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While mature employees provide organizations with invaluable institutional knowledge and extensive expertise, they can also face a higher risk of workplace injury due to natural age-related physical limitations. Consequently, managing an aging workforce presents a complex operational challenge for modern businesses.

By 2030, a substantial portion of the global workforce is projected to be over the age of 55—a demographic shift that is particularly pronounced in the United States, Japan, and several European nations. Although this experienced cohort offers significant strategic value, their sustained employment requires targeted risk management.

A primary concern is the elevated incidence of musculoskeletal disorders (MSDs). Natural physiological changes, including diminished muscle strength, joint flexibility, and endurance, increase vulnerability to injury. Accordingly, tasks requiring heavy lifting, repetitive motions, or prolonged standing can exacerbate these limitations, resulting in a higher frequency of strains, sprains, and other MSDs.

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Ergonomic and Digital Interventions to Support Occupational Safety, Health, and Work Ability Among Older Workers

Stanislav Malý[1*], Ivan Dlugoš[1], Andrea Macháčková[1], Jana Ranglová[1]
[1] Research Institute for Labour and Social Affairs (RILSA), Jeruzalémská 1283/9, 110 00 Prague 1, Czech Republic

KEYWORDS

Older workers;
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Age management;
Occupational safety and health;
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ABSTRACT

Population ageing and extended working lives have increased the need to create safe and sustainable working conditions for older employees. This article examines the impact of ageing on work ability, occupational safety and health (OSH), and workplace performance, with particular emphasis on ergonomic and organizational interventions supporting older workers. The study reviews current employment trends among older workers and discusses the role of age management, ergonomic workplace adaptation, and age diversity in promoting sustainable employability. Particular attention is devoted to digital ergonomics, including workplace simulation tools, virtual reality, and digital human modelling technologies. These approaches enable the assessment of physical workload, working postures, and occupational risks during workplace design and optimization. The review highlights the potential of digital ergonomic solutions to improve workplace safety, reduce physical strain, and support longer working lives. At the same time, the limitations of digital tools and the importance of integrating technological solutions with organizational measures and occupational health management are discussed. The findings suggest that effective support for older workers requires an integrated approach combining ergonomics, occupational safety and health, digital technologies, and age management strategies.

1. INTRODUCTION

Workforce ageing has become one of the most significant challenges facing contemporary labour markets and is increasingly reflected in the activities of international organizations such as the United Nations (UN), the World Health Organization (WHO), the Organization for Economic Co-operation and Development (OECD), and Eurostat. As populations age, the proportion of economically active older individuals continues to increase, generating new demands in the areas of occupational safety and health (OSH), ergonomics, and work organization.

Ageing is a natural biological process whose progression varies considerably among individuals and is influenced by genetic, health-related, and environmental factors. Advancing age is associated with changes in both physical and cognitive capabilities that may affect work performance, resilience to

* *Corresponding Author*: stanislav.maly@rilsa.cz

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workload, and the ability to adapt to working conditions. At the same time, older workers possess substantial professional experience, expertise, and organizational stability.

According to the European Agency for Safety and Health at Work (EU-OSHA), occupational accidents occur less frequently among older workers than among younger age groups; however, their consequences are often more severe. The most common incidents involve falls, musculoskeletal injuries, and accidents related to inadequately adapted workplaces, particularly in manufacturing, transportation, warehousing, and health and social care sectors. Consequently, ergonomic workplace optimization, workload prevention, and workplace health promotion play a crucial role in maintaining occupational safety and work ability.

Workforce ageing is particularly pronounced in Europe and Japan and is increasingly evident in China, where the proportion of employed individuals aged 55 years and older has steadily risen over recent decades (OECD, 2023; Eurostat, 2023a). In response, governments and employers have implemented measures promoting flexible working arrangements, lifelong learning, age management strategies, and ergonomic interventions designed to sustain the work ability of older employees (WHO, 2021; Eurofound, 2024). Research consistently demonstrates the positive impact of ergonomic interventions and age-inclusive human resource management on work performance and occupational safety (Ilmarinen, 2006; EU-OSHA, 2016).

Despite technological advancements and increasing digitalization, many occupations remain physically and psychologically demanding. Ergonomics therefore represents an essential tool for adapting working conditions to the needs of older workers. This includes the use of digital ergonomic tools capable of analysing work movements, postures, and workload in real time.

The objective of this article is to identify opportunities for applying ergonomic and digitally assisted solutions that support work performance, occupational safety, and health protection among older workers. The importance of high-quality working conditions is further emphasized by evidence showing that the ability to sustain employment over an extended period depends not only on individual capabilities but also on the quality of the work environment and work organization.

2. OLDER WORKERS

2.1 Legal and Conceptual Framework for Employing Older Workers

The term older worker is not uniformly defined within labour legislation. It is most commonly used to refer to employees aged over 50 or 55 years, or to workers possessing extensive professional experience and specialized expertise. However, assessments of older workers should not be based solely on chronological age but should also consider work ability, health status, psychological well-being, and adaptability to workplace conditions.

From an occupational safety and health perspective, job demands should correspond to the employee's functional capacity and should not impose excessive physical or psychological strain. Consequently, assessments of work fitness should be individualized and based on the specific requirements of the job position, working conditions, and the worker's health status.

To support longer labour market participation among older employees, it is essential to create conditions that encourage their continued employment. This approach is reflected in the concepts of active ageing and age management, which focus on promoting health, occupational safety, eliminating age discrimination, and supporting age diversity within organizations.

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Age management encompasses measures such as lifelong learning, flexible working arrangements, workplace adaptation, occupational healthcare, career development, and managed transitions into retirement. The growing importance of these measures is linked to demographic ageing, labour shortages, and the need to preserve organizational knowledge and competencies.

2.2 Current Trends in the Employment of Older People

Over the past decade, employment among older individuals has increased by approximately one-fifth compared with 2009 levels. These increases have been more than four times greater than those observed among individuals aged 25–54 years. The rising labour market participation of people aged 55–64 years has been largely independent of educational attainment and has primarily resulted from efforts to maintain stable full-time employment.

Statistical evidence indicates that most individuals leave the labour market shortly after receiving their first old-age pension. However, a minority continue working after retirement, suggesting a gradual transition from employment into retirement.

In 2023, the proportion of employed pension recipients remained relatively low. This finding suggests that delayed retirement is primarily driven by increases in statutory retirement ages rather than by a stronger preference among individuals to continue working after retirement. Eurostat data show that Estonia recorded both the highest employment rate and the highest proportion of employed pension recipients among individuals aged 60–74 years. Similarly, high proportions were observed in Latvia and Sweden. Employment rates among older people were also particularly high in Estonia, Latvia, and Lithuania (Eurostat, 2023b).

By contrast, in Spain, Greece, and Romania, the proportion of employed pension recipients aged 60–74 years was below 1.5%, indicating a greater tendency for retirees in these countries to withdraw completely from the labour market rather than combine pension receipt with employment (Figure 1).

The topic of older workers has become increasingly important due to demographic ageing and the extension of working lives. Older employees contribute substantial professional experience, practical knowledge, responsibility, organizational stability, and loyalty to employers. They also play a valuable role in transferring knowledge and expertise to younger colleagues through mentoring and coaching activities.

At the same time, the employment of older workers presents several challenges, including health limitations, reduced physical capacity, difficulties adapting to new technologies, and persistent age discrimination. Consequently, support for lifelong learning, digital skills development, flexible work arrangements, and age management initiatives is essential. Intergenerational cooperation also plays a significant role by facilitating the effective integration of experience and innovation across different age groups.

In addition, several emerging trends are reshaping the employment of older workers, including the growth of the silver economy, increasing pressure to extend working lives due to demographic changes, and a growing emphasis on age diversity within organizations. The silver economy represents an economic sector focused on addressing the needs of ageing populations while simultaneously creating new opportunities for economic growth, innovation, and employment.

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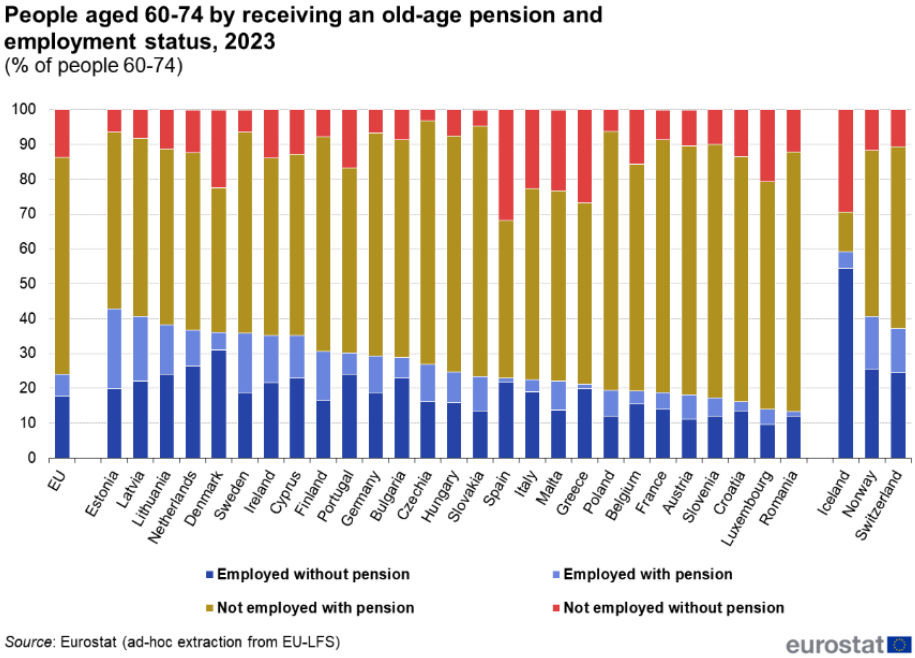
Figure 1. *Employment Status of Individuals Aged 60–74 Receiving an Old-Age Pension, 2023 (% of Persons Aged 60–74 Years)*



Note: *Adapted from Eurostat, ad hoc extraction from the EU Labour Force Survey (Eurostat, 2023b).*

Age-diverse teams are increasingly recognized as valuable because they combine the experience of older employees with the innovation and digital competencies of younger generations. Such teams support intergenerational learning, creativity, organizational stability, and collaborative workplace cultures. Although differences in work styles, technology adoption, and value preferences may sometimes create challenges, age diversity generally contributes to innovation, competitiveness, and the long-term sustainability of the workforce.

2.3 Physiology of Older Individuals and Work Physiology

Physiology is a biological science concerned with the functions of the human organism and the mechanisms that maintain internal homeostasis. Within ergonomics and occupational settings, physiological knowledge provides an essential basis for adapting working conditions to human capabilities. Work physiology, as an applied medical discipline, examines the functioning of the human body during work activities with the dual objective of protecting workers' health and supporting efficient job performance.

In the context of older workers, physiology focuses on age-related changes in the human organism and their effects on work ability, performance, and occupational safety. Physiological ageing is a natural biological process characterized by a gradual decline in functional capacity, although the rate and extent of this decline vary considerably among individuals.

Ageing is typically associated with reductions in muscular strength and endurance, decreased flexibility and motor coordination, diminished respiratory and cardiovascular capacity, slower metabolism, and deterioration of certain sensory and cognitive functions. At the same time, long-term professional experience, accumulated knowledge, and decision-making abilities are generally preserved and may even continue to develop.

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These physiological changes should be considered when organizing work, designing working conditions, and implementing ergonomic workplace adaptations. Work physiology therefore contributes to the prevention of excessive physical and mental workload and supports the development of working environments that enable safe, effective, and sustainable job performance throughout the working life course.

2.4 The Impact of Ageing on Occupational Safety Among Older Workers

The ageing workforce represents a significant challenge for occupational safety and health (OSH). As working lives become longer and the European population continues to age, employers and policymakers face increasing pressure to adapt working conditions to the needs of older employees.

Among the most significant consequences of ageing are declines in physical capacity, deterioration of visual and auditory functions, slower reaction times, and a higher prevalence of chronic health conditions. These factors may increase susceptibility to occupational injuries and work-related strain. In addition, older workers may experience slower information processing and greater difficulty adapting to new technologies. Nevertheless, they frequently demonstrate high levels of professional experience, responsibility, and risk awareness, often resulting in safer work behaviour compared with younger workers.

From an organizational perspective, workforce ageing increases the need for ergonomic interventions, workplace adaptations, and support for intergenerational collaboration. European occupational safety policy emphasizes employers' responsibility to identify and manage risks that may threaten workers' health and safety, including risks associated with demographic ageing. Effective prevention requires continuous monitoring of working conditions and the implementation of technical, organizational, medical, and psychosocial measures designed to support work ability across all age groups (Král, 2018).

Table 1 summarizes the principal consequences of workforce ageing and corresponding preventive measures.

Table 1. *Effects of Ageing on Occupational Safety and Recommended Preventive Measures*

Area	Effects of Ageing	Recommended Measures
Physical capacities	Reduced flexibility, strength, and endurance; impaired hearing and vision; increased prevalence of chronic diseases; slower reactions	Regular health examinations; high-quality workplace lighting (intensity, colour, direction); lifting aids; ergonomic workplace design; workplace health promotion programmes
Cognitive capacities	More difficult adaptation to new technologies; slower processing of information required for work activities	Mentoring programmes; memory and cognitive skills training; simplified user interfaces; age-appropriate training methods
Safety	Longer recovery periods; less frequent but more severe occupational injuries	Improved safety signalling; injury prevention measures; reduction of high-risk tasks; targeted rehabilitation programmes
Social and organizational factors	More difficult adaptation to organizational changes; high reliability and experience; increased risk of fatigue	Flexible working hours; involvement of older employees as mentors; age management programmes; intergenerational cooperation
Productivity and adaptability	Potential reduction in work speed; higher quality and accuracy of work performance	Teamwork with younger colleagues; adjustment of work pace; task allocation according to competencies and capabilities

Note: *Adapted from Král (2018).*

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2.4.1 Medical Fitness for Work Among Older Employees

In order to perform a particular occupation or job position, individuals must meet the required standards of medical fitness for work. This requirement applies equally to older workers. Fitness for work is assessed in relation to the content of the job, specific work tasks, and occupational requirements associated with a given position.

Medical fitness assessments are typically conducted through occupational medical examinations, including pre-employment, periodic, extraordinary, and exit examinations. To ensure consistency and transparency in evaluating health status, work limitations, necessary accommodations, and recommendations regarding suitability for specific positions, standardized assessment procedures and documentation templates are commonly employed.

For older workers, such assessments play a particularly important role in identifying potential limitations while simultaneously supporting continued labour market participation through appropriate workplace adjustments and preventive measures.

2.4.2 Optimization of Working Conditions and Risk Assessment

Visual working conditions represent an important ergonomic factor influencing both work performance and employee health. Insufficient lighting, inappropriate viewing distances, or inadequate visual conditions may increase eye strain, alter working postures, and contribute to musculoskeletal overload. Consequently, ergonomic workplace design should take into account workers' visual capabilities, task requirements, and the size of objects being observed (Smutná & Dulina, 2010).

When designing workplaces, particular attention should be paid to viewing distance, viewing angle, visual field, and object size. Frequently used tools and materials should be positioned within the optimal visual field to minimize unnecessary head and eye movements and reduce visual strain.

Equally important is the appropriate design of work surfaces and the overall ergonomic layout of the workstation. Workstations should allow individual adjustment according to workers' anthropometric characteristics, including adjustable work surface heights, seating arrangements, and the placement of equipment and tools. Inadequate ergonomic design may result in physical and psychological discomfort as well as long-term health problems.

As individuals age, certain physical and sensory functions gradually decline, making it essential to incorporate age-related considerations into workplace risk assessments and work organization. At the same time, older workers possess valuable experience, professional expertise, and strategic thinking skills (EU-OSHA, 2025). For this reason, organizations should support flexible work arrangements, ergonomic workplace adaptations, regular occupational safety training, and psychosocial support initiatives.

Ergonomically optimized workplaces contribute to reducing physical and psychological strain, preventing occupational injuries, improving productivity, and enhancing overall employee satisfaction. Moreover, they strengthen human reliability, which remains a critical factor in the safe and effective functioning of organizations.

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2.5 International Comparison of Approaches to Older Workers

2.5.1 Global Perspective: Labour Market Participation of Older Workers

International comparisons of policies addressing older workers frequently focus on labour market participation rates and institutional conditions supporting longer working lives. One of the most widely cited composite indicators in this area is the Golden Age Index (GAI) developed by PwC, which evaluates how effectively OECD countries utilize the economic potential of individuals aged 55–64 and 65–69 years (PwC, 2023).

The GAI is based on seven weighted indicators derived from OECD databases, including employment rates among older age groups, relative earnings of older workers, participation in lifelong learning, gender employment gaps, the prevalence of part-time work, and long-term unemployment rates among older individuals. The resulting composite score enables international comparisons of countries' ability to create conditions that support prolonged labour market participation.

According to the most recent edition (GAI 2023), countries such as New Zealand, Iceland, and Japan rank among the highest-performing nations, reflecting both high employment rates among older adults and supportive institutional environments for extending working lives (PwC, 2023). Additional comparative evidence can be obtained from the OECD Dashboard on Older Workers, which provides harmonized indicators related to employment, job quality, and employability (OECD, 2023).

It should be noted, however, that the GAI primarily captures labour market outcomes at the macroeconomic level and pays comparatively less attention to working conditions and ergonomic aspects of employment.

2.5.2 European Context: Employment, Working Conditions, and Institutional Frameworks

Within Europe, substantial differences exist in the employment rates of individuals aged 55–64 years. Eurostat data indicate that Northern and Western European countries generally achieve higher employment rates among older workers than Southern European countries and several Central and Eastern European states (Eurostat, 2023a).

Employment rates alone, however, provide only a partial understanding of the situation of older workers. Working conditions, job quality, and institutional support mechanisms are equally important. Analyses conducted by Eurofound demonstrate that extended working lives are strongly associated with age-friendly workplaces, flexible work arrangements, opportunities for lifelong learning, and preventive occupational health measures (Eurofound, 2024).

A broader framework for assessing active ageing in Europe is provided by the Active Ageing Index (AAI), developed jointly by the European Commission and the United Nations Economic Commission for Europe (UNECE). The AAI comprises 22 indicators grouped into four domains:

- Employment;
- Participation in society;
- Independent, healthy, and secure living;
- Capacity and enabling environment for active ageing.

The index therefore provides a multidimensional assessment of conditions that allow older individuals to remain economically and socially active (UNECE & European Commission, n.d.).

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From an ergonomics research perspective, a particularly valuable feature of the Active Ageing Index is its differentiation of employment indicators across age groups (55–59, 60–64, 65–69, and 70–74 years). This enables a more detailed analysis of transitions between different stages of working life and retirement (UNECE & European Commission, n.d.). At the same time, the index incorporates health, educational, and social dimensions that are essential determinants of sustainable work ability.

The most recent available wave of the Active Ageing Index (AAI 2020) confirms substantial regional disparities across Europe. Scandinavian and north-western European countries consistently achieve the highest scores, whereas southern and eastern European countries generally report lower overall values. These differences are attributable not only to employment rates among older people but also to broader determinants such as population health status, educational attainment, and institutional support for active ageing.

