, Dependent Self-Employment - Various forms of dependent self-employment (e.g., subcontracting, franchising) have grown, Bogus/Informal Work Arrangements - Some workers deliberately operate outside labor regulations, social protection, and legal frameworks. These arrangements pose challenges for worker rights and access to social security benefits, Health and Safety Implications - Non-standard employment is associated with more negative outcomes - Work-Related Issues - Occupational safety and health risks are heightened and Health Outcomes - Workers face health-related challenges due to irregular hours and precarious conditions.

This study highlights the need for policy interventions that address the consequences of non-standard employment. Policymakers must strike a balance between flexibility and worker protection to ensure health and safety in evolving work environments.

In summary, the paper underscores the critical role of non-standard employment arrangements in shaping worker health and safety. By understanding these dynamics, policymakers can design effective strategies to safeguard workers' well-being in an ever-changing labor landscape.

3. Methods

The methodology used in the present work begins with sample selection where selecting representative samples is critical for valid comparisons. The approach adopted in here is summarized:

- Collect data from both formal and informal construction workers.
- Consider inclusion criteria, such as age, location, and employment status.
- Ensure a balanced representation to avoid bias.

Data collection accurately is essential. For that reason, it is employed the following methods:

- Surveys: Gather information on working conditions, safety practices, and health.
- Secondary data: Utilize existing records, such as government reports and industry data.

This data collection gives us the tools to perform a comparative analysis that systematically compare data between the two sectors:

- Use quantitative analysis: Employ statistical tools to identify significant differences.
- Focus on variables like accident rates, exposure to hazards, and compliance with safety regulations.

Also, it is examined the contextual factors because allow us to acknowledge the broader context:

- Legal and regulatory environment: Consider how formal and informal sectors operate within existing laws.
- Socioeconomic factors: Explore how economic conditions impact workers' choices.
- Cultural norms: Understand how societal expectations influence behavior.

4. Data Collection

The data utilized in this study was sourced from the Labor Observatory of the Colombian Safety Council, specifically from the 2023 report. To conduct statistical analyses and generate associated graphical representations, we employed the MATLAB online version software. This decision was made due to the robust analytical capabilities and graphical functionalities offered by MATLAB, allowing for comprehensive examination and visualization of the dataset.

Accessing data from reputable sources such as the Labor Observatory ensures the reliability and accuracy of our findings, contributing to the validity of the research outcomes. By leveraging MATLAB, we were able to perform statistical analyses, including trend identification, correlation assessments, and data visualization techniques, thus facilitating a deeper understanding of the patterns and dynamics within the dataset. This combination of reliable data sources and analytical tools strengthens the rigor and credibility of our research findings, enhancing the overall quality and significance of the study's conclusions.

5. Results and Discussion

Within the realm of technical discourse, the National Administrative Department of Statistics (DANE) employs the metric 'Occupied Population' to elucidate the intricacies of workforce demographics and job attributes. This analytical approach involves meticulous inquiry into pertinent variables necessary for applying the International Labour Organization's (ILO) definition of informal employment, encompassing both within and outside the formal sector.

In Figure 1, the behavior of the employed population affiliated with the General System of Occupational Risks (SGRL) is contrasted with that of the population not affiliated with SGRL (calculated based on the difference from the total employed population). Until the year 2018, the DANE applied the framework of the Integrated Household Survey (GEIH) 2005, transitioning to the redesign process for GEIH 2018 from 2019 onwards(Dane 2024). The data reveals a trend of inverse proportionality, stabilizing at values close to 50%. This trend underscores the implementation of a state normative system, which has heightened surveillance and control over the working population.

While it is true that Law 9 was enacted in 1979, mandating the establishment of occupational health programs in all workplaces, significant advancements have been made since 2012 with the introduction of Law 1562. This law embraced the concept of a Management System for Occupational Health and stipulated that previously established programs would constitute part of this management system. In 2014, provisions were issued for the implementation of the Health and Safety Management System through Decree 1443. In 2015, with the aim of standardizing criteria, Decree 1075 was designed to create a comprehensive regulatory decree for the labor sector. Finally, in 2019, Resolution 312 established minimum standards that companies must adhere to. However, for the construction sector, compliance requirements encompass the entirety of Decree 1075.

After observing the aforementioned behavior, we seek to ascertain whether the means of the samples from the population affiliated with the SGRL, and the population not affiliated with the SGRL exhibit statistically significant differences. To achieve this, the t-student test is employed under the assumption of equal variances. The test rejects the null hypothesis that the difference in means is zero. This limitation constrains making projections based on the characteristics of the employed population affiliated with the SGRL to the employed population not affiliated with the SGRL. The outcomes of a statistical analysis, with each component delineated that the value of h (h=1) typically pertains to null or alternative hypotheses in statistical tests, suggesting in this instance that the null hypothesis is rejected in favor of the alternative hypothesis. The p-value (p=3.6919e-05) indicates the probability of obtaining results as extreme as or more extreme than the observed data under the assumption of the null hypothesis being true; a notably low p-value, as seen here, suggests statistical significance. Additionally, the confidence interval (CI) offers a range within which the true parameter value is expected to fall. Finally, structured statistics (tstat, df, sd), common in regression analysis and hypothesis testing, may encompass a t-statistic, degrees of freedom, and standard deviation reinforcing the idea of considering the most pessimistic scenario corresponding the 7.86% for reported Accident Rate.