2.5.3 Implications for Contemporary and Future Ergonomics

A comparative analysis of international approaches reveals three key factors that characterize countries with higher levels of labour market participation among older workers:

- Supportive labour market policies, including flexible retirement pathways and measures aimed at preventing age discrimination;
- Age-appropriate working conditions, encompassing ergonomic workplace design, adaptation of workload, and flexible work organization;
- Lifelong learning and skills development, which help maintain employability and work ability throughout later career stages (UNECE & European Commission, n.d.).

Macro-level indicators such as the Golden Age Index primarily capture the outcomes of these structural conditions through labour market participation rates (PwC, 2023). By contrast, European policy analyses and multidimensional frameworks such as the Active Ageing Index provide insights into the institutional and social determinants underlying these outcomes (UNECE & European Commission, n.d.).

For ergonomics research and practice, it is essential to bridge these macro-level indicators with the micro-level realities of workplace conditions and individual work ability. The quality of the working environment remains one of the most important factors determining whether employees can safely and sustainably extend their working lives.

3. WORK ERGONOMICS AND WORKING CONDITIONS

Effective, safe, and health-promoting work performance requires the adaptation of working conditions, tools, and work environments to workers' capabilities and needs, particularly those of older employees. Ergonomic interventions include technical, organizational, and educational measures aimed at reducing excessive physical workload, awkward working postures, repetitive tasks, fatigue, and work-related stress. They also seek to eliminate adverse environmental factors that may negatively affect health and performance.

The quality of working conditions has a substantial influence on work ability, physical and psychological workload, stress levels, and safe work behaviour. Long-term exposure to inadequate working conditions may contribute to health problems, human error, occupational accidents, and even major incidents. Consequently, workplace optimization should be considered an integral component of organizational management at all levels.

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Every work activity places specific demands on an individual's physical and cognitive capacities. Therefore, maintaining a balance between job demands and worker capabilities is crucial. An imbalance between these factors may result in stress, reduced productivity, and declining work performance (Malý et al., 2025).

3.1 Digital Tools Supporting Health, Performance, and Occupational Safety

Digital technologies designed to support health, performance, and safety include applications, sensor-based systems, wearable devices, and artificial intelligence solutions that collect and analyse data related to workers' health status, productivity, and exposure to occupational risks.

Examples include mobile applications for monitoring sleep quality, heart rate, physical activity, and mental well-being; productivity analysis tools; biofeedback systems; wearable sensors; and safety monitoring technologies. In the field of occupational safety and health, digital solutions increasingly include environmental monitoring systems, digital OSH training platforms, fatigue detection systems, and sensors capable of identifying hazardous behaviours.

Within ergonomics, computer-assisted technologies have become important tools for analysing workplace layouts, visual conditions, reach distances, and work movements. Simulation models and virtual environments make it possible to test alternative workplace configurations, optimize working conditions, and reduce health risks before a physical workplace is constructed or modified. The advantages of simulation include the possibility of experimentation, reductions in implementation costs, time savings, and improvements in design quality. On the other hand, simulation-based approaches often require considerable investment in software, data preparation, and specialist expertise.

A particularly significant role is currently played by virtual reality (VR) technologies and the broader concept of the digital enterprise, which facilitate the simulation of production processes, workplace design, and optimization of working conditions in accordance with ergonomic and safety requirements. These systems are based on workers' physiological and anthropometric characteristics and support the creation of safe, efficient, and individually adapted workplaces—an especially important consideration when employing older workers.

Modern software solutions enable users to define a wide range of parameters according to the intended analytical objectives. Typical variables include age, body height, body type, upper and lower limb space requirements, reach capabilities, biomechanical characteristics, visual conditions, and other ergonomic attributes. A particularly valuable feature is the ability to evaluate static and dynamic workload, including manual material handling conditions and lifting tasks.

Using specialized software tools, digital human models can be created and manipulated according to specified anthropometric characteristics. Among the most widely used systems are DELMIA, Tecnomatix Process Simulate (eM-Power), JACK, and ErgoMas. Figure 2 illustrates an example of ergonomic workplace planning using the ErgoMas software environment.

The system supports the ergonomic design of workstations and production cells integrated into production lines. Once one or more workstations have been configured, time studies can be conducted and work tasks subsequently simulated.

One of the most sophisticated software platforms currently available is DELMIA, which provides a comprehensive suite of digital 3D manufacturing solutions. Within DELMIA, ergonomics functions as a dedicated module supporting workplace design, workstation analysis, and assessment of work activities. Its primary objective is to understand and optimize interactions among humans, machines, and products. From an ergonomic perspective, these interactions are viewed as components of a dynamic and open system in which the human operator constitutes an integral element.

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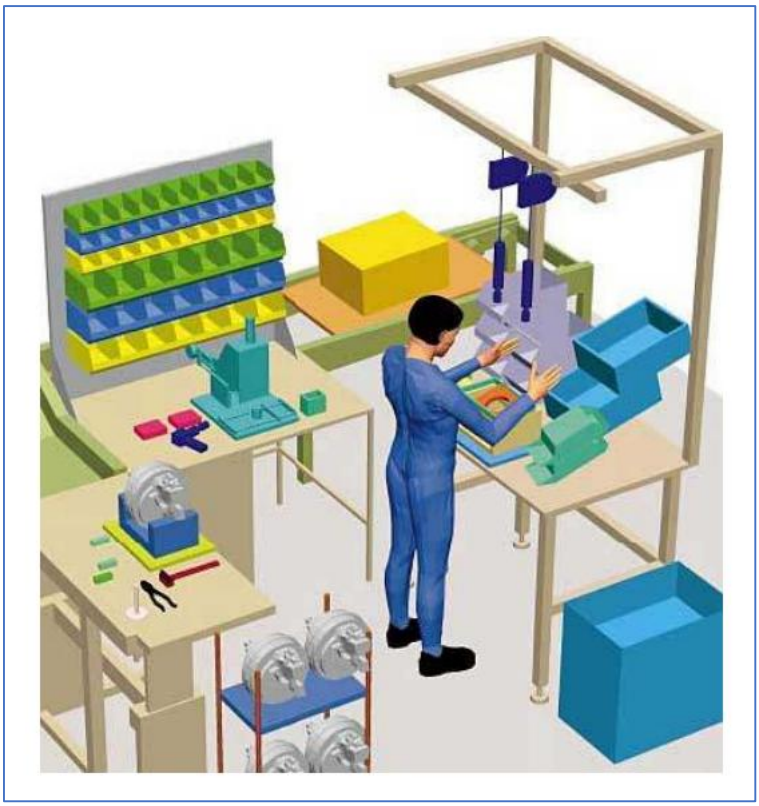
Figure 2. *Example of the ErgoMas software environment (adapted from Smutná & Dulina, 2010).*



Note. *Adapted from Metódy a softvérová podpora v priemyselnej ergonómii by M. Smutná and Ľ. Dulina, 2010, Slovenská ergonomická spoločnosť.*

In this framework, the worker is regarded as both the decisive and potentially limiting component of the system, significantly influencing overall system behaviour and performance outcomes.

Digital ergonomics tools enable organizations to monitor ergonomic conditions throughout the workplace lifecycle. Their principal advantage lies in reducing the time required to achieve acceptable ergonomic standards and enabling validation during the design phase of new or redesigned workplaces.

Before ergonomic analyses can be performed, the workplace must first undergo a process of digitalization. During this phase, the essential characteristics of the real workplace are abstracted and transferred into a virtual model. This virtual representation subsequently serves as the basis for ergonomic studies and simulations.

A further step in comprehensive workplace digitalization involves modelling human work activities. Human models are adapted to reflect real individuals through the use of anthropometric databases integrated into digital enterprise software systems. Specific work tasks are then assigned to the virtual worker, enabling simulation of job performance.

Such simulations serve multiple purposes:

- visualization of work activities,
- verification of task duration,
- evaluation of ergonomic risks,
- support for worker training and workplace instruction.

Simulation is valuable not only for newly designed workplaces but also for existing workplaces undergoing optimization and continuous improvement initiatives.

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Following completion of the digital workplace model, ergonomic studies can be conducted to evaluate physical workload, working postures, workstation dimensions, task requirements, and work cycle durations (Slamková et al., 2010).

For the assessment of physical workload and manual material handling, internationally recognized methods are commonly employed, including:

- NIOSH Lifting Equation for manual handling tasks,
- Snook and Ciriello Tables,
- RULA (Rapid Upper Limb Assessment) for repetitive activities,
- OWAS (Ovako Working Posture Analysis System) for evaluating working postures during manual tasks.

3.2 Benefits of Digital Ergonomics for Age Management

The integration of digital ergonomics into age management strategies represents a significant shift from reactive responses to health-related problems toward a systematic and preventive approach to managing work ability throughout an employee's working life. Digital technologies enable the analysis of physical workload, working postures, reach distances, force requirements, and repetitive movements before a workplace is implemented or a work process is modified. In the context of an ageing workforce, this predictive capability is particularly valuable because it allows organizations to identify potential risk factors that may have a disproportionately negative cumulative impact on older workers.

One of the principal advantages of digital ergonomics is its ability to model workplace scenarios while taking age-related changes in work capacity into account. Reductions in muscular strength, limitations in range of motion, and increased sensitivity to static or repetitive workloads can be incorporated into digital models through modified biomechanical parameters. This enables the comparison of alternative workplace designs and facilitates the selection of solutions that minimize long-term strain while supporting the maintenance of work ability among employees aged 50 years and older. In this respect, digital ergonomics contributes to extending working lives without requiring premature job reassignment or early withdrawal from the labour market.

Another important benefit is the support of evidence-based managerial decision-making. The visualization of ergonomic risks and the quantification of workload using standardized assessment methods such as RULA, OWAS, REBA, and NIOSH provide objective information for investments in technical modifications, work reorganization, or the implementation of assistive devices. Digital simulations also facilitate communication among engineers, ergonomists, occupational safety specialists, and organizational management by enabling a clear demonstration of how specific interventions influence workers' physical workload.

Digital ergonomics further supports a more individualized approach to workplace design. It allows simulations of adjustments in work surface height, optimization of handling spaces, and modifications of work sequences according to the specific anthropometric characteristics of employees. Such an approach is particularly important for older workers, among whom interindividual variability may be substantially greater than in younger age groups.

From the perspective of organizational ergonomics, digital tools also contribute to the planning of sustainable workload distribution within teams, the design of job rotation systems, and the assessment of task suitability for different age groups. In a broader context, digital ergonomics serves as a bridge between technical workplace design and strategic human resource management.

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Overall, digital ergonomics significantly enhances systematic age management by integrating ergonomic prevention, technological planning, and long-term work ability management. However, its effective use requires expert interpretation of results and integration with additional tools for evaluating working conditions, employee health status, and organizational factors.

3.3 Limitations and Risks of Digital Ergonomics in Relation to Older Workers

Despite its considerable potential, digital ergonomics is associated with several methodological and practical limitations that must be taken into account when interpreting results and making decisions based on simulation outcomes.

One of the primary limitations is that most digital ergonomic tools rely on simplified biomechanical models and standardized anthropometric databases. These models are generally based on population averages and therefore do not fully reflect individual differences in health status, chronic diseases, cumulative occupational exposure, or psychosocial factors, all of which are particularly relevant among older workers.

Another limitation concerns the restricted ability of digital models to capture the dynamics of long-term and cumulative workload. For older employees, occupational risks are influenced not only by immediate biomechanical demands but also by the chronic nature of exposure, recovery capacity, fatigue accumulation, and interactions with non-work-related factors. Digital simulations typically evaluate individual work cycles or short-term scenarios and may therefore underestimate risks associated with prolonged work exposure.

There is also a risk of overestimating the precision and objectivity of digital outputs. Quantitative scores generated by methods such as RULA, REBA, or the NIOSH Lifting Equation may create the impression of definitive and objective evaluations, although they remain model-based calculations founded on simplifying assumptions. In the case of older workers, where individual differences in functional capacity may be particularly pronounced, simulation results should always be interpreted cautiously and supplemented by workplace observations, employee interviews, and relevant health indicators, such as the Work Ability Index (WAI).

A further limitation arises from the fact that many digital ergonomic tools were not originally designed with workforce age diversity in mind. Although it is technically possible to simulate reduced muscular strength, limited mobility, or other age-related characteristics, such adaptations often require expert intervention and manual parameter adjustments. Without these modifications, digital models may implicitly represent a younger, physically fit worker, resulting in a systematic underestimation of risks for older age groups.

Organizational and economic constraints should also be considered. The implementation of digital ergonomics requires specialized software, trained personnel, and sufficient time for model development and interpretation. For small and medium-sized enterprises, these requirements may represent a significant barrier to adoption, limiting the broader application of digital ergonomic tools precisely where support for older workers may be most needed.

Consequently, digital ergonomics should not be viewed as a standalone solution to the challenges associated with workforce ageing. Rather, it should be regarded as one component of a comprehensive strategy that combines technical interventions, organizational measures, occupational health promotion, preventive healthcare, and active communication with employees. Only through the integration of digital simulations with real-world workplace assessments can organizations effectively support the long-term work ability of older workers while minimizing the risk of inappropriate interpretation of simulation results.

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4. PRACTICAL IMPLICATIONS

The findings of this review suggest several practical measures that can support the health, safety, and work ability of older workers:

- Conduct age-sensitive ergonomic risk assessments that consider age-related changes in physical and cognitive capacities.
- Adapt workplaces through ergonomic design, adjustable workstations, assistive devices, and appropriate workplace lighting.
- Utilize digital ergonomics and simulation tools to identify and mitigate occupational risks before workplace implementation or redesign.
- Promote lifelong learning and digital skills development to support adaptation to technological change.
- Integrate age management principles into occupational safety and health (OSH) strategies, including flexible work arrangements, mentoring programmes, and intergenerational knowledge transfer.

These measures can contribute to reducing occupational risks, maintaining work ability, and supporting sustainable employment among ageing workers.

5. CONCLUSION

Population ageing and the extension of working life represent one of the most significant challenges for contemporary occupational safety and health systems. Maintaining the work ability, health, and productivity of older workers requires a comprehensive approach that integrates ergonomic workplace design, age management strategies, occupational health promotion, and organizational support mechanisms.

The findings presented in this study indicate that chronological age alone is not a reliable predictor of work performance or occupational safety outcomes. Although ageing is associated with physiological and cognitive changes that may affect work capacity, older workers continue to provide substantial value through their professional experience, decision-making skills, reliability, and organizational knowledge. Consequently, workplace interventions should focus on individual functional capacity rather than age itself.

The review further demonstrates that ergonomically optimized working conditions play a critical role in reducing physical and psychosocial workload, preventing occupational injuries, and supporting sustainable employability. In particular, digital ergonomics, simulation technologies, and virtual workplace modelling provide new opportunities for identifying occupational risks and evaluating preventive measures before their implementation. These technologies can contribute significantly to the development of age-friendly workplaces and support evidence-based decision-making in occupational safety management.

At the same time, digital ergonomic tools should not be regarded as standalone solutions. Their effectiveness depends on appropriate interpretation, integration with workplace risk assessments, occupational health surveillance, and active involvement of employees in the design and evaluation of working conditions. The complexity of workforce ageing requires a multidisciplinary approach that combines ergonomics, occupational medicine, human resource management, engineering, and organizational psychology.

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From a practical perspective, organizations that invest in age-inclusive workplace design, lifelong learning, and preventive occupational safety measures are likely to benefit from higher workforce sustainability, improved knowledge retention, reduced injury-related costs, and enhanced organizational resilience. As demographic ageing continues to reshape labour markets worldwide, creating safe, healthy, and productive working environments for older workers should become a strategic priority for employers, policymakers, and occupational safety professionals alike.

Future research should focus on evaluating the long-term effectiveness of digital ergonomic interventions, developing age-sensitive assessment methodologies, and strengthening the evidence base linking ergonomic workplace design with sustainable work participation among ageing workers.

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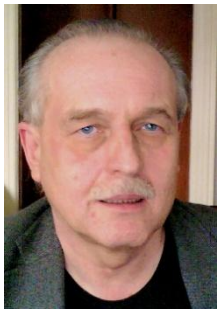

Stanislav Malý serves as Deputy Director of the Research Institute for Labour and Social Affairs (RILSA), where he oversees the Occupational Risk Prevention Section, and also heads the Department of Ergonomics and Occupational Risk Prevention. He is a recognized expert in occupational risk prevention, ergonomics, human reliability, industrial safety, major accident prevention, and fire protection. With more than four decades of experience in occupational health and safety, he began his professional career in 1980 at the Institute of Hygiene and Epidemiology (now the State Institute of Public Health). In 1990, he joined the Research Institute of Occupational Safety, v. v. i., which is now part of RILSA, where he has been actively engaged in research, expert consultancy, and the practical implementation of occupational safety and ergonomics principles. He graduated from the Faculty of Science at Charles University and completed his doctoral studies at the Faculty of Safety Engineering of VŠB–Technical University of Ostrava. Drawing on extensive experience in both research and academia, he also serves as a guarantor and supervisor of selected doctoral study programmes. Throughout his career, he has contributed to numerous national and international research projects, with a particular focus in recent years on ergonomics and work-related musculoskeletal disorders. He is a strong advocate of holistic and interdisciplinary approaches to ergonomics and occupational risk prevention, promoting the integration of human, organizational, and technical factors in creating safe and healthy workplaces.

Contact details
Research Institute for Labour and Social Affairs / RILSA
Jeruzalémská 1283/9, 110 00 Praha 1 – Nové Město
T: +420 723 922 291
E: stanislav.maly@rilsa.cz, slavekmal56@gmail.com, slavekmal@icloud.com

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Assessment of N95 Strap Placement Across Multiple Uses

Megan Benton[1], Lorri Birkenbuel[1], Daniel Autenrieth[1], David Gilkey[1*], and Janet Coe[2]
[1] Department of Industrial Hygiene, Montana Technological University, 1300 West Park St. Butte, MT 59701
[2] Sherry Lesar of Nursing, Montana Technological University

KEYWORDS

N95 Filtering Facepiece;
Respirators (N95 FFRs);
Respirator Fit Testing;
Strap Placement;
Respiratory Protection;
Healthcare Workers;
Repeated Donning.

ABSTRACT

Proper fit and consisted use of N95 Filtering Facepiece Respirators are essential for protecting healthcare workers against airborne hazards. While N95 filtering face piece respirators are rigorously tested to meet regulatory testing requirements, such as filtration efficiency, loading and pressure differential, variations in strap placement and repeating donning can influence overall fit and protection. This study evaluated the fit factors of two NIOSH-approved N95 filtering facepiece respirator models, the 3M Aura and the 3M 1860, under standard manufacturer strap placement recommendations and an alternative crossed strap placement across multiple uses. Twenty-five participants completed eight quantitative fast fit tests using a TSI PortaCount® 8026 device, assessing fit factors across standard and crossed strap placement during two donnings. Two hundred total fit factors were collected and analyzed using paired t-tests to determine statistically significant difference between test conditions. Results revealed a statistically significant reduction in mean fit factors of the 3M 1860 model when straps were crossed ($p < 0.001$), particularly after repeated use. Repeated donning further impacted the fit factors of the 3M 1860 under crossed strap conditions ($p = 0.005$), indicating fit and performance degradation over time. While the 3M Aura also showed a decrease in fit factor with crossed straps, the change was not statistically significant ($p = 0.174$).

1. BACKGROUND

Respiratory protection is a primary component in safeguarding workers, especially in environments where airborne contaminants, pathogens, and particulates pose a health risk. With the increased prevalence of airborne diseases and environmental hazards, proper use of respirators, particularly N95 Filtering Facepiece Respirators (N95 FFRs) and equivalents, have gained heightened importance in both healthcare and industrial settings (Harber & Beckett, 2023).

As of 2022, 16.3 million people were employed in the healthcare industry (N. C. F. H. W. A. 2024). N95 FFRs are utilized to protect healthcare workers (HCWs), as these N95 FFRs provide a barrier between the person and airborne particulates. At least 95% of airborne particles, including harmful pathogens, smoke, dust, smoke and various other contaminants are filtered with an N95 FFRs. These respirators greatly reduce the risk of infection in a healthcare setting (Ejaz, et al., 2024). N95 FFRs have been used

* *Corresponding Author*: dgilkey@mtech.edu

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to protect workers from airborne diseases such as COVID-19, influenza, tuberculosis, and others by filtering out viral and bacterial particles and droplets. With inhalation as a primary exposure pathway, HCWs rely on protection from personal protective equipment (PPE), specifically respiratory protection.

Especially important in protecting HCWs is the use of a properly fitted and sealed respirator. Effective respiratory protection relies on using the appropriate type of mask, ensuring the respirator fits the wearer appropriately through a fit test, maintaining a seal, and following the manufacturer's recommendations, which significantly influences the respirator's performance. HCWs must select a respirator that fits well to their face and minimizes the amount of air leakage (NIOSH Myths, 2016).

The population of workers that need respiratory protection has a wide variation of face shapes and sizes. For this reason, it is critical to provide an array of N95 FFR styles to match to the unique dimensions of a person's face. A study by Rottach and Lei (2018) found that a "poor match between the face and the respirator can allow excessive leakage of unfiltered air into the breathing space". Common N95 FFR models used in healthcare settings are trifold and cup shaped models. One particular cup shaped model, the surgical N95 FFRs, is manufactured to meet both National Institute for Occupational Safety and Health (NIOSH) N95 FFR testing standards and Food and Drug Administration standards for surgical masks (Smith et al., 2016)

Face seal leakage can enable fine respiratory particles to bypass mask filters (Ejaz et al., 2024). A study comparing non-fitted with fitted N95 FFRs utilized in a healthcare environment, determined that HCWs using fitted N95 FFRs, had lower outcomes of respiratory type illness and infection than the HCW wearing non fitted N95 FFRs (Regli, et al., 2021).

An initial fit test is performed to validate and ensure the respirator make and model is an appropriate fit for the wearer by passing respirator fit factor (FF) requirements. A passing FF for an N95 FFR is a minimum of 100, indicating a good fit. The fit tests are accomplished through qualitative or quantitative methods. Both qualitative and quantitative fit test method follows series of exercises which determines if the respirator meets fit testing requirements and indicates that a respirator is a good fit for the wearer. Qualitative fit test methods rely on the users senses and are based on a pass or fail depending on whether they taste the testing agent (OSHA, 2004). If the individual cannot sense the testing agent it is determined that the minimum FF of 100 for the N95 FFR is met. Quantitative methods calculate a fit factor for each individual exercise based on particle concentration inside and outside of the respirator. While using quantitative methods such as the TSI PortaCount® 8026, fit factors are calculated and must receive an overall fit factor of 100, however can determine FFs levels up to 200. FF above 200 show as 200+, indicating a stronger fit.

Healthcare workers routinely work 8–12-hour shifts and may readjust respirators, ultimately modifying the fit throughout a workday. In a study done by Suen, et al., (2019), it was found that even after just 10 minutes of "normal nursing procedures", the respirators FF decreased by as much as 50. Masks may also shift due to biological factors such as normal sweat and skin oils being produced along with facial changes. During a normal shift a person's face may slightly swell due to hydration, fatigue, or pressure from wearing a mask for long periods of time (Ejaz et al., 2024).

Several studies have investigated how typical workplace practices and repeated donning affect the overall FF of respirators. Straps may move during a work shift due to extended wear, frequent movement, PPE layering, or reuse. Since N95 FFR are frequently removed and reapplied throughout a shift, understanding the impact of multiple donnings on fit integrity is critical. The straps of N95 FFRs are composed of various elastomeric materials designed to stretch and recoil; however, once stretched beyond their elastic limit, their ability to return to their original form diminishes, potentially compromising the respirator's fit (Roberg et al., 2012).

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NIOSH found that many HCWs used improper practices when donning respirators, including incorrect strap placement, dismissing a user seal check, improper doffing, and improper respirator disposal (NIOSH Myths, 2016). NIOSH (2023) provides instructions on proper donning and correct strap placement of N95 FFRs. Wearers are instructed to place the bottom of the N95 FFR under the chin with the nosepiece bar located at the bridge of the nose. NIOSH recommends to pull the top strap over your head, then move the bottom strap over the head with the upper strap placed on the crown of the head and the lower strap behind the neck and under hair where needed (Cummings et al., 2007). Ensuring proper upper and lower strap placement results in the correct force and pull on the N95 FFR to keep the placement on the face and chin (Niezgoda et al., 2013 and Roberg et al., 2012).

A study completed on the effect of upper strap downward displacement found that the slippage of upper strap placement has little negative effect on the overall fit factor (Roberge et al., 2014). NIOSH (2023) also notes the importance of not wearing the straps in a crisscross, which will change the placement of the N95 FFR.

The purpose of this research is to investigate fit factors of two N95 FFR models based on standard and crossed strap placement across multiple uses. Because they are commonly used in healthcare, both 3M Aura 9210+ and 3M 1860 models were utilized for this project. The proposed research specific aims and hypothesis are described below:

Specific Aim 1:

Evaluate the fast-fit test results of N95 models while following the standard manufacture strap placement recommendations with fast fit test results of crossed strap placement.

- ***Null Hypothesis 1*** *– There will be no difference in the fit test results of the N95 respirators while straps are in the manufacturer suggested location when compared to respirators fit tested with a crossed strap placement.*

Specific Aim 2:

Evaluate the fast-fit test results of N95 models while following manufacture strap placement recommendations with fast fit test results of crossed strap placement across multiple uses.

- ***Null Hypothesis 2*** *– There will be no difference in the fit test results of the N95 respirators while straps are in the manufacturer suggested location across multiple uses.*

Specific Aim 3:

Compare the fast-fit test results of both N95 models with manufacture strap placement recommendations and with crossed strap placement across multiple uses.

- ***Null Hypothesis 3*** *– There will be no difference in the fit test results of the N95 respirators while straps are in a crossed placement across multiple uses.*

2. METHODS

For this investigation, 25 study subjects were recruited to assess the fit of two 3M N95 FFR models using two strap placements. Straps placed in the manufacturers recommended location is referred to as “standard” location, and strap placed in a crisscrossed position is referred as “crossed” location. This research was reviewed and granted approval by the University of Montana Institutional Review Board for the use of human subjects as participants.

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Participants were instructed to arrive with a clean-shaven face and were instructed not to smoke for 30 minutes prior to the fit tests. Participants were also instructed on proper donning and doffing of the respirators and strap placement for each fit test. Additionally, participants were informed of the test exercises and how to perform the exercises prior to beginning the fit test. Lastly participants were given the opportunity to stop the test at any point for any reason.

Materials utilized for this research included two N95 FFR's manufactured by 3M; an Aura 9210 + (Aura) and a 3M surgical N95. The 3M Aura 9210+ is a trifold one-size fits most respirator and the 3M 1860 is a cup shape model, also known as the surgical N95. Each model has different strap materials, the Aura straps are composed of a polyisoprene band and the 1860 contains a braided polyester made from four connected bands.

Additional materials utilized were a probing kit, a TSI PortaCount® 8026, a TSI particle generator, and TSI fitPro+ software. Fit testing was completed with the TSI PortaCount® 8026 while using the N95 fast fit test method, which utilizes four exercises. A particle generator was used to ensure the particle count was sufficient while remaining under the recommended 800 pt/cc (TSI, 2022).

Each of the participants completed eight total fit tests; two fit tests were completed with each strap placement, standard and crossed, with each respirator model. Study subjects were fit tested two times in each strap placement for both respirator models to determine fit factors across strap placement and across multiple donning, using a total of four respirators, one respirator for standard placement and one for crossed strap placement for each FFR model. With each respirator model, a fast-fit test was completed with the standard manufacturer strap placement, the respirator was then removed and donned a second time for a second fit test with standard strap placement. With a new and unused N95 FFR, the test subject then underwent the same process with crossed straps. The process was completed again with the second 3M Model. Strap placement is shown in figure 1 and 2 for each N95 FFR model.

A total FF was obtained for each of the eight fit tests and FFs were collected for each test exercise. The aim of this study was to compare the total FF of the two different mask styles for the standard strap placement versus the crossed strap placement across multiple uses. Paired T tests were completed to analyze and compare the datasets. Eight different sets of data were analyzed and compared to determine if there was a statistically significant difference in fit factors. Minitab software was used in the analysis.

Figure 1. *3M Aura Standard and Crossed Strap Placement*

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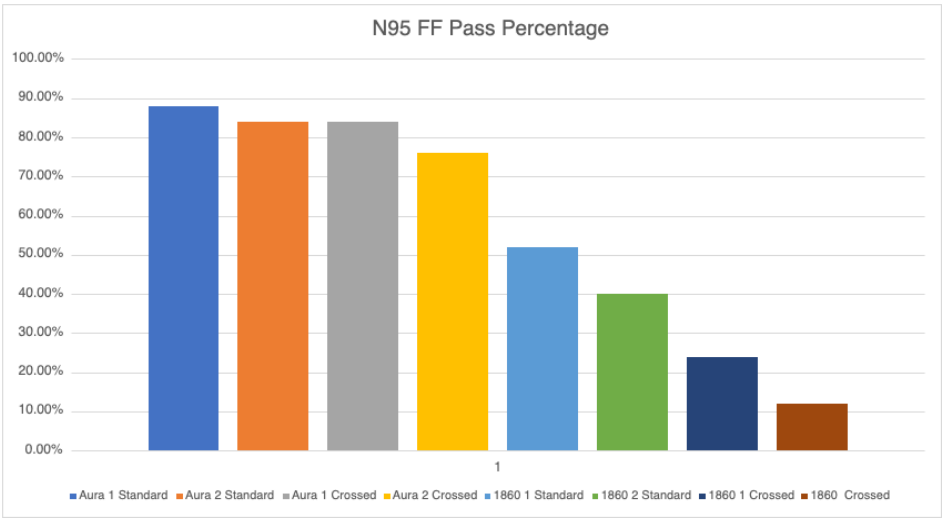
Figure 2. *3M 1860 Standard and Crossed Strap Placement*

3. RESULTS

The aim of this study was to compare total FF of two different N95 FFR styles with standard versus crossed strap placement. A total of 800 FFs were collected, with 200 total FF. Total FFs were calculated based on the FF of each of the four test exercises of the fast fit test. The initial fit test using the Aura with standard strap placement had the highest pass rating percentage of 88 %. The subsequent standard strap fit test with the Aura showed a slight decrease in pass rating percentage of 84 %, which is the same passing percentage rate as the first fit test with the crossed straps using the Aura. The second set of fit tests with the Aura and crossed straps showed a pass percentage of 76 %, eight percent lower from the first fit test with the crossed straps.

The performance of the 1860, as measured by the quantitative fit test, demonstrated a reduced pass rate as compared to the Aura. The initial 1860 fit test with standard straps had a pass rating of 52 %, while the second fit test with the standard strap declined to a pass percentage of 40 %. With the crossed straps, there was an additional reduction in the fit factor pass rate. The first donning with crossed straps showed a pass rate of 24%. The lowest pass rating was with the second donning of the 1860 with crossed straps, with a pass rate of 12%. The progression fit factors for each dataset are shown in Figure 3.

Figure 3. *Fit Factor Pass Percentage*



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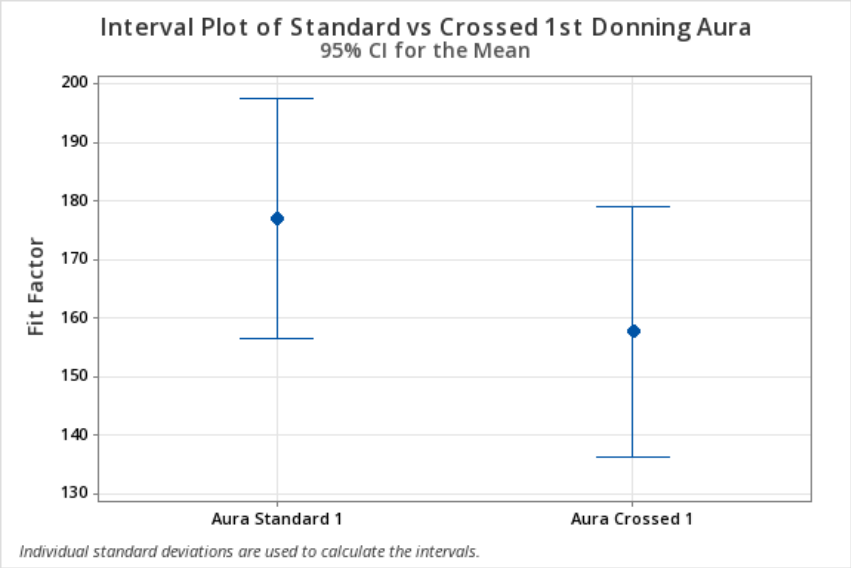
A paired t-test was used to analyze and compare the different data sets.

a) Standard vs Crossed 1st Donning Aura
b) Standard vs Crossed 1st Donning 1860
c) Standard 1st vs 2nd Donning Aura
d) Standard 1st vs 2nd Donning 1860
e) Crossed 1st vs 2nd Donning Aura
f) Crossed 1st vs 2nd Donning 1860
g) Standard Aura vs 1860 1st Donning
h) Crossed Aura vs 1860 1st Donning
i) Standard Aura vs 1860 2nd Donning
j) Crossed Aura vs 1860 2nd Donning

3.1 Standard Versus Crossed Straps

When comparing standard strap placement to crossed strap placement for Aura first donning, the results yielded a p-value of 0.174, indicating no significant difference. As shown in figure 4, the mean fit factor for Aura standard strap placement was 176.92, with a standard deviation of 49.74. Aura crossed strap placement had a mean fit factor of 157.6, with a standard deviation of 51.96.

Figure 4. *Interval Plot of Aura Standard 1, Aura Crossed 1*



The results of comparing strap placement of the 1860, first donning, yielded a p-value of less than 0.001, indicating significant difference. Here, the mean FF for the 1860 with standard strap placement had a mean FF of 115.36, with a standard deviation of 63.83. The 1860 with crossed strap placement had a mean FF of 65.32 with a standard deviation of 60.75. This is shown below in figure 5.

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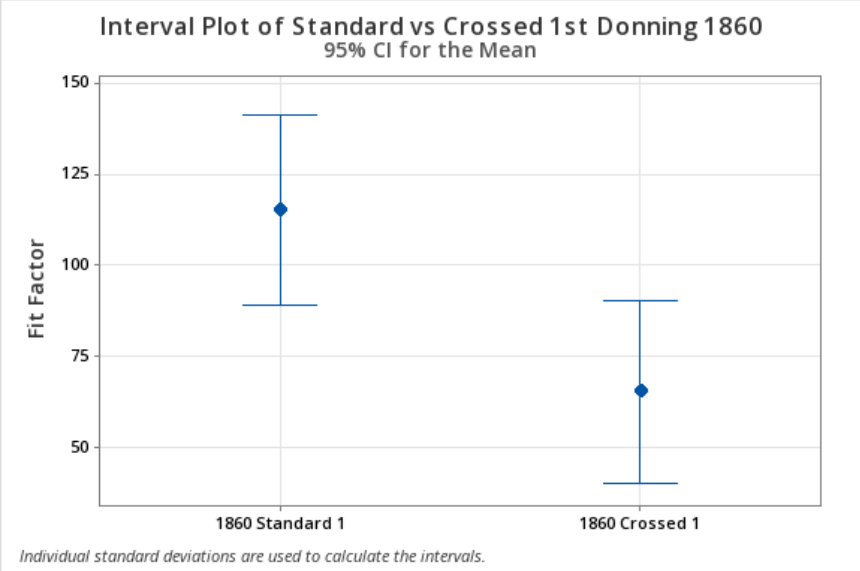
Figure 5. *Interval Plot of 1860 Standard 1, 1860 Crossed 1*

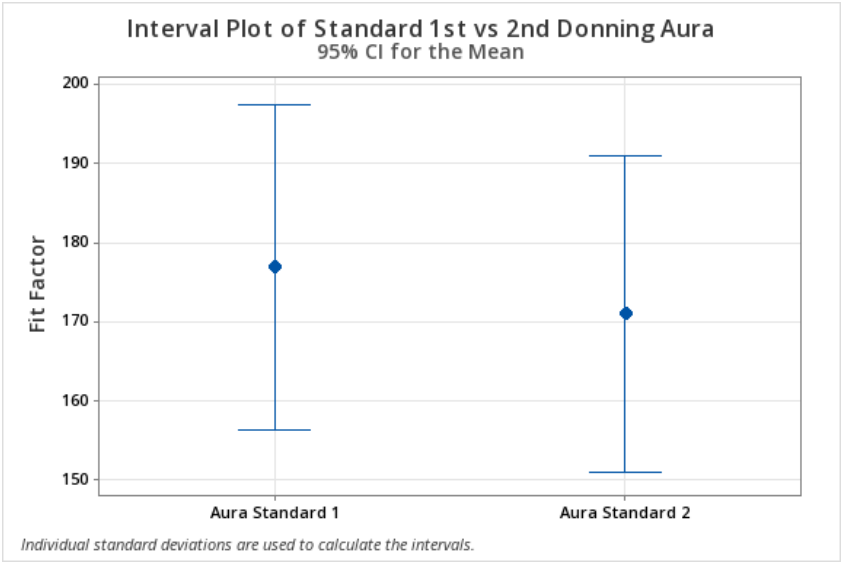


3.2 First donning versus second Donning

When comparing first and second donning of N95 FFRs, the following data were collected.

After comparing first donning of Aura with standard placement to the second donning a p-value of 0.614 was yielded. As shown in figure 6, the first donning of the Aura with standard strap placement had a mean FF of 176.92 with a standard deviation of 49.74, the second donning had a mean FF of 170.96 with a standard deviation of 48.52.

Figure 6. *Interval Plot of Aura Standard 1, Aura Standard 2*



Comparing the first donning of 1860 with standard placement to the second donning yielded a p-value of 0.186. As shown in figure 7, the first donning of the 1860 with standard placement had a mean FF of 115.36 with a standard deviation of 63.83. The second donning had a mean FF of 104.96 with a standard deviation of 56.03.