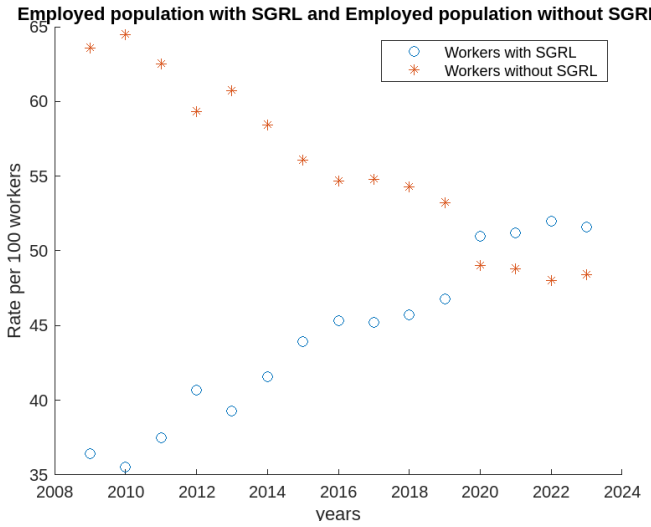

Figure 1. Employed population with SGRL and Employed population without SGRL

Table 1 presents data on employed population, accidents, and mortality in the informal sector. An estimation of Unreported Accidents to the SGRL was conducted using a pessimistic scenario wherein the maximum reported Accident Rate to the SGRL, corresponding to 7.82% occurring in the year 2012, was taken and calculated over the total employed population from 2009 to 2023. Subsequently, the total accidents (generated from both affiliated and non-affiliated employed population to the SGRL) were estimated. The year 2023 exhibits the lowest accident rate, marking a decrease of 3.98% compared to the previous year. However, the mortality rate is the highest reported in the past 10 years. Given that mortality due to Occupational Diseases is around 1% and considering the impossibility of projecting it onto the informal sector, this study does not address it.

Based on the estimation of Accidents in the informal sector, the relationship between accident rates in the employed population (Affiliated and Non-Affiliated with the SGRL) and the total employed population from 2009 to 2023 is presented. This relationship exhibits a positive trend and can be represented through the following linear regression model: $y = 0.1255\ x - 422000$. The adjusted coefficient of determination corresponds to $R^2 = 0.8309$ as presented in Figure 2, and Figure 3 depicts the relationship of the residuals, showing a good fit to the model. This will allow for projecting and estimating the capacity of the health and safety system at work based on the employed population, whether formal or informal. On the other hand, as workers in the informal sector are not covered by labor security, the control of risks related to their activities is minimal or non-existent. Personal protective equipment and overall preventive measures are deficient, thereby increasing the risk of exposure. Additionally, preventive culture, which could be cultivated during primary and secondary education, is limited, partly due to the levels of education achieved and the lack of curriculum content related to health and safety.

Table 1. Accidents and Mortality 2009-2023 of workers affiliated with the SGRL

Year	Occupied Population	Average number of SGRL workers	SGRL Work Accidents	Rate (Accidents per 100 workers)	Non-affiliated Occupied Population	Non-SGRL Accident Rate[1] (Max SGRL accident rate) 7.82	Total Accident Rate SGRL and non-SGRL	Work-Related Deaths	Rate (Deaths per 100,000 workers)
2009	18427000	6700836	403390	6,02	11726164	1440991,4	1844381,4	586	8,75
2010	19215000	6813658	450383	6,61	12401342	1502613	1952996	691	10,14
2011	20020000	7499488	560962	7,48	12520513	1565564	2126526	693	9,24

[1] Estimated Accidents based on the maximum probability of accidents in the Formal sector reported in the year 2012.

2012	20696000	8430976	659302	7,82	12265024	1618427,2	2277729,2	678	8,04
2013	21048000	8271915	622875	7,53	12776085	1645953,6	2268828,6	708	8,56
2014	21503000	8936931	689037	7,71	12566069	1681534,6	2370571,6	569	6,37
2015	22017000	9656828	724262	7,50	12360172	1721729,4	2445991,4	566	5,86
2016	22156000	10039529	701763	6,99	12116471	1732599,2	2434362,2	607	6,05
2017	22649000	10237807	660339	6,45	12411194	1771151,8	2431490,8	568	5,55
2018	22953000	10487595	644987	6,15	12465405	1794924,6	2439911,6	573	5,46
2019	22287000	10431580	619040	5,93	11855421	1742843,4	2361883,4	492	4,72
2020	19843000	10123389	450045	4,45	9719611	1551722,6	2001767,6	454	4,33
2021	21087000	10799343	513857	4,76	10287657	1649003,4	2162860,4	608	5,63
2022	22468000	11675905	542983	4,65	10792095	1756997,6	2299980,6	526	4,5
2023	22864000	11801786	522160	4,42	11062214	1787964,8	2310124,8	694	5,88