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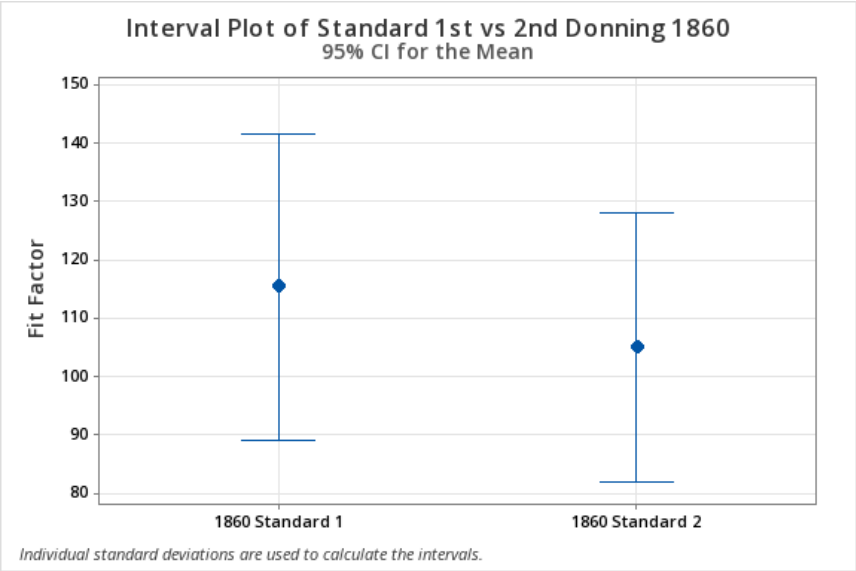
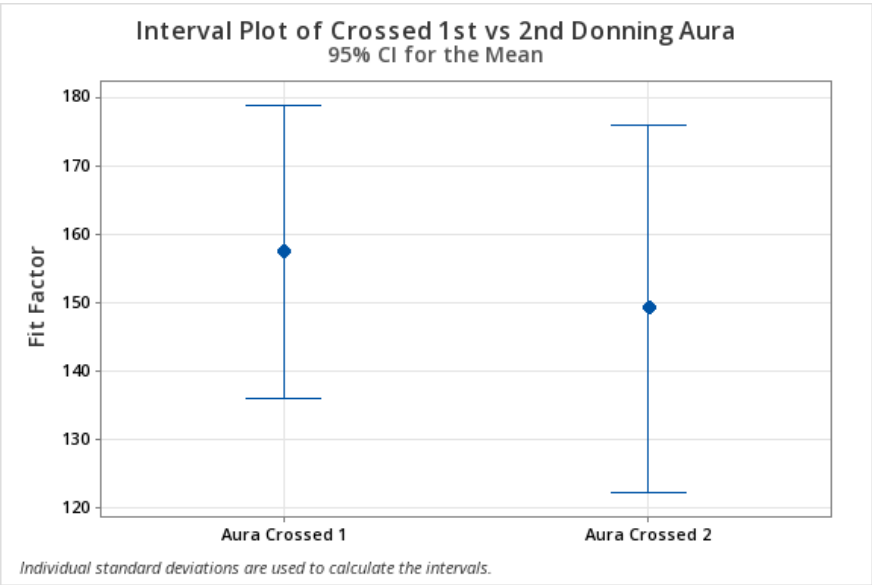
Figure 7. *Interval Plot of 1860 Standard 1, 1860 Standard 2*



As shown in figure 8, the first donning of the Aura with crossed straps compared to the second donning of the Aura with crossed straps yielded a p-value of 0.522. The first donning with crossed straps had a mean FF of 157.6 with a standard deviation of 51.96. The second donning with crossed straps had a mean FF of 149.24 with a standard deviation of 65.30.

Figure 8. *Interval Plot of Aura Crossed 1, Aura Crossed 2*



As depicted in figure 9, the first donning of the 1860 with crossed straps, when compared to the second donning of the 1860 with crossed straps, yielded a p-value of 0.005. The first donning with crossed straps had a mean FF of 65.32, with a standard deviation of 60.75. The second donning with crossed straps had a mean FF of 42.64, with a standard deviation of 46.75.

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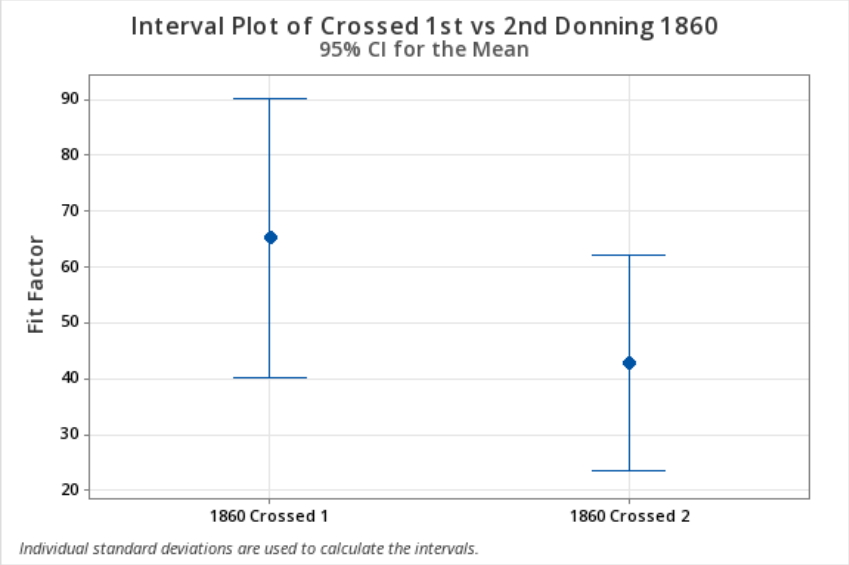
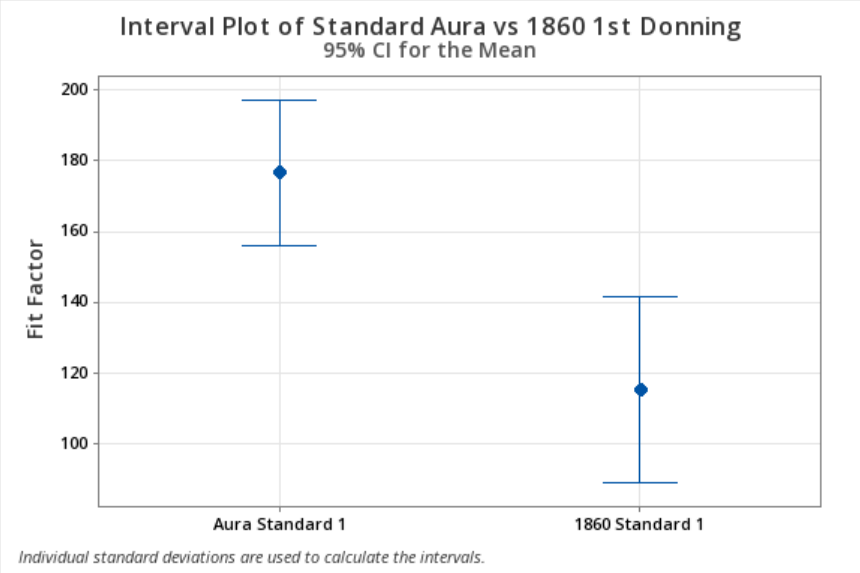
Figure 9. *Interval Plot of 1860 Crossed 1, 1860 Crossed 2*



3.3 Comparing Aura versus 1860 style respirators 1st Donning

The first donning of the Aura with standard straps, when compared to the first donning of the 1860 with standard straps, yielded a p-value < 0.001. This comparison can be shown in figure 10.

Figure 10. *Interval Plot of Standard Aura 1, Standard 1860 1*



The first donning of the Aura with crossed straps, when compared to the first donning of the 1860 with crossed straps yielded a p-value < 0.001. This comparison can be shown in figure 11.

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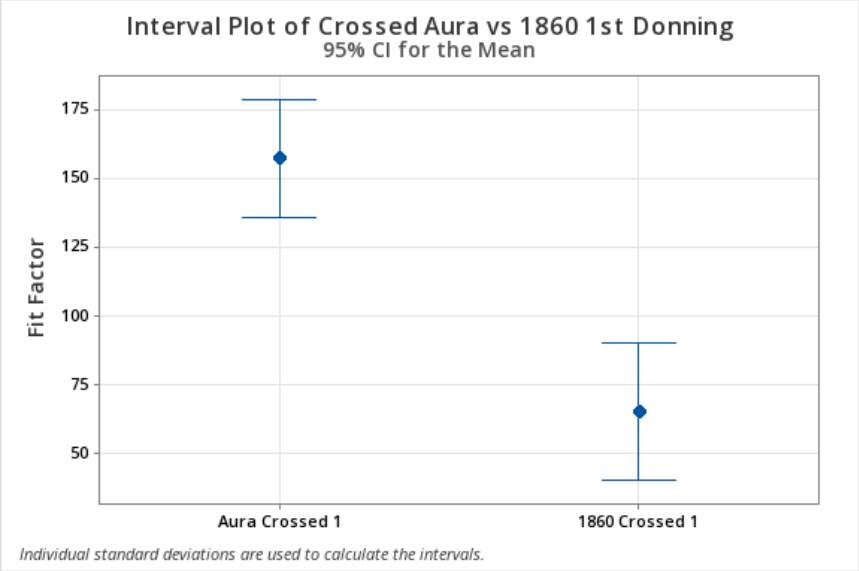
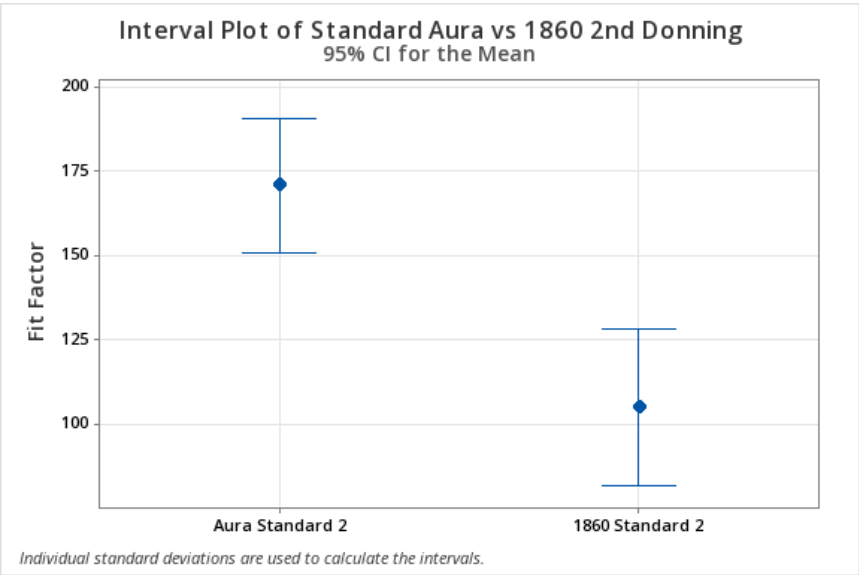
Figure 11. *Interval Plot of Crossed Aura 1, Crossed 1860 1*



3.4 Comparing Aura versus 1860 style respirators 2nd Donning

The second donning of the Aura with standard straps, when compared to the second donning of the 1860 with standard straps, yielded a p-value < 0.001. This comparison can be shown in figure 12.

Figure 12. *Interval Plot of Standard Aura 2, Standard 1860 2*



The second donning of the Aura with crossed straps, when compared to the second donning of the 1860 with crossed straps, yielded a p-value < 0.001. This comparison can be shown in figure 13.

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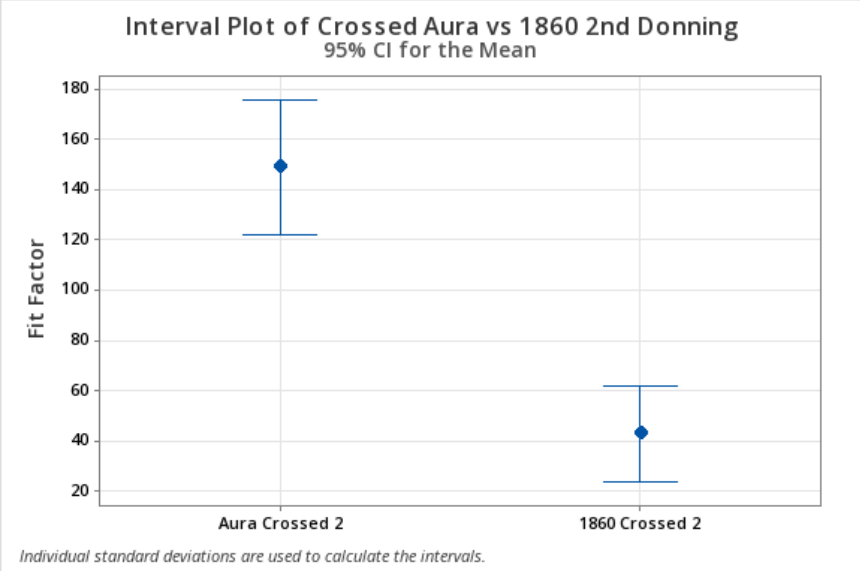
Figure 13. *Interval Plot of Crossed Aura 2, Crossed 1860 2*



4. DISCUSSION

This study showed a statistically significant difference in fit factors when comparing the FF of the 1860 standard strap placement and crossed strap placement. The statistically significant comparisons involved the 1860-style respirators, indicating that the use of the manufacturer's recommendations for strap placement is critical. The Aura-style respirators proved to decrease FFs when comparing standard to crossed strap placement, although it was not statistically significant.

A study completed by Roberge et al., (2012) looked at the elastic restorative forces after being stretched from the initial and subsequent donning. The study findings revealed the largest decrease in strap stretch loss was in the first donning, although the degradation continued to decline slightly through multiple donnings (Roberge et al., 2012). These results indicated that the load decrements would be sufficient to pass a fit test of up to 5 donnings; however, they did not verify with human subjects. Bergman et al. (2012) tested six N95 models and found that multiple donning had a negative effect on the overall FF of N95 FFRs. However, the results were dependent on the type of N95 model tested. The data found suggests that a total of five consecutive donnings can be performed before the FF will consistently fall below 100, leaving HCWs unprotected (Bergman et al., 2012).

Roberge et al. (2014) compared the fit factors of three cup-shaped N95 FFR models and one tri-fold N95 FFR with the standard strap placement and an alternative placement with the top strap displaced downward over the ears. Similar to this study, the Roberge et al. (2014) study showed reduced fit factors with the displaced strap placement. Also, the initial fit test results were lower with the cupped type of mask than with the trifold. However, Roberge et al. (2014) found that the displaced alternative straps fit test did not significantly decrease from those that passed the initial fit test. When comparing results of this study, the initial fit test results were also lower for the cup shaped mask in comparison with the trifold mask. The trifold showed 88% of the initial fit test with standard strap placement period of those that passed the initial fit with standard strap placement, 82% past the crossed strap placement fit test for the first donning. Looking at the 1860, cup style, only 52% of the initial fit test with standard strap placement passed. Of those that passed the initial fit with the standard strap placement, 38.5% passed the crossed strap replacement fit test for the first donning.

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It is also important to note that it is recognized that there may be significant variability in face morphology in human subjects and that not all mask styles are compatible with all subjects. The Aura had an overall higher passing fit test for both standard and crossed straps vs. the 1860 model, where the percentage of those who passed the initial fit test was low, indicating the 1860 was not a good fit for 48% of the participants. Like the Roberge (2014) findings, test subjects who were considered petite were more likely to not pass the quantitative fit test, particularly when using the 1860 style respirator.

It was also found that initial improper upper strap placement can occur due to a number of factors. These include human error, friction of the straps and hair, head motion, speech, and speed in which exercise are completed. Friction of straps and hair can occur due to composition of FFR straps, natural oiliness of hair, hair moisture, the products an individual may use, and the hair style worn by the individual.

5. LIMITATIONS AND RECOMMENDATIONS

Several limitations were noted throughout the study. The sample size was small and is not representative of other populations. Study participants were a convenience sample of college students recruited at the university, they were not selected randomly and do not represent the larger population. Upper strap location had variances from participant to participant and across participants, which may have influenced the total FF. Some study subjects were more susceptible to strap slippage during the exercises, this may have influenced seal, creating a leakage and thus affected our findings. Potential variations in tubing and probe connections were present and in the port positioning. Specifically, the 1860 mask style had reduced initial and all subsequent fit for all participants indicating the need for larger sample size. The low initial fit and subsequent fit tests were likely due to the variations in individual face structures and size. This mismatch may have influenced overall fit test results and limited the general findings across the study.

An increased sample size is recommended in future studies to enhance statistical power, facilitate the detection of outliers, and improve the accuracy and reliability of the results. More participants would help ensure the externalization of findings. In addition, study subjects should be randomly selected from the population of interest to be representative of the target population, thus increasing the generalizability of the study's conclusions.

Another aspect of the study design to consider is the exact location of the upper strap placement. Achieving uniform strap placement among all participants is difficult, given the variability in head and face anatomy and the potential for minor deviations during application. To improve the consistency and reliability of future measurements, it is recommended that a standardized method or positioning guide be developed to ensure uniform strap placement on participants' heads. The variability in strap positioning may influence the seal and thus the measurements collected. Consistency of strap placement would likely minimize variability and enhance results.

Our study completed two donnings per strap location. Data from additional donnings would be useful to determine fit degradation over subsequent donnings and allow further comparisons with studies that included five or more donnings.

6. CONCLUSIONS

This study evaluated the impact of N95 strap placement across multiple uses. The results demonstrated a statistically significant difference in the overall FF when the straps of the 3M 1860 N95 respirator were crossed, particularly after two consecutive donnings. These findings highlight the critical importance of adhering to manufacturer-recommended strap placement, especially for the 1860 model. Future research

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could expand on these findings by increasing the sample size and developing a standardized method for upper strap positioning

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MAIN AUTHOR

Megan Benton is an occupational health and safety professional currently serving as a Safety Educator at Barnard in Knoxville, Tennessee. She earned a Bachelor's degree in Occupational Health and Safety from Montana Technological University in 2024, where she was a member of the Montana Tech Volleyball Team and the American Society of Safety Professionals (ASSP). She later completed a Master of Science in Industrial Hygiene at Montana Technological University in 2025, further developing her expertise in workplace health and safety. Megan's academic achievements and professional experience reflect her commitment to promoting safe, healthy, and productive work environments through education and risk prevention.

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Insights into Script Writing a Longitudinal Corporate Safety Culture

Harbans Lal[1*] and Elias M. Choueiri[2]

[1] Professor of Psychology (Retd.), SNDT Women's University;
Director, Forum of Behavioural Safety, Mumbai, India

[2] WSO Board Member and Liaison Officer to the United Nations;
Professor at several Lebanese universities

KEYWORDS

Safety Culture Script;
Safety Governance;
Behaviour-Based Safety (BBS);
Organizational Safety Culture;
Leadership Commitment;
Longitudinal Safety Culture Model.

ABSTRACT

Organizations frequently encounter substantial structural hurdles when designing, authoring, and executing a resilient corporate safety culture. This operational ambiguity often breeds widespread organizational passivity, structural fragmentation, and systemic vulnerabilities across operational processes. Drawing upon an extensive longitudinal analysis of 100 industrial case studies conducted over a 25-year period (2001–2025) across diverse global sectors, this study systematically evaluates the multi-level authorship, strategic ownership, and practical enforcement of corporate safety scripts.

Grounded in the behavioral psychology principles of the Antecedents–Behaviours–Consequences (ABC) model, this study introduces an expanded, multi-tiered Behavior-Based Safety (BBS) framework that deliberately links executive vision, supervisory accountability, and frontline engagement. The research uncovers three primary thematic dimensions:

- The critical operational disconnect between technical script authors (executive leaders and EHS professionals) and real-world script controllers (middle management and frontline workers).
- The mechanical execution of a continuous, closed-loop Accountability-Behavior sequence.
- A modern paradigm shift toward proactive leading indicators, psychological safety, and non-punitive "Just Culture" frameworks.

Ultimately, this study demonstrates that sustainable cultural transformation cannot rely on strict, top-down mandates or superficial, client-driven metrics. Instead, it demands active workforce involvement, visible leadership micro-behaviors, and a fundamental alignment between institutional frameworks and human excellence to achieve a truly incident-free workplace.

[*] *Corresponding Author*: kailahl@hotmail.com

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1. INTRODUCTION

The execution of robust occupational health and safety (OHS) programs combined with a resilient safety culture exerts a profound influence on achieving the dual corporate milestones of "Zero Accidents" and a fortified organizational reputation. Within modern high-risk industries, progressive operations are shifting away from viewing safety as a tedious exercise in mere regulatory compliance. Instead, forward-thinking organizations treat it as a high-value strategic investment designed to minimize hazardous workplace exposures, mitigate systemic vulnerabilities, and foster a sustainable corporate image within a competitive marketplace. Despite this theoretical consensus, field practices indicate that enterprises frequently suffer from structural confusion when attempting to initiate, scale, and sustain long-term safety culture strategies.

A central dilemma confronting contemporary safety professionals is identifying who writes, owns, and controls the operational "script" of corporate safety cultures. Far too often, ambiguity regarding the precise boundaries separating executive leadership teams, Environment, Health, and Safety (EHS) specialists, and frontline operations leads to widespread organizational passivity. When these distinct roles are poorly defined, safety initiatives stall, leaving critical questions unanswered: what percentage of the workforce remains unawakened or silent? Is management solely responsible for controlling safety resources and budgets? Is the internal EHS team structurally positioned high enough within the corporate hierarchy to actually influence systemic change? This lack of operational clarity ultimately manifests as systemic weaknesses, culminating in serious workplace incidents and preventable fatalities.

While traditional Behavior-Based Safety (BBS) models—grounded in classical operant conditioning theory—offer a systematic blueprint for shaping human actions, many field implementations fall short because they fail to integrate with macro-ergonomic and broader organizational systems. Safety outcomes are never produced in a vacuum; they are shaped by a complex, continuous interplay of cultural norms, management practices, open communication patterns, and daily habits. To prevent both catastrophic, large-scale system disturbances and routine operational injuries, attention must be directed toward the visible manifestations of safety culture within daily practices. This requires the formulation of a comprehensive framework that successfully balances corporate productivity and profitability with robust accident prevention.

In building this corporate script, strategic integration must move beyond basic check-the-box compliance to facilitate active employee engagement and deeply internalized values. Emerging research highlights that while corporate executives control the overarching organizational structures, policies, and systems, frontline worker associates ultimately control the practical implementation on the shop floor. This dynamic makes safety culture a constantly negotiated, evolving social script. If workers perceive executive leadership behavior as hypocritical—such as prioritizing production speeds over physical well-being—they will inevitably disregard formal written policies and control the safety script via informal, unsupervised social norms.

To address these critical gaps, this study explores the multi-level ownership of safety culture transformation by analyzing the distinct roles across organizational hierarchies. Drawing on extensive literature and a longitudinal analysis of 100 industrial case studies spanning a 25-year period from 2001 to 2025, this study evaluates field-based guidelines for accelerating safety culture performance. By examining diverse industrial sectors including chemicals, automotive, petroleum, energy, sugar, and construction, this research aims to resolve the confusion surrounding safety script authorship. Ultimately, it provides a structured, multi-level framework linking strategic leadership vision to frontline behavioral reinforcement, providing organizations with the necessary insights to sustain a safe, transparent, and incident-free workplace.

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2. OBJECTIVES

The primary objective of this research is to investigate who writes, authorizes, and controls the operational script of corporate safety cultures across different hierarchical levels in an organization. By evaluating the unique roles of executive leadership, EHS professionals, middle management, and frontline workers, this study aims to resolve the widespread structural confusion in high-risk industries regarding who should initiate and contribute to safety transformation initiatives.

Furthermore, this study seeks to bridge a major gap in current safety literature by providing a structured, field-tested set of guidelines for an accelerated, longitudinal safety culture model. Ultimately, the study leverages a comprehensive 25-year analysis of 100 industrial case studies to demonstrate how organizations can systematically transition from passive regulatory compliance to proactive, behavior-based human excellence, thereby reducing serious incidents and sustaining long-term operational safety.

3. THEORETICAL & CONCEPTUAL FRAMEWORK

The theoretical foundation of a modern, long-term corporate safety culture is grounded in the Antecedents–Behaviours–Consequences (ABC) framework. Originating from behavioral psychology, this framework serves as a systematic approach to shaping human behavior within complex industrial environments:

- **Antecedents (A):** Represent the foundational stimuli—such as organizational policies, technical training, corporate communication, and leadership cues—that prompt specific actions.
- **Behaviours (B):** Constitute the observable, measurable actions performed by employees on the shop floor or site.
- **Consequences (C):** Act as the vital reinforcement mechanisms that influence, correct, and shape future behavior.

Academic and empirical safety research demonstrates that outcomes are shaped by a complex interplay of cultural norms, management practices, and daily behavioral patterns. By treating safety as a dynamic system, organizations can utilize specialized system dynamics models to balance ongoing operational pressures for short-term profitability with long-term accident prevention. A comprehensive safety culture script requires the precise alignment of three distinct operational dimensions: the psychological, the behavioral, and the situational.

Table 1. *Sustainable Safety Culture Script*

Culture Dimension	Focus Area / Description	Expected Impact
Psychological Dimension	Internalized values, mutual trust, and team safety beliefs.	Builds a proactive reporting culture where employees feel safe speaking up about hazards without fear of blame.
Behavioral Dimension	Day-to-day safe or unsafe acts executed during operations.	Reduces incident rates through consistent compliance, peer accountability, and active safety habits on the floor.
Situational Dimension	Structural policies, EHS systems, and physical sites.	Provides the necessary physical safeguards, clear protocols, and engineering controls to minimize systemic workplace risks.

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A deficiency in any single dimension destabilizes the entire framework, making total alignment essential for cultural sustainability. Contemporary theoretical advancements highlight a critical shift where the safety script must move beyond simple compliance toward active employee engagement and internalized values. When safety practices are imposed purely through top-down enforcement without meaningful employee involvement, organizations suffer from low engagement and significantly weaker safety performance. Thus, modern frameworks treat safety not as a rigid rulebook, but as an evolving, participative learning cycle.

This evolution establishes a clear division of labor between management control and frontline employee action within the safety culture script. While executive leadership maintains absolute control over structural design, resource allocation, and organizational systems, worker associates ultimately control practical implementation on the shop floor. Because workers determine how safety is executed when they are unsupervised, safety culture is understood as a co-constructed and constantly negotiated script. If leadership prioritizes production quotas over safety, workers quickly detect the hypocrisy and alter the script via informal, unsafe social norms.

To bridge this potential divide, the framework integrates a multi-level safety culture model that systematically connects strategy, behavior, and reinforcement across three distinct tiers:

- **Organizational Level:** Safety must be integrated directly into overarching business strategies, corporate social responsibility (CSR) initiatives, and technical policy designs, transitioning it into a core corporate capability.
- **Group or Supervisory Level:** Acts as the primary conduit for translating high-level policy into daily operational reality by directly controlling immediate consequences, feedback loops, and reinforcement patterns.
- **Individual Level:** Addresses personal attributes such as safety awareness, internal motivation, competence, and a psychological sense of personal ownership over workplace well-being.

At the core of this system sits the Accountability–Behavior Loop, which functions as an operational mechanism to sustain safe practices. The loop moves through a continuous, closed-loop sequence: Identify → Observe → Feedback → Correct → Learn → Reinforce. By systematically identifying unsafe acts, measuring work behaviors, discussing corrective coaching, and reinforcing positive performance, the loop ensures that behavioral errors are intercepted and corrected swiftly before they manifest as serious incidents.

Furthermore, modern frameworks emphasize that a robust safety culture serves as a vital strategic asset to manage human factors within highly complex systems. Emerging research directions integrate advanced digital tools—such as AI-driven predictive insights, real-time tracking, and automated risk mitigation—directly into the safety management system. These technological enablers allow companies to transition from reactive incident tracking to proactive hazard prevention, significantly enhancing operational efficiency and bolstering long-term business sustainability. True safety excellence is achieved only when an organization builds a "Just Culture" grounded in psychological safety, open communication, and an underlying foundation of human excellence.

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Table 2. *Synthesis of the Theoretical & Conceptual Framework*

Framework Dimension	Core Component	Operational Function	Long-Term Cultural Impact
The ABC Model	Antecedents (A)	Establishes policies, training programs, leadership communication, and initial organizational cues.	Triggers and sets the expectation for safe work practices.
	Behaviours (B)	Represents the observable and measurable actions executed by the workforce on the shop floor.	Defines the baseline of actual, day-to-day operational safety.
	Consequences (C)	Implements feedback, reinforcement patterns, and swift corrections by line management.	Shapes and sustains positive habits while eliminating unsafe norms.
Cultural Alignment	Psychological	Fosters internalized values, mutual trust, and psychological safety among employees.	Builds personal ownership and a collective "Culture of Care".
	Behavioral	Monitors routine activities, habits, and direct interaction with equipment.	Minimizes risk and prevents minor or routine workplace injuries.
	Situational	Structures the physical work environment, EHS systems, and legal/regulatory compliance.	Provides the mandatory institutional framework for accident prevention.
The Core Mechanism	Accountability-Behavior Loop	Executes a closed-loop sequence: Identify → Observe → Feedback → Correct → Learn → Reinforce.	Intercepts behavioral errors and structural barriers before incidents occur.
Modern Enablers	Just Culture & Tech	Promotes non-punitive incident reporting alongside AI-driven predictive risk tracking.	Drives continuous organizational learning and long-term business sustainability.

4. METHODOLOGY

The empirical validation of this accelerated corporate safety culture model necessitates a rigorous, long-term research design capable of capturing genuine behavioral shifts across diverse industrial environments. This study utilizes a longitudinal qualitative and field-based insight analysis spanning a 25-year period from 2001 to 2025. By deploying a multi-decade research timeline, the study effectively mitigates the limitations of short-term safety interventions, which often capture transient compliance rather than sustained cultural transformation. The longitudinal structure allows for the thorough evaluation of how initial antecedents transform into deeply ingrained organizational habits over extended operational lifecycles.

The data corpus for this research is drawn from 100 comprehensive industrial case studies compiled across multiple high-risk sectors. This broad sectorial representation ensures that the resulting framework is adaptable across varied regulatory and structural environments. The participating industries include chemicals, automotive, petroleum, energy, sugar, and construction. Each of these sectors presents distinct risk profiles, hazard densities, and workforce dynamics, providing a highly demanding testing ground for the Behavior-Based Safety (BBS) model.

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To capture a holistic view of how the safety script is written and controlled, a multi-level stakeholder sampling strategy was employed. Data collection directly involved key actors across the entire corporate hierarchy, ensuring that both top-down strategic intent and bottom-up operational realities were documented. Primary participants included Company Directors, Heads of Departments (HODs), EHS Managers, line supervisors, frontline worker associates, and third-party contractors. This inclusive approach prevents elite bias in data collection and accounts for the critical role that contractors and frontline personnel play in actual safety execution.

The research methodology relies on data triangulation to ensure internal validity and qualitative robustness. The data collection process combined exhaustive literature reviews, detailed historical case records, direct field insights from shop-floor observations, and expert recommendations. By synthesizing formal documentation with real-time field data, the methodology uncovers discrepancies between written safety procedures ("the documented script") and actual, day-to-day employee behavior ("the executed script").

A core component of the methodology involved the active execution of behavioral safety culture interventions within the participating industrial plants. These field interventions were designed around the Accountability-Behavior Loop, embedding structured observation and coaching routines into daily operations. Rather than acting as passive external observers, the researchers tracked how the introduction of these participative learning cycles altered the baseline percentages of "awakened" versus "silent" workers over months and years of continuous application.

The systematic analysis of the 100 case studies focused heavily on evaluating the efficacy of supervisory consequences and leadership micro-behaviors. Field notes and observation metrics were categorized based on how supervisors responded to unsafe acts, how frequently open safety conversations occurred, and how efficiently physical or systemic barriers were corrected. This targeted tracking allowed the study to isolate the exact managerial behaviors that successfully transition an organization from a punitive, blame-heavy environment to a psychologically safe "Just Culture".

Socio-economic and geographic contexts were also integrated into the methodological analysis to account for macro-level forces affecting safety cultures. The case studies primarily examine organizations operating within developing contexts, where companies face substantial occupational hazards and frequently struggle with weakly enforced national safety regulations or poor data management systems. The methodology deliberately contrasts how multinational corporations leveraging international standards navigate these regional constraints compared to smaller domestic enterprises.

To extract actionable insights from the massive volume of longitudinal data, the study employed thematic analysis to identify recurring patterns across the 25-year timeline. Case files were systematically coded to track changes in safety performance indicators, shifting leadership attitudes, and employee engagement metrics. This rigorous qualitative synthesis ultimately yielded three overarching themes—design frameworks, schematic models, and key stakeholder roles—which form the basis of the subsequent research discussion.

The methodology also accounts for the integration of modern technological enablers as an emerging variable in the latter years of the study. In the case studies spanning the 2021–2025 window, data collection expanded to track how the introduction of Industry 4.0 tools, AI-driven predictive insights, and automated safety tracking modified traditional BBS loops. This allowed the researchers to validate a modernized version of the framework that balances human behavioral coaching with digital risk mitigation.

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Table 3. *Methodological Framework Synthesis*

Methodological Parameter	Target/Scope	Data Sources & Mechanisms	Analytical Objective
Temporal Scope	25-Year Longitudinal Window (2001–2025)	Historical case records, field logs, and multi-decade tracking files.	To evaluate the long-term sustainability of BBS models and track cultural shifts.
Sample Size	100 Comprehensive Case Studies	Plant-level operational data, safety audits, and intervention reports.	To build a highly generalizable and field-validated corporate safety framework.
Industrial Sectors	Chemicals, Automotive, Petroleum, Energy, Sugar, and Construction	Cross-sector safety metrics, risk registers, and regulatory compliance logs.	To test the adaptability of the safety culture script across varied hazard profiles.
Stakeholder Hierarchy	Directors, HODs, EHS Managers, Supervisors, Frontline Workers, and Contractors	Qualitative interviews, field surveys, direct shop-floor observations, and expert feedback.	To map out the distinct roles responsible for writing vs. controlling the safety culture.
Intervention Focus	The Accountability-Behavior Loop	Real-time coaching sessions, worker-led safety audits, and barrier-resolution tracking.	To measure the acceleration of safe behaviors and the reduction of workplace incidents.

5. FINDINGS & THEMATIC ANALYSIS

5.1 Theme 1: The Multi-Level Authorship of the Safety Script (Design vs. Control)

The longitudinal analysis reveals a critical operational distinction between stakeholders who design the formal safety script and those who control its daily execution. Rather than a singular top-down mandate, safety culture operates as a negotiated social script. A profound disconnect often exists between the formal "documented script" housed in corporate safety management systems and the real-world "executed script" performed by the workforce when unsupervised. Resolving this structural tension requires clear delineation of roles across the hierarchy.

- **The "Writers":** Responsible for strategic formation, technical design, and systemic alignment. Board Directors and Executive Leadership establish macro strategy and authorize resource allocation. EHS Professionals translate this strategic intent into technical workflows and SOPs, while external regulators provide the foundational legal parameters.
- **The "Controllers":** Govern practical implementation and real-time maintenance. Middle management and line supervisors translate policies into shift-by-shift practices, while safety committees track barrier resolutions. Frontline worker associates and third-party contractors retain absolute control over final execution; if they perceive that leadership prioritizes production speed over physical well-being, they will reject the formal script in favor of unsafe, informal social norms.

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Table 4. *Stakeholder Alignment & Operational Roles*

Hierarchy	Specific Stakeholder	Operational Role in the Script	Critical Actions for Alignment & Transformation
Script Writers	Board Directors & Executive Leadership	Establishes macro strategic direction, authorizes resource budgets, and defines safety as a core value.	Leads by visible example (e.g., wearing PPE), reviews leading safety data, and aligns safety with long-term business sustainability.
	EHS Directors & Professionals	Designs technical frameworks, drafts policies, outlines procedures, and builds training programs.	Acts as an expert coach to executive leadership, facilitates field audits, and guides proactive hazard mitigation.
	External Regulators	Establishes the foundational legal script, compliance mandates, and statutory frameworks.	Drives baseline industry standards and enforces structural risk reduction across geographic regions.
Script Controllers	Line Managers & Supervisors	Acts as the primary operational driver, translating high-level policy into daily shift execution.	Engages directly in shop-floor safety walkthroughs, models safe behaviors, and enforces protocols consistently.
	Frontline Workers & Associates	Serves as the ultimate practitioner of the culture, executing the script during daily unsupervised operations.	Takes personal ownership of safety, identifies near misses, and actively participates in worker-led safety audits.
	Contractors & Subcontractors	Adheres to and integrates into the host company's active safety management systems.	Maintains alignment with site protocols to eliminate localized blind spots and prevent site incidents.
	Safety Committees & Champions	Maintains script relevance and momentum through continuous localized monitoring and reviews.	Facilitates peer-to-peer safety conversations, tracks barrier resolution, and drives participative learning cycles.
	Human Resources (HR)	Embeds safety expectations directly into the structural lifecycle of personnel.	Integrates safety competence into onboarding, professional development, and performance management reviews.

5.2 Theme 2: The Accountability-Behavior Loop (The Core Model)

At the operational core of the advanced Behavior-Based Safety (BBS) framework sits the Accountability-Behavior Loop, a dynamic mechanism designed to operationalize safety and sustain safe workplace practices. The longitudinal studies demonstrate that safety cultures remain fragile if they rely solely on static rules or periodic training sessions. Instead, a robust safety culture requires a closed-loop system that actively monitors, intercepts, and corrects behavioral errors and systemic barriers in real time. Grounded in the theoretical framework of operant conditioning, this loop shifts the focus of safety management from lagging indicators and retroactive discipline to proactive, frontline engagement and continuous feedback.