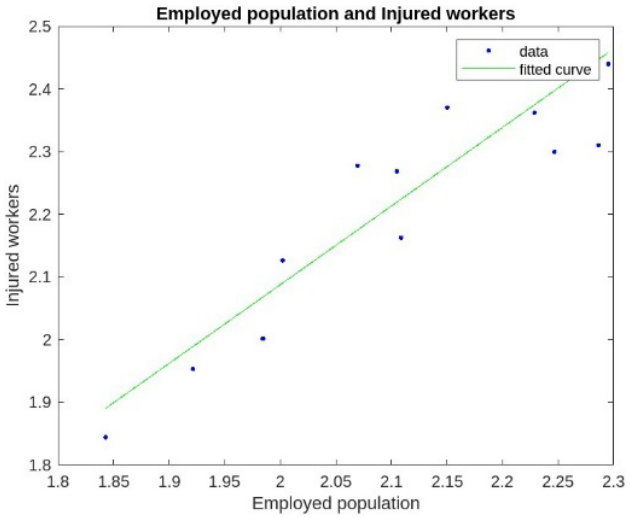

Figure 2. Employed population and Injured workers.

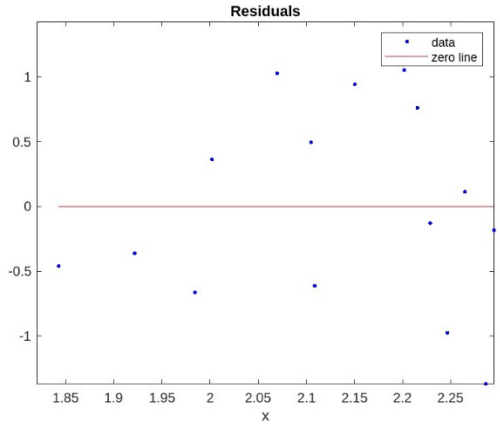

Figure 3. Statistical Residuals

Finally, Table 2 presents the current state of the construction sector regarding accidents and mortality since the year 2019. It can be observed that in terms of accidents, it has been decreasing, ranking N_o 6. As for mortality, by the year 2023, it held the 4th position out of approximately 22 in total, reaching values close to those prior to the pandemic. However, a larger amount of data is required to establish clear relationships or trends.

Table 2. Accidents and Mortality in the Construction Sector

Year	Occupied Population	SGRL Population	Population in the Construction Sector	Accident Rate in the Construction Sector (per 100 workers)	Accidents in the Construction Sector (per 100 workers)	Ranking[2] (out of approximately 22)	Death Rate in the Construction Sector (per 100,000 workers)	Deaths in the Construction Sector (per 100,000 workers)	Ranking (out of approximately 22)
2019	22287000	10431580	1582377	8,47	134027	4	9,91	157	2
2020	19843000	10123389	1349324	6,39	86222	3	6,39	86	7
2021	21087000	10799343	1518264	7,1	107797	4	5,63	85	7
2022	22468000	11675905	1685100	6,48	109194	6	5,66	95	5
2023	22864000	11801786	1600480	6,48	103711	6	8,68	139	4

6. Conclusion

The study on occupational health in Colombia's construction industry sheds light on the formidable challenges confronting workers in this sector. Several key conclusions emerge from the analysis.

Firstly, the prevalence of non-standard employment arrangements, particularly in the informal sector, significantly impacts the health and safety of workers. Informal workers often lack access to essential safety measures, adequate training, and health benefits, accentuating disparities in protection. Effective policy interventions are imperative to rectify these inequities and ensure the well-being of all workers.

Secondly, the study underscores the detrimental effects of poor working conditions on the health outcomes of construction workers. Factors such as prolonged working hours, physical exertion, and exposure to hazardous

[2] Ranking occupied by the construction sector in relation to other economic sectors, approximately 22nd.

materials contribute to adverse health outcomes. Enhancing working conditions is pivotal not only for mitigating health risks but also for enhancing overall productivity and well-being.

Moreover, wage disparities persist between formal and informal sectors, with informal workers receiving lower pay and fewer legal protections. Bridging these gaps through targeted policies is essential for promoting equitable treatment and safeguarding workers' rights.

Furthermore, the high incidence of work-related accidents poses a significant challenge in the construction industry. Addressing this issue requires robust safety protocols, comprehensive training programs, and stringent enforcement mechanisms. Collaboration among government agencies, employers, and workers is paramount to effectively mitigate risks and ensure a safer working environment.

Additionally, the study emphasizes the importance of balancing economic growth with worker well-being. While Colombia's economic development hinges on the construction sector, prioritizing worker health and safety is indispensable for fostering sustainable growth. Policies must strike a delicate balance between economic interests and worker protection to uphold both prosperity and welfare.

In summary, targeted interventions, enhanced regulations, and awareness campaigns are imperative to create a safer and healthier environment for construction workers in Colombia. By addressing these pressing issues, Colombia can nurture a thriving construction industry while safeguarding the welfare of its workforce.

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