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Table 5. *Stages of the Accountability-Behavior Loop*

Stage	Core Operational Focus	Frontline Execution & Dynamics	Cultural & Behavioral Impact
1. Identify	Pinpointing specific unsafe acts, systemic barriers, and critical risk exposures.	Utilizing historical case data, risk assessments, and past near-miss trends to define what behaviors require targeted observation.	Sharpens organizational awareness and establishes clear, measurable baselines for workplace risk mitigation.
2. Observe	Measuring and documenting actual, day-to-day employee actions during routine operations.	Peers, supervisors, or internal safety champions conduct structured, non-obtrusive walkthroughs to capture real-time behavior when unsupervised.	Transitions the company from relying on lagging accident data to tracking real-time behavioral indicators.
3. Feedback	Conducting open, peer-to-peer and supervisory safety conversations regarding observed actions.	Delivering immediate, objective feedback that highlights safe practices first, followed by a collaborative discussion on observed risks.	Activates the "silent workforce," builds psychological safety, and encourages workers to speak up about systemic challenges.
4. Correct	Formulating and executing speedy corrections for identified behaviors and physical work barriers.	Intercepting risky habits immediately on the shop floor while line management simultaneously repairs broken tools or faulty processes.	Demonstrates leadership commitment to safety over production, building deep organizational trust and credibility.
5. Learn	Transforming individual corrections into collective, organizational knowledge assets.	Discussing the insights gained from behavioral trends during shift huddles, toolbox talks, and participative learning cycles.	Prevents the repetition of operational errors and fosters a continuous, adaptive learning orientation across teams.
6. Reinforce	Applying systematic reinforcement to lock in safe practices and ensure long-term habit formation.	Utilizing positive reinforcement, praise, and social rewards for safe acts, completely replacing traditional punitive coercion.	Sustains behavioral change over time, shifting safe actions from forced compliance to deeply internalized cultural norms.

5.3 Theme 3: Enablers, Moderators, and KPIs of Modern Safety Culture

The third major theme extracted from the longitudinal data highlights a modern transition in safety management, explicitly documented in the latter years of the study stretching into 2026. Historically, organizations evaluated safety performance solely through lagging indicators, such as Total Recordable Incident Rates (TRIR) and lost-time injuries. However, the case studies demonstrate that relying on lagging metrics creates a false sense of security, often masking systemic vulnerabilities until a catastrophic event occurs. Modern safety culture models shift the focus toward proactive leading indicators and participation metrics that assess the actual health of an organization's safety ecosystem. This shift requires specific structural "enablers" and "moderators"—such as psychological safety, a Just Culture framework, and advanced technological integrations—to remove the traditional barriers of fear, blame, and reporting suppression that routinely paralyze frontline engagement.

A critical finding within this modern paradigm is that trust and credibility, rather than rigid policy statements, serve as the primary predictors of sustainable safety performance. For an organization to successfully tap into its "silent workforce," it must actively cultivate psychological safety, which is relationally constructed through daily, micro-level interactions between leaders and employees. In a psychologically safe environment, workers feel secure to report near misses, identify procedural errors, and halt unsafe operations without fear of retaliation or punitive reprimand. Furthermore, modern safety

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culture designs in 2026 heavily incorporate advanced technology, deploying artificial intelligence (AI) and predictive analytics directly into safety management systems. These technological enablers move organizations away from passive tracking and toward real-time risk mitigation and automated hazard identification, ensuring that human behavioral coaching is optimized by predictive operational insights.

Table 6. *Enablers, Moderators, and KPIs of Modern Safety Culture*

Framework Category	Core Element	Operational Function & 2026 Metrics	Impact on Cultural Transformation
Cultural Enablers	Psychological Safety	Facilitates daily, supportive leader-employee interactions that eliminate fear.	Promotes open, transparent communication and drives high-frequency frontline hazard reporting.
	Just Culture Framework	Establishes a clear, non-punitive distinction between honest human error and deliberate negligence.	Replaces a toxic culture of blame with an environment focused on systemic learning and rapid process correction.
Operational Moderators	Bridging Document-Practice Gap	Aligns written procedures directly with actual physical field constraints and tooling capabilities.	Eliminates operational workarounds and restores the real-world credibility of formal safety systems.
	Technological Integration	Deploys AI-driven predictive insights, real-time tracking, and automated risk monitoring.	Complements human coaching loops with data-driven, proactive hazard interception.
Modern KPIs	Leading Indicators	Tracks near-miss reporting speed, safety audit completion rates, and hazard resolution velocities.	Evaluates active risk prevention efforts before incidents can physically manifest.
	Participation Metrics	Measures the frequency of peer-to-peer safety conversations and worker-led audit engagement.	Quantifies the ongoing transition of the workforce from passive compliance to active safety ownership.

6. DISCUSSION

The transition of a corporate safety program from a rigid framework of rules into an integrated organizational culture reveals several complex institutional challenges. The 25-year longitudinal data demonstrates that simply writing strict policies or purchasing standardized observation packages does not automatically guarantee safety excellence. Instead, safety culture is heavily influenced by systemic barriers, structural positioning, and macro-economic factors. To achieve a sustainable workplace free of incidents, leadership teams must confront the underlying organizational realities that govern how safety scripts are perceived, negotiated, and executed by the workforce.

A primary barrier to cultural maturity is the "silent workforce" phenomenon. Field insights reveal that in the initial stages of a safety intervention, approximately 50% to 60% of the workforce remains unawakened or silent, choosing not to speak up about observed hazards or systemic errors. This passivity is often a defensive reaction to historic patterns of negative reinforcement, where safety violations were met with punitive measures or workplace blame. Moving a company toward an interdependent safety culture requires shifting from punitive control to positive reinforcement. As psychological safety and trust improve through supportive supervisory interactions, employee participation metrics rise, systematically reducing the percentage of silent workers month by month.

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Furthermore, the structural positioning of the Environment, Health, and Safety (EHS) team within the corporate hierarchy dictates its operational efficacy. When EHS teams are placed low within the organizational structure, they are frequently marginalized by operations managers who prioritize production speed over risk mitigation. The case studies indicate that safety culture interventions are significantly more vibrant and impactful when the EHS team reports directly to the Chief Executive Officer (CEO) or top executive leadership. This structural alignment provides the safety team with the necessary authority to influence corporate resource allocation, budget decisions, and strategic business integration, establishing safety as an uncompromised corporate value rather than a secondary administrative task.

The scale of an organization also introduces distinct structural dynamics, contrasting sharply between small and medium-sized enterprises (SMEs) and global multinationals. Small domestic organizations frequently view safety culture initiatives as a confusing and costly administrative burden, often ignoring underlying behavioral risks due to limited capital and lack of dedicated expertise. Conversely, global corporations are compelled to meet rigorous international standards and client requirements, making them more likely to invest in comprehensive safety culture interventions. However, a critical pitfall emerges when even large corporations implement safety scripts solely to satisfy clients or pass external audits. Such compliance-driven scripts become short-lived and superficial, leading companies to conduct isolated safety training modules rather than deeply embedded culture interventions. Long-term sustainability requires that senior leaders internalize safety as a foundational component of business excellence, independent of external customer pressures.

Macro-level forces and geographic contexts also heavily shape the development of corporate safety cultures. Frontline personnel in developing nations bear a disproportionate burden, facing over 80% of the world's occupational hazards. While the core concepts of hazard and risk are universal, the effectiveness of mitigation strategies varies widely due to stark legislative, regulatory, and economic disparities. Developed countries benefit from rigorous, strictly enforced regulatory frameworks that prioritize risk reduction and human life. In contrast, many organizations in developing contexts operate under weak national safety enforcement and poor data management systems, where inconsistent record-keeping makes it difficult to track near misses or identify risk patterns. Additionally, powerful corporate and political actors often shape local regulations to prioritize private economic interests over worker well-being, complicating efforts to build transparent, accident-free workplaces.

To bridge these organizational and geographic divides, contemporary corporate leadership must cultivate cognitive readiness for transformation and actively promote human excellence. Human excellence serves as the underlying foundation of cultural maturity, presupposing that true safety performance cannot be achieved through violence, abuse, or intimidation at the workplace. When leaders treat workers with dignity, respect, and visible care, they foster organizational citizenship behaviors where employees willingly take personal ownership of their safety and the well-to-do status of their colleagues. Resolving conflicting management paradigms—such as the artificial trade-off between production quotas and human safety—requires senior executives to lead by visible example, spend meaningful time on the shop floor, and structurally integrate core organizational values with behavior-based safety excellence.

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Table 7. *Synthesis of Organizational Barriers & Dialectics*

Organizational Variable	Traditional Approach	Robust Modern Practice (2026)	Cultural & Operational Consequence
Workforce Engagement	The Silent Workforce: 50–60% of personnel remain silent due to fear of blame or punitive reprimands.	The Awakened Workforce: High-frequency hazard reporting driven by psychological safety and a Just Culture.	Transitions safety execution from forced, unsupervised compliance to shared, proactive ownership.
EHS Hierarchy	Marginalized Positioning: EHS teams are placed low in the structure, reporting to local operations.	Strategic Positioning: EHS directors report directly to the CEO, maintaining veto authority.	Ensures safety priorities are not bypassed by short-term production pressures or resource constraints.
Organizational Scale	Superficial Compliance: SMEs ignore safety due to costs; multinationals run scripts solely for clients.	Strategic Asset: Safety is integrated into core corporate capability, CSR, and business continuity.	Prevents short-lived safety programs, ensuring deep, lasting behavioral change across the enterprise.
Regional Context	Weak Enforcement & Poor Data: Fragmented record-keeping and weak oversight mask true risk patterns.	Rigorous Standards Integration: Companies adopt international risk mitigation frameworks independent of local weak laws.	Overcomes regional geographic disparities, protecting vulnerable frontline labor from occupational hazards.
Reinforcement Paradigm	Negative/Punitive Coercion: Utilizing safety violations, violence, or abuse to force compliance.	Positive Culture & Care: Utilizing positive reinforcement, praise, dignity, and respect to reward safe acts.	Drives human excellence and organizational citizenship behaviors, anchoring safety as a core value.

7. CONCLUSIONS AND IMPLICATIONS

The synthesis of this 25-year longitudinal research demonstrates that transforming a corporate safety culture requires absolute coherence between leadership intent, structural system design, and daily behavioral reinforcement mechanisms. Organizations that concentrate solely on writing rigid policies or conducting isolated observation drills, without deeply evaluating how behaviors are reinforced through immediate supervisory consequences, are unlikely to achieve lasting, sustainable change. Corporate safety culture is not a static document or a superficial training module; rather, it is a dynamic, co-constructed social script that is constantly negotiated between management systems and frontline actions. True safety excellence is achieved only when an enterprise successfully transitions away from punitive compliance toward active employee engagement and internalized organizational values, establishing an environment where "Zero Accidents" becomes an achievable operational standard rather than a distant corporate slogan.

The practical implications of this expanded Behavior-Based Safety (BBS) framework extend directly to executive boards, safety professionals, and operational leaders:

- Senior executives and company directors must recognize that safety culture is driven primarily by visible leadership micro-behaviors—such as spending time on the shop floor, demonstrating curiosity, and modeling safe habits—rather than passive policy statements or signatures.
- Organizations must structurally reposition their EHS teams higher within the corporate hierarchy, ideally reporting directly to the CEO, to ensure that safety parameters are never compromised by short-term production pressures.

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- Management must actively foster a "Just Culture" grounded in psychological safety, replacing a traditional culture of blame with an environment focused on systemic learning and rapid barrier correction.
- By deploying modern leading indicators alongside advanced digital tools like AI-driven predictive tracking, companies can accurately measure workforce participation and safeguard long-term business sustainability.

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MAIN AUTHOR

Dr. Harbans LAL earned a Master's degree in Psychology from Guru Nanak Dev University and a Ph.D. from Tata Institute of Social Sciences, Mumbai, India. He has been at SNDT Women's University and the Central Labor Institute, Mumbai, for over 28 years. He represented India at Conferences in New York, Berlin, Muscat, Rome, New Zealand, Japan, London, Dubai, Cairo, and Sydney. He is the Editor of the Journal of Psychosocial Research, and serves as Director of the Forum of Behavioral Safety. He has conducted over 1000 behavioral safety programs for the industry.

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Afghan Women: A Life Without Rights – The Struggle for Freedom, Education, and Equality Under Taliban Rule

Elias M. Choueiri[1*]

[1] WSO Board Member and Liaison Officer to the United Nations;
Professor at several Lebanese universities

KEYWORDS

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ABSTRACT

The return of Taliban rule in Afghanistan in 2021 has fundamentally reshaped the status of women and girls, turning longstanding human rights concerns into a multidimensional human security crisis. This study examines the impact of restrictions on education, employment, healthcare, mobility, and public participation on Afghan women's safety, well-being, and socioeconomic resilience. Using an interdisciplinary qualitative approach grounded in the human security framework, it synthesizes evidence from international reports, academic literature, and institutional analyses to assess the legal, social, economic, educational, and health consequences of current governance policies.

Findings show that the erosion of women's rights produces interconnected vulnerabilities that reinforce one another across multiple domains. Educational exclusion reduces future human capital and employment prospects, economic marginalization deepens poverty and dependency, and limited access to healthcare undermines physical and mental well-being. At the same time, weakened legal protections increase exposure to gender-based violence, early marriage, and social isolation, collectively constraining household resilience and national development capacity. While international organizations, human rights mechanisms, and Afghan women themselves have developed adaptive responses through informal education, entrepreneurship, and advocacy, these efforts remain insufficient without institutional reform. The study concludes that sustainable recovery and stability depend on restoring women's access to education, work, healthcare, justice, and public life, positioning gender equality as both a human rights imperative and a prerequisite for long-term peace and development.

1. INTRODUCTION

Women's rights are universally recognized as an essential component of human rights and a prerequisite for inclusive social, economic, and political development. Societies that promote equal access to education, healthcare, employment, and civic participation generally demonstrate higher levels of human development, institutional resilience, and social stability.

* *Corresponding Author*: elias.choueiri@gmail.com

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Conversely, systematic discrimination against women weakens economic productivity, undermines governance, and generates long-term security challenges that extend well beyond the individuals directly affected. Consequently, the condition of women has become an important indicator of both democratic governance and sustainable development.

Afghanistan provides one of the most significant contemporary examples of the close relationship between governance, gender equality, and human security. For more than four decades, the country has experienced successive periods of armed conflict, political transition, foreign intervention, and institutional restructuring. These transformations have profoundly influenced the rights and social position of women, producing alternating periods of progress and regression. Changes in political authority have repeatedly reshaped access to education, employment, healthcare, and public participation, illustrating the extent to which women's rights have remained vulnerable to shifts in governance.

The return of the Taliban to power in August 2021 marked another major turning point in this historical trajectory. Since then, a broad range of administrative directives and policy measures have substantially reduced women's participation in public life. Restrictions affecting secondary and higher education, formal employment, mobility, civic engagement, and access to public institutions have altered the social and economic landscape of Afghanistan while generating widespread international concern. These developments have implications that extend beyond legal rights, directly influencing physical safety, economic security, psychological well-being, and social inclusion.

The consequences of these policies should therefore be understood within a broader human security framework rather than solely through a legal or political lens. Human security emphasizes the protection of individuals from chronic threats that compromise their survival, dignity, and quality of life. In Afghanistan, the interaction between educational exclusion, labor market restrictions, limited healthcare access, economic deprivation, and social isolation creates mutually reinforcing forms of vulnerability that affect women throughout the life course. These interconnected challenges also weaken household resilience, reduce national human capital, and constrain long-term development.

Although numerous reports have documented individual aspects of the current situation, relatively few studies examine the cumulative relationship between institutional restrictions, human security, and sustainable development. This study addresses that gap by providing an integrated analysis of how contemporary governance structures influence the safety, well-being, and opportunities of Afghan women and girls. By adopting a multidisciplinary perspective that combines human rights, gender studies, public policy, and human security, the study seeks to contribute to a more comprehensive understanding of one of the most pressing humanitarian and developmental challenges facing Afghanistan today.

2. RESEARCH OBJECTIVES

The primary objective of this study is to examine the implications of the current political and institutional environment in Afghanistan for the rights, safety, and human security of women and girls. It seeks to evaluate how restrictions affecting education, employment, mobility, healthcare, and public participation influence individual well-being while simultaneously shaping broader patterns of social and economic development.

More specifically, the study analyzes the mechanisms through which legal and administrative restrictions increase vulnerability to gender-based violence, early and forced marriage, economic dependency, social exclusion, and limited access to essential services. It also investigates the interrelationships between these forms of vulnerability, emphasizing that they should not be viewed as isolated phenomena but as interconnected outcomes of structural exclusion.

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A further objective is to assess the broader implications of these developments for household resilience, community stability, human capital formation, and national development. In addition, the study evaluates the contributions and limitations of international organizations, humanitarian agencies, and civil society actors in responding to the challenges faced by Afghan women under the current political context.

Finally, the study aims to demonstrate that the deterioration of women's rights represents not only a human rights concern but also a comprehensive human security issue with profound social, economic, and developmental consequences. By integrating historical context, institutional analysis, and contemporary evidence, the study provides a multidisciplinary framework for understanding the evolving position of women in Afghanistan and the critical importance of gender equality for sustainable peace, inclusive governance, and long-term national recovery.

3. THE HISTORICAL EVOLUTION OF WOMEN'S RIGHTS IN AFGHANISTAN

The history of women's rights in Afghanistan is characterized by alternating periods of reform and regression, reflecting the country's prolonged political instability and changing systems of governance. Rather than following a gradual or linear process of social development, the position of Afghan women has been repeatedly reshaped by shifts in political authority, armed conflict, ideological transformation, and institutional restructuring. Consequently, women's access to education, employment, healthcare, and public life has often depended less on enduring legal guarantees than on the priorities of successive governments. Understanding this historical evolution is essential for interpreting the current situation, as contemporary restrictions cannot be separated from the broader political and institutional context in which they emerged.

Efforts to modernize Afghan society during the early twentieth century introduced the first significant reforms affecting women's status. Several governments sought to expand educational opportunities for girls, encourage women's participation in selected professions, and gradually increase their visibility within public institutions. These initiatives reflected broader state-building efforts intended to modernize administrative structures and promote national development. Nevertheless, the implementation of these reforms remained geographically uneven. Urban centers such as Kabul benefited from improved educational and professional opportunities, whereas many rural communities continued to preserve traditional social structures that placed severe limitations on female autonomy. As a result, modernization produced localized progress without fundamentally transforming gender relations throughout the country.

Political upheaval during the second half of the twentieth century profoundly altered this trajectory. The Soviet intervention, followed by years of armed conflict and internal fragmentation, transformed Afghanistan into an environment where security concerns increasingly overshadowed social reform. Although the communist government formally supported women's education and labor-force participation, these policies were implemented amid widespread violence and political instability. Consequently, improvements in women's legal status often failed to translate into consistent protection or equal opportunities, particularly outside government-controlled urban areas. The persistence of conflict weakened institutional capacity and reduced the state's ability to safeguard the rights it formally recognized.

The collapse of centralized authority during the civil war further accelerated the deterioration of women's social position. As governmental institutions weakened, authority became increasingly fragmented among regional actors whose approaches to gender governance varied considerably. In many areas, women experienced growing restrictions on mobility, education, and employment as local power structures replaced national legal institutions. This period illustrates the close relationship between

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institutional fragility and gender inequality, demonstrating that the erosion of state capacity frequently results in the weakening of legal protections and the expansion of informal systems of social control.

The establishment of Taliban rule in 1996 represented a decisive transformation in Afghanistan's gender regime. Women were systematically excluded from most areas of public life through policies that prohibited secondary and higher education, restricted employment opportunities, and imposed extensive limitations on freedom of movement. These measures extended beyond individual rights to reshape the country's institutional landscape by removing women from educational institutions, professional sectors, and decision-making processes. Consequently, female participation in public life declined dramatically, while economic dependency and social isolation became increasingly widespread.

Following the political transition of 2001, Afghanistan entered a period marked by extensive international engagement and institutional reconstruction. Significant investments were directed toward expanding girls' education, strengthening healthcare services, promoting women's political participation, and supporting civil society organizations. Female enrollment in schools and universities increased substantially, women entered a growing number of professions, and legal reforms sought to strengthen constitutional guarantees of equality. This period represented the most significant expansion of women's opportunities in contemporary Afghan history, supported by cooperation between national institutions and international development partners.

Despite these achievements, progress remained uneven and often fragile. Continuing armed conflict, corruption, weak governance, and persistent regional disparities limited the effective implementation of many reforms. Women living in rural and conflict-affected provinces continued to encounter substantial barriers to education, healthcare, and formal employment, while gender-based violence remained a widespread concern despite legal protections. These structural weaknesses revealed that improvements in legislation alone were insufficient to produce durable social transformation in the absence of strong institutions capable of enforcing rights consistently across the country.

The return of the Taliban to power in August 2021 marked another fundamental turning point in the historical development of women's rights. A series of administrative directives and regulatory measures substantially reduced women's participation in education, employment, public administration, and civic life. These policies rapidly reversed many of the institutional gains achieved during the previous two decades, producing significant consequences for economic participation, household welfare, and social development. Unlike earlier periods of instability, however, the current restrictions have been implemented within a more centralized administrative framework, resulting in a broader and more systematic restructuring of women's public roles.

The historical evolution of women's rights in Afghanistan therefore demonstrates that gender equality has remained closely linked to political stability, institutional capacity, and governmental priorities. Each major political transition has redefined women's legal status and opportunities, illustrating the absence of durable institutional mechanisms capable of protecting fundamental rights regardless of changes in political leadership. This historical pattern also explains why advances in women's empowerment have repeatedly proven vulnerable to reversal during periods of political transformation.

Viewed over the long term, Afghanistan's experience illustrates that sustainable progress in women's rights requires more than temporary political reform or external assistance. Durable improvements depend upon stable institutions, effective legal protections, inclusive governance, and sustained investment in education and human development. Without these foundations, advances achieved during one political period remain susceptible to reversal during the next. The historical record therefore provides important lessons for future policy by demonstrating that lasting gender equality cannot be separated from broader processes of institutional resilience, democratic governance, and long-term social development.

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Table 1. *Evolution of Women's Rights Across Major Political Periods in Afghanistan*

Historical Period	Institutional Context	Women's Rights	Long-Term Consequences
Early modernization (pre-1979)	State-led modernization	Gradual expansion of education and limited employment	Uneven urban-centered progress
Soviet and conflict period (1979–1992)	Centralized reforms amid conflict	Formal legal expansion with limited implementation	Institutional instability and inconsistent protection
Civil war (1992–1996)	Fragmented governance	Declining legal protections and increasing restrictions	Growing regional disparities
Taliban rule (1996–2001)	Centralized religious governance	Extensive exclusion from public life	Economic dependency and social isolation
Reconstruction period (2001–2021)	Internationally supported institutional rebuilding	Significant expansion of education, employment, and political participation	Improved opportunities but persistent structural inequalities
Taliban administration (2021–present)	Centralized restrictive governance	Systematic contraction of public participation	Human security crisis and reduced national development potential

4. LEGAL AND INSTITUTIONAL RESTRICTIONS ON WOMEN IN AFGHANISTAN

The status of women in Afghanistan is currently shaped by a regulatory environment that extends beyond individual policy decisions to encompass a broader institutional framework governing social participation. Since the political transition of 2021, a series of administrative directives, regulatory measures, and institutional practices have substantially redefined the relationship between women and the state. Collectively, these measures influence access to education, employment, healthcare, mobility, and civic life, thereby altering the opportunities available to women across nearly every sphere of society. Rather than functioning as isolated restrictions, these policies interact to produce a comprehensive system that regulates female participation in public life.

Education represents one of the most consequential areas of institutional restriction. The suspension of access to secondary schools and universities for many girls has interrupted educational pathways that previously enabled academic advancement, professional development, and socioeconomic mobility. Beyond the immediate loss of learning opportunities, these measures reduce the future availability of qualified female professionals, including teachers, healthcare workers, and administrators. Consequently, educational exclusion affects not only individual aspirations but also the country's long-term capacity to develop human capital and sustain essential public services.

Employment has undergone a similarly profound transformation. Restrictions affecting women's participation in public administration, humanitarian organizations, and numerous private-sector occupations have significantly reduced their role in the formal economy. The consequences extend well beyond labor-market participation. For many households, female employment represented an important source of income that contributed to education, healthcare, nutrition, and overall family welfare. The contraction of these opportunities has therefore increased household economic vulnerability while simultaneously reducing national productivity and limiting the utilization of skilled human resources.

Institutional regulation of mobility constitutes another defining feature of the current governance framework. Administrative requirements governing travel, access to public spaces, and interaction with public institutions substantially influence women's ability to pursue education, obtain healthcare, maintain employment, or participate in community activities. These measures have implications that extend beyond physical movement. Restrictions on mobility also reduce access to information, weaken professional and social networks, and limit opportunities for civic engagement, thereby reinforcing social isolation and dependence on immediate family structures.

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The reduction of women's participation in political and civic institutions has further narrowed opportunities for representation and public influence. Female participation in governmental bodies, local governance, civil society organizations, and professional associations has declined considerably, reducing women's capacity to contribute to public decision-making processes. This exclusion weakens institutional diversity and limits the incorporation of gender perspectives into policy development, thereby diminishing the responsiveness of governance structures to the needs of half the population.

An important characteristic of the current institutional environment is the significant degree of regulatory ambiguity surrounding the implementation of many restrictions. Although broad policy objectives are evident, practical enforcement frequently varies across provinces and local administrative authorities. Such variability generates uncertainty for women and their families, making it difficult to anticipate which activities may be permitted or prohibited in specific contexts. This uncertainty often encourages self-imposed limitations on mobility and participation, extending the influence of regulatory measures beyond formal enforcement.

The cumulative effect of these legal and administrative measures extends beyond the denial of specific rights to reshape broader patterns of social organization. Reduced educational attainment limits future employment opportunities; diminished economic participation increases financial dependency; restricted mobility weakens access to healthcare and public services; and reduced civic participation narrows opportunities for representation. Together, these interconnected processes reinforce one another, creating a cycle in which disadvantages accumulate over time rather than occurring independently.

Despite these institutional constraints, Afghan communities have demonstrated varying degrees of adaptation. Informal educational initiatives, home-based economic activities, local support networks, and community-based assistance have emerged in response to changing circumstances. Although these mechanisms provide limited opportunities for continuity and resilience, they remain highly vulnerable to regulatory changes, resource limitations, and security concerns. Consequently, they should be viewed as temporary coping strategies rather than sustainable substitutes for formal institutions.

From a governance perspective, the current legal framework illustrates how administrative regulation can reshape social structures without relying exclusively on formal legislative change. The interaction between institutional directives, local implementation practices, and social norms has produced a regulatory environment that influences nearly every dimension of women's daily lives. This demonstrates that human security is determined not only by constitutional guarantees or legal provisions but also by the practical functioning of institutions that govern access to education, employment, healthcare, and public participation.

Ultimately, the legal and institutional restrictions currently affecting Afghan women represent more than limitations on individual freedoms. They constitute a broader restructuring of social, economic, and political relationships that influences household resilience, national development, and institutional capacity. Addressing these challenges therefore requires more than isolated policy adjustments. Sustainable progress depends upon strengthening legal certainty, expanding institutional accountability, restoring equal access to public institutions, and ensuring that governance frameworks promote inclusion rather than exclusion.

Table 2. *Principal Institutional Restrictions Affecting Women in Afghanistan*

Institutional Domain	Regulatory Measure	Immediate Consequences	Broader Developmental Impact
Education	Restrictions on secondary and higher education	Interrupted academic progression	Reduced human capital formation
Employment	Exclusion from major sectors of the labor market	Income loss and declining financial independence	Lower productivity and increased household vulnerability

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Mobility	Administrative limitations on travel and public access	Restricted access to services and opportunities	Social isolation and reduced civic participation
Political Participation	Reduced representation in governance and civil society	Limited influence on public policy	Weakened institutional inclusiveness
Legal Protection	Uneven implementation and regulatory ambiguity	Limited access to justice and legal certainty	Increased institutional vulnerability and inequality

5. SAFETY RISKS FACED BY WOMEN AND GIRLS IN AFGHANISTAN

Personal safety constitutes one of the fundamental dimensions of human security, encompassing protection from violence, coercion, exploitation, and conditions that threaten physical or psychological well-being. In Afghanistan, the security of women and girls is shaped by the interaction of social norms, economic hardship, institutional constraints, and limited access to protective services. Rather than arising from isolated incidents, the risks experienced by women reflect a broader environment in which multiple vulnerabilities reinforce one another. Understanding these risks therefore requires moving beyond individual cases to examine the structural conditions that increase exposure to harm while simultaneously reducing opportunities for protection and recovery.

Among the most persistent threats is gender-based violence, which remains a significant challenge despite longstanding international efforts to strengthen legal protections and support services. Violence may occur within households, communities, workplaces, or other social environments, affecting women across different age groups and socioeconomic backgrounds. Although reliable national data remain difficult to obtain because of underreporting and limited monitoring, available evidence consistently indicates that many incidents remain undocumented. Fear of retaliation, social stigma, family pressure, and uncertainty regarding legal remedies frequently discourage survivors from seeking formal assistance, contributing to a cycle in which violence remains both hidden and insufficiently addressed.

Domestic violence represents one of the most prevalent manifestations of gender insecurity. Economic dependency, unequal household power relations, financial stress, and restricted opportunities for independent living often combine to reduce women's ability to leave abusive situations. In many circumstances, limited access to employment, legal representation, or alternative housing further constrains available options. Consequently, domestic abuse should not be viewed solely as an individual or family matter but as an outcome influenced by broader social and institutional conditions that affect women's autonomy and capacity to exercise personal choice.

Early and forced marriage continues to present serious risks for adolescent girls, particularly in contexts characterized by poverty, displacement, and economic uncertainty. Families facing financial hardship may regard marriage as a strategy for reducing economic pressure or providing perceived social protection. However, early marriage frequently interrupts education, limits future employment opportunities, increases health risks associated with early pregnancy, and restricts long-term social and economic participation. These consequences often extend throughout adulthood, reinforcing cycles of disadvantage that affect both women and their children.

Social isolation constitutes another important dimension of insecurity. Reduced opportunities to participate in education, employment, and community life limit women's interaction with institutions and support networks that might otherwise provide information, assistance, or protection. Isolation also weakens access to peer relationships, professional contacts, and civil society organizations capable of offering practical or psychological support. Over time, reduced social connectivity diminishes resilience by narrowing the range of resources available during periods of crisis or personal hardship.

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Psychological well-being has emerged as an increasingly important aspect of women's safety. Prolonged uncertainty regarding education, employment, family welfare, and future opportunities contributes to elevated levels of stress, anxiety, and emotional distress. The cumulative impact of restricted opportunities, economic insecurity, and social isolation may adversely affect mental health, particularly among adolescents and young adults whose educational and professional aspirations have been interrupted. Despite growing recognition of these concerns, access to psychological support services remains limited in many parts of the country, particularly in rural areas where mental healthcare infrastructure is already scarce.

Weak institutional protection further compounds these vulnerabilities. Effective responses to violence depend upon accessible reporting mechanisms, impartial judicial procedures, and specialized support services capable of assisting survivors. Where such systems are limited, inconsistent, or difficult to access, accountability is reduced and confidence in formal institutions declines. The resulting protection gap increases the likelihood that incidents remain unresolved while discouraging future reporting, thereby reinforcing patterns of insecurity and institutional distrust.

Economic insecurity also influences personal safety by reducing women's capacity to exercise independent decision-making. Financial dependence may restrict access to healthcare, legal services, transportation, or alternative housing during periods of crisis. Moreover, households experiencing severe economic hardship often face increased stress, which can intensify existing social tensions and contribute indirectly to heightened risks of violence or exploitation. Economic resilience should therefore be recognized as an important component of personal security rather than solely a development objective.

Despite these challenges, Afghan women continue to develop adaptive strategies that strengthen individual and community resilience. Informal support networks, extended family relationships, neighborhood solidarity, humanitarian assistance, and community-based organizations provide varying degrees of practical and emotional support. While these initiatives cannot fully compensate for the absence of comprehensive institutional protection, they demonstrate the capacity of local communities to develop coping mechanisms under difficult circumstances. Their effectiveness, however, remains constrained by limited resources, restricted operational environments, and the broader structural conditions that generate vulnerability.

Viewed through the lens of human security, the safety of Afghan women cannot be understood exclusively in terms of protection from physical violence. It encompasses the broader ability to live free from fear, access essential services, exercise personal autonomy, and participate meaningfully in social and economic life. The interaction between institutional constraints, economic hardship, social exclusion, and limited protection mechanisms creates a multidimensional risk environment in which vulnerabilities accumulate over time. Addressing these challenges therefore requires integrated strategies that strengthen legal protection, expand social services, improve economic opportunities, and reinforce community resilience while promoting the full inclusion of women in public life.

Table 3. *Principal Safety Risks Affecting Women and Girls in Afghanistan*

Safety Risk	Primary Contributing Factors	Immediate Consequences	Long-Term Implications
Gender-based violence	Weak protection mechanisms, social inequality, limited reporting	Physical and psychological harm	Long-term trauma and reduced social participation
Domestic violence	Economic dependency, household inequality, limited alternatives	Injury, emotional distress, restricted autonomy	Chronic insecurity and intergenerational effects
Early and forced marriage	Poverty, educational interruption, economic uncertainty	School dropout, health risks, reduced opportunities	Lifelong socioeconomic disadvantage

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Social isolation	Restricted participation in education, employment, and public life	Reduced access to support networks	Increased vulnerability and diminished resilience
Psychological distress	Uncertainty, exclusion, economic hardship, limited services	Anxiety, depression, emotional stress	Persistent mental health challenges
Limited institutional protection	Weak access to justice and support services	Underreporting and reduced accountability	Continued vulnerability and institutional distrust

6. EDUCATION DENIAL AS A SECURITY THREAT FOR WOMEN AND GIRLS IN AFGHANISTAN

Education is widely recognized as one of the most influential determinants of human development and a cornerstone of human security. Beyond its role in transmitting knowledge, education expands individual capabilities, strengthens economic resilience, promotes social mobility, and enhances civic participation. For women and girls, access to education is closely associated with improved health outcomes, delayed marriage, greater labor-market participation, and increased decision-making autonomy. Consequently, restrictions on education extend far beyond the classroom, influencing virtually every dimension of individual well-being and national development. In Afghanistan, the progressive exclusion of girls from formal education has therefore become not merely an educational issue but a multidimensional security challenge with profound long-term implications.

One of the most immediate consequences of educational exclusion is the interruption of human capital development during critical stages of personal growth. Secondary and higher education provide the knowledge, technical skills, and professional competencies required for meaningful participation in modern economies. When these educational pathways are interrupted, future employment opportunities decline substantially, limiting economic independence and reducing lifetime earnings. The effects extend beyond individual careers by diminishing the availability of qualified professionals across sectors such as healthcare, education, engineering, public administration, and scientific research. Over time, the cumulative reduction in skilled human resources constrains national productivity and weakens institutional capacity.

Education also plays a central role in strengthening individual agency and informed decision-making. Schools and universities provide environments in which students acquire not only academic knowledge but also critical thinking skills, legal awareness, communication abilities, and social networks. These competencies enable women to better understand their rights, recognize potential risks, access available services, and participate more effectively in family and community decision-making. The absence of these opportunities reduces personal autonomy and limits the capacity to respond to social, economic, or legal challenges throughout adult life.

The relationship between education and personal safety is particularly significant in fragile contexts. Numerous international studies demonstrate that girls who remain in school are generally less vulnerable to early marriage, forced marriage, labor exploitation, and other forms of gender-based discrimination. Continued education often delays marriage, increases future employment prospects, and strengthens household bargaining power. Conversely, educational interruption may narrow future life options, making early marriage appear to families as one of the few remaining pathways available under conditions of economic uncertainty. Education therefore functions not only as a developmental investment but also as an important protective factor against multiple forms of vulnerability.

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The broader economic implications of educational exclusion are equally substantial. Modern economies rely increasingly on educated workforces capable of adapting to technological change, innovation, and complex labor markets. Excluding a significant proportion of the population from advanced education reduces labor productivity, limits entrepreneurship, and constrains economic diversification. For Afghanistan, where long-term reconstruction depends heavily upon developing skilled human resources, reduced female educational participation represents a significant obstacle to sustainable economic growth. Human capital losses generated today are likely to affect national competitiveness and development for decades.

Educational deprivation also produces important intergenerational consequences. Extensive international research has consistently shown that maternal education influences household health, child nutrition, educational attainment, and overall family well-being. Educated mothers are generally more likely to seek preventive healthcare, support children's schooling, and adopt practices that improve long-term household welfare. Consequently, limiting educational opportunities for today's girls may adversely affect not only their own future prospects but also the development and well-being of subsequent generations. In this respect, educational exclusion perpetuates cycles of disadvantage that extend well beyond individual lives.

The psychological dimensions of educational denial should not be underestimated. For many adolescents, education represents more than academic achievement; it provides structure, social interaction, personal identity, and aspirations for the future. Sudden interruption of schooling can generate feelings of uncertainty, frustration, anxiety, and hopelessness, particularly among students who had anticipated pursuing higher education or professional careers. These psychological effects are often compounded by broader economic and social constraints, contributing to declining emotional well-being during formative stages of development.

In response to formal restrictions, numerous informal educational initiatives have emerged across different communities. Home-based learning programs, online instruction, community tutoring, and small educational networks illustrate the determination of Afghan families and educators to preserve learning opportunities despite considerable obstacles. Although these initiatives demonstrate remarkable resilience and adaptability, they cannot fully replace comprehensive national education systems. Limited resources, technological barriers, regulatory uncertainty, and uneven access continue to restrict their scale, continuity, and effectiveness, particularly in remote and economically disadvantaged regions.

From a human security perspective, education functions as an enabling capability that supports nearly every other dimension of development. Educational attainment influences employment prospects, health literacy, political participation, economic resilience, and social cohesion. Restricting access to education therefore generates cascading effects across multiple sectors, reducing the ability of individuals, households, and institutions to respond effectively to future challenges. Rather than representing an isolated policy decision, educational exclusion reshapes broader patterns of social development by weakening the foundations upon which resilient societies are built.

Ultimately, the denial of education to women and girls constitutes one of the most significant long-term challenges facing Afghanistan. Its consequences extend beyond individual rights to influence economic performance, institutional effectiveness, public health, and national development. Restoring equitable access to quality education should therefore be regarded not only as an educational priority but also as a strategic investment in human security, social stability, and sustainable development. Without strengthening educational opportunities for women, efforts to achieve lasting peace, economic recovery, and institutional resilience are unlikely to realize their full potential.

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Table 4. *Human Security Implications of Educational Exclusion*

Human Security Dimension	Effect of Educational Restriction	Immediate Consequences	Long-Term National Impact
Human capital	Interrupted learning pathways	Reduced skills acquisition	Lower workforce productivity
Economic security	Limited qualifications	Restricted employment opportunities	Slower economic growth
Personal security	Reduced awareness and autonomy	Greater exposure to exploitation	Increased structural vulnerability
Health and well-being	Lower health literacy	Reduced use of preventive healthcare	Poorer population health outcomes
Social development	Reduced civic participation	Limited social mobility	Weaker institutional resilience
Intergenerational development	Lower maternal educational attainment	Reduced educational support for children	Persistent cycles of poverty and inequality

7. HEALTH, WELL-BEING, AND ACCESS TO ESSENTIAL SERVICES FOR WOMEN AND GIRLS IN AFGHANISTAN

Health constitutes one of the fundamental pillars of human security, reflecting not only the absence of disease but also the capacity of individuals to live productive, dignified, and socially engaged lives. For women and girls, equitable access to healthcare is closely associated with educational attainment, economic participation, reproductive autonomy, and overall quality of life. In fragile and conflict-affected societies, healthcare systems perform an even more critical function by mitigating the long-term consequences of political instability, displacement, poverty, and social exclusion. In Afghanistan, however, women's health has become increasingly vulnerable to the combined effects of institutional restrictions, economic decline, shortages of healthcare personnel, and reduced accessibility to essential medical services. These interconnected challenges extend beyond individual health outcomes to influence household welfare, community resilience, and national development.

One of the principal challenges affecting women's health is the reduced accessibility of healthcare services. Physical distance from medical facilities, transportation constraints, financial hardship, and administrative restrictions frequently delay or prevent women from receiving timely medical attention. These barriers are particularly pronounced in rural provinces, where healthcare infrastructure has historically been limited and specialized medical services remain scarce. For many women, seeking medical treatment involves overcoming multiple logistical and social obstacles, resulting in delayed diagnoses, interrupted treatment, and preventable deterioration of health conditions. Consequently, healthcare accessibility has become an important indicator of broader social inclusion and institutional effectiveness.

Maternal health represents one of the most significant dimensions of women's health security. Pregnancy and childbirth require continuous access to qualified medical professionals, prenatal monitoring, emergency obstetric care, and postnatal services. Interruptions in these services increase the likelihood of maternal complications, neonatal mortality, and long-term health problems affecting both mothers and infants. Although improvements were achieved during previous decades through investments in maternal healthcare, recent institutional and economic challenges have placed considerable strain on these gains. Strengthening maternal health therefore remains essential not only for reducing mortality but also for improving long-term family welfare and child development.

Reproductive healthcare constitutes another essential component of women's well-being. Access to reproductive health information, family planning services, antenatal care, and safe childbirth enables women to make informed decisions regarding their health while reducing preventable medical

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complications. Limitations affecting these services diminish reproductive autonomy and contribute to adverse health outcomes, particularly among adolescents and women living in underserved communities. Moreover, inadequate reproductive healthcare influences broader demographic and socioeconomic patterns by affecting family planning, maternal education, and household economic stability.

Mental health has emerged as an increasingly significant yet frequently overlooked aspect of human security. Prolonged exposure to uncertainty, educational disruption, financial hardship, social isolation, and diminished future opportunities contributes to elevated levels of psychological distress among women and girls. Anxiety, depression, chronic stress, and feelings of hopelessness may develop gradually as multiple forms of insecurity accumulate over time. Nevertheless, mental healthcare services remain limited throughout much of Afghanistan, with shortages of trained professionals, inadequate community-based support, and persistent social stigma discouraging many individuals from seeking assistance. Expanding mental health services should therefore be considered an integral component of public health policy rather than a secondary healthcare priority.

The availability of qualified female healthcare professionals also plays a decisive role in determining women's access to medical services. Cultural norms, personal preferences, and privacy considerations often make female physicians, nurses, and midwives essential providers of healthcare for women, particularly in reproductive and maternal health. However, constraints affecting women's education and professional employment have gradually reduced the pipeline of future female healthcare workers. This creates a self-reinforcing cycle in which declining educational opportunities contribute to shortages of qualified professionals, further limiting healthcare accessibility for subsequent generations.

Economic conditions significantly influence healthcare utilization. Household poverty frequently forces families to prioritize immediate necessities such as food and shelter over preventive healthcare, routine medical consultations, or prescribed medication. Transportation costs, consultation fees, diagnostic testing, and pharmaceutical expenses represent substantial financial burdens for many households experiencing declining incomes. Consequently, economic insecurity often translates directly into health insecurity, reinforcing inequalities that disproportionately affect women and children. Improving healthcare access therefore requires not only stronger medical infrastructure but also broader strategies aimed at reducing poverty and strengthening household economic resilience.

The capacity of the healthcare system itself remains a critical determinant of women's well-being. Effective health systems depend upon adequate infrastructure, trained personnel, reliable supply chains, institutional coordination, and sustainable financial resources. In environments characterized by political uncertainty and economic instability, maintaining these components becomes increasingly difficult. Interruptions in medical supply chains, shortages of essential medicines, and uneven distribution of healthcare facilities reduce the overall resilience of the health sector. Strengthening institutional capacity is therefore indispensable for ensuring continuity of care during periods of social and political transition.

Despite these challenges, humanitarian organizations, local healthcare providers, and community-based initiatives continue to make important contributions to women's health. Mobile medical clinics, maternal health programs, vaccination campaigns, nutritional assistance, and health education initiatives have helped mitigate some of the most immediate consequences of limited healthcare access. These interventions demonstrate the value of collaborative partnerships between local communities and international organizations. Nevertheless, humanitarian assistance cannot substitute for a comprehensive national healthcare system capable of delivering equitable, sustainable, and high-quality services throughout the country.

From a broader human security perspective, health cannot be considered independently of education, employment, nutrition, housing, and social protection. Improvements in one dimension reinforce progress in others, while deterioration in any single area often generates cascading effects throughout society. The health of Afghan women therefore represents more than a medical concern; it serves as an

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indicator of institutional resilience, socioeconomic inclusion, and national development capacity. Ensuring equitable healthcare access, strengthening public health institutions, expanding female participation within the medical profession, and integrating mental health into primary healthcare should remain central priorities for any strategy aimed at promoting sustainable development, human dignity, and long-term stability in Afghanistan.

Table 5. *Major Health Challenges Affecting Women and Girls in Afghanistan*

Health Dimension	Principal Challenges	Immediate Consequences	Long-Term Human Security Implications
General healthcare access	Geographic, financial, and institutional barriers	Delayed diagnosis and treatment	Increased preventable illness and mortality
Maternal health	Limited prenatal and postnatal services	Pregnancy-related complications	Higher maternal and infant mortality
Reproductive health	Restricted access to reproductive services	Reduced reproductive autonomy	Poor maternal health and family well-being
Mental health	Social isolation, uncertainty, and chronic stress	Anxiety, depression, emotional distress	Reduced resilience and long-term psychological disorders
Female healthcare workforce	Shortage of trained female professionals	Reduced healthcare utilization	Persistent inequalities in women's healthcare
Health system capacity	Infrastructure and resource limitations	Inconsistent service delivery	Weak institutional resilience and reduced public health outcomes

8. ECONOMIC INSECURITY AND SURVIVAL CHALLENGES FACING WOMEN AND GIRLS IN AFGHANISTAN

Economic security represents one of the essential foundations of human security because it determines an individual's capacity to satisfy basic needs, maintain personal autonomy, and participate meaningfully in society. Stable income, productive employment, financial independence, and access to economic opportunities collectively influence health, education, housing, food security, and overall quality of life. For women, economic participation extends beyond income generation; it enhances decision-making authority within households, reduces dependency, strengthens resilience during crises, and contributes to broader social and national development. In Afghanistan, however, recent political and institutional developments have profoundly altered women's economic position, creating conditions that have intensified financial vulnerability and constrained long-term socioeconomic mobility.

The exclusion of women from substantial segments of the formal labor market has significantly reduced their contribution to household and national economies. Professional sectors that previously employed large numbers of women—including education, public administration, humanitarian organizations, financial services, and various private enterprises—have experienced considerable reductions in female participation. This contraction has implications that extend well beyond individual employment. Families that once relied on dual-income households have experienced declining purchasing power, reduced savings, and increasing difficulty meeting essential living expenses. Consequently, employment restrictions have contributed not only to individual financial hardship but also to broader patterns of household economic instability.

The economic consequences of declining female labor-force participation become particularly evident when viewed from a macroeconomic perspective. Women's participation in productive economic activities contributes directly to gross domestic product, tax revenues, entrepreneurship, consumer demand, and workforce diversification. Limiting the participation of approximately half of the country's potential workforce inevitably reduces productive capacity, weakens economic competitiveness, and constrains opportunities for long-term growth. The loss of highly educated female professionals further

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compounds these challenges by reducing the availability of skilled human capital required for institutional development and economic modernization.

Female-headed households constitute one of the population groups most severely affected by current economic conditions. Widows, divorced women, unmarried women, and households in which male family members are absent frequently depend upon independent income for their survival. Where opportunities for formal employment are severely limited, these households often encounter heightened risks of food insecurity, inadequate housing, interrupted education for children, and dependence upon humanitarian assistance. Their economic vulnerability illustrates how restrictions affecting women's employment can generate disproportionate hardship for entire families rather than solely for individual workers.

In response to declining opportunities within the formal economy, many women have increasingly relied upon informal economic activities as alternative sources of livelihood. Home-based enterprises, handicrafts, tailoring, online freelancing, tutoring, small-scale retail, food production, and other household businesses provide limited opportunities to generate income while remaining compatible with prevailing social and regulatory conditions. Although these activities demonstrate considerable adaptability and entrepreneurial capacity, they generally produce modest earnings, operate with limited legal protection, and remain highly vulnerable to market fluctuations, resource shortages, and administrative uncertainty. As a result, informal employment frequently serves as a mechanism of survival rather than a pathway toward sustainable economic advancement.

Economic dependency also has important social and psychological implications that extend beyond financial well-being. Individuals lacking independent sources of income often possess reduced bargaining power within households and diminished capacity to influence decisions regarding education, healthcare, mobility, or personal welfare. Financial dependency may also limit the ability to leave unsafe domestic environments or respond effectively to unexpected crises. Consequently, economic insecurity should be understood as a factor that interacts closely with broader dimensions of human security, including personal safety, mental health, and social inclusion.

Afghanistan's broader economic environment further intensifies these challenges. Persistent inflation, currency instability, declining investment, reduced commercial activity, and high unemployment have affected nearly every sector of the national economy. These macroeconomic conditions influence all households; however, women experience disproportionately severe consequences because structural barriers limit their ability to adapt through labor-market participation or entrepreneurial expansion. Economic shocks therefore reinforce existing gender inequalities by reducing the range of available coping strategies for women and their families.

Humanitarian assistance has become an increasingly important component of household survival for many vulnerable families. International organizations and humanitarian agencies provide food assistance, cash transfers, vocational training, nutritional support, and livelihood programs targeting women and female-headed households. These interventions have helped alleviate immediate hardship and prevent further deterioration of living conditions in many communities. Nevertheless, humanitarian assistance remains inherently temporary and cannot replace inclusive economic policies capable of generating sustainable employment, expanding productive investment, and strengthening national economic resilience. Long-term recovery ultimately depends upon the restoration of economic opportunities rather than continued reliance upon emergency support.

Despite persistent constraints, Afghan women continue to demonstrate considerable resilience and adaptability in sustaining household livelihoods. Community cooperation, informal financial networks, family enterprises, digital commerce, and local entrepreneurship illustrate the capacity of women to develop innovative responses under adverse circumstances. These initiatives not only contribute to household survival but also preserve valuable entrepreneurial skills and social capital that could support

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broader economic recovery in the future. However, their long-term effectiveness depends upon a more enabling economic environment that permits women to participate fully in national development without institutional barriers.

From a human security perspective, economic inclusion should be regarded as both a development objective and a security imperative. Financial independence strengthens household resilience, improves access to healthcare and education, reduces vulnerability to exploitation, and enhances women's capacity to participate actively in social and civic life. Conversely, persistent economic exclusion generates cumulative disadvantages that reinforce poverty, weaken institutional development, and constrain national recovery. Sustainable reconstruction in Afghanistan will therefore require policies that expand opportunities for women's productive participation, support entrepreneurship, strengthen labor-market inclusion, and recognize female economic empowerment as an essential component of long-term peace, stability, and inclusive development.

Table 6. *Dimensions of Economic Insecurity Affecting Women and Girls in Afghanistan*

Economic Dimension	Primary Drivers	Immediate Effects	Long-Term Human Security Implications
Labor-market exclusion	Restrictions on formal employment	Loss of income and professional opportunities	Increased household poverty and reduced national productivity
Household vulnerability	Reduced dual-income families	Financial instability	Greater dependence on humanitarian assistance
Female-headed households	Limited employment opportunities	Food insecurity and financial hardship	Persistent intergenerational poverty
Informal employment	Restricted formal economic participation	Low and unstable earnings	Limited economic mobility and weak social protection
National economic decline	Inflation, unemployment, reduced investment	Reduced purchasing power	Slower economic recovery and widening inequality
Economic dependency	Limited financial autonomy	Reduced household decision-making	Increased vulnerability to exploitation and social exclusion

9. HUMAN RIGHTS AND INTERNATIONAL PROTECTION MECHANISMS FOR WOMEN AND GIRLS IN AFGHANISTAN

The situation of women and girls in Afghanistan has become one of the most closely monitored human rights issues in contemporary international affairs. Since the political changes of 2021, numerous international organizations, multilateral institutions, humanitarian agencies, and civil society networks have expressed concern regarding the progressive erosion of women's rights and the broader implications for human security. These responses reflect the recognition that gender equality is not merely a domestic policy issue but an essential component of international human rights, sustainable development, and global peacebuilding. Nevertheless, the Afghan case also demonstrates the limitations of existing international protection mechanisms when political realities restrict their implementation.

International human rights law provides a comprehensive normative framework for protecting women against discrimination and guaranteeing equal access to education, employment, healthcare, political participation, and justice. Legal instruments such as the Universal Declaration of Human Rights, the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), the International Covenant on Civil and Political Rights, and the International Covenant on Economic, Social and Cultural Rights collectively establish internationally recognized standards that define women's rights as universal and indivisible. These conventions provide both legal and ethical foundations for evaluating state policies and guiding international engagement. However, the effectiveness of these instruments

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ultimately depends upon national implementation, institutional accountability, and political commitment, all of which remain highly challenging within the current Afghan context.

The United Nations occupies a central position within the international protection architecture. Through specialized agencies—including UN Women, UNICEF, UNESCO, the Office of the High Commissioner for Human Rights (OHCHR), and the United Nations Assistance Mission in Afghanistan (UNAMA)—the organization has continuously documented developments affecting Afghan women while advocating for the restoration of fundamental rights. These agencies also generate reliable data, publish monitoring reports, coordinate humanitarian activities, and provide technical assistance that informs international policy discussions. Their documentation serves not only humanitarian purposes but also creates an evidentiary basis for diplomatic engagement, accountability initiatives, and future policy planning.

Beyond the United Nations, international humanitarian organizations have played a crucial role in mitigating the immediate consequences of institutional restrictions. International and national non-governmental organizations continue to provide healthcare, food assistance, emergency relief, psychosocial support, livelihood programs, and educational initiatives for vulnerable communities. Their work has prevented further deterioration in many regions by maintaining access to essential services despite increasingly complex operational conditions. Nevertheless, humanitarian actors frequently face significant challenges related to funding shortages, administrative restrictions, logistical constraints, and security concerns that limit both geographical coverage and program sustainability. Consequently, humanitarian assistance often alleviates symptoms without addressing the structural conditions that generate vulnerability.

Despite the existence of extensive international legal frameworks, enforcement remains the most significant weakness of the global human rights system. International law relies primarily upon state cooperation, diplomatic engagement, and voluntary compliance rather than direct coercive authority. While international institutions may adopt resolutions, issue recommendations, establish investigative mechanisms, or impose diplomatic pressure, they possess limited capacity to compel implementation within sovereign states. The Afghan case therefore illustrates one of the central dilemmas of contemporary international law: the existence of robust normative standards without equally robust enforcement mechanisms capable of ensuring compliance under adverse political circumstances.

Monitoring and documenting human rights conditions also present substantial methodological and operational challenges. Restrictions on field access, limitations affecting independent observers, security risks for local partners, and interruptions in communication reduce opportunities to verify incidents comprehensively. Underreporting remains a persistent concern, particularly regarding gender-based violence, early marriage, and violations occurring within private households or isolated rural communities. These information gaps complicate evidence-based policymaking and may delay humanitarian responses or international advocacy efforts. Consequently, strengthening monitoring capacity remains essential for improving both accountability and the effectiveness of international assistance.

Diplomatic engagement constitutes another important dimension of international protection. Governments, regional organizations, and international alliances employ various diplomatic instruments—including bilateral dialogue, multilateral negotiations, economic sanctions, travel restrictions, conditional development assistance, and political recognition—to influence policy outcomes. The effectiveness of these approaches, however, varies considerably depending upon broader geopolitical considerations, regional security dynamics, and competing foreign policy priorities. Diplomatic pressure may encourage limited policy adjustments, yet sustained improvements generally require complementary domestic institutional reforms and long-term engagement rather than isolated political interventions.

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Civil society organizations and Afghan women's advocacy networks continue to play an indispensable role within the international protection landscape. Women's rights defenders, journalists, academics, legal professionals, and members of the Afghan diaspora have become important sources of documentation, advocacy, and public awareness. Through international conferences, academic research, media engagement, digital campaigns, and collaboration with global human rights organizations, these actors ensure that the experiences of Afghan women remain visible within international political discourse. Their contributions also strengthen transnational solidarity while preserving institutional memory that may support future legal and policy reforms.

The increasing importance of digital technology has further transformed international advocacy. Secure communication platforms, online educational initiatives, virtual conferences, and digital documentation systems enable Afghan women, researchers, and humanitarian organizations to maintain international connections despite physical restrictions. Digital technologies facilitate information exchange, support remote education, strengthen professional networks, and provide platforms through which women can continue participating in global conversations. At the same time, unequal internet access, technological limitations, cybersecurity concerns, and digital surveillance create new challenges that influence the accessibility and effectiveness of these emerging forms of international engagement.

Ultimately, the Afghan experience demonstrates that international protection mechanisms remain both indispensable and inherently limited. International law establishes essential normative standards; humanitarian organizations alleviate immediate suffering; diplomatic engagement sustains political dialogue; and civil society preserves international attention. However, none of these mechanisms can independently secure lasting improvements in women's rights without corresponding institutional change within Afghanistan itself. Sustainable progress therefore depends upon integrating international advocacy with domestic institutional development, strengthening accountability mechanisms, supporting Afghan civil society, and promoting governance frameworks that recognize gender equality as a prerequisite for long-term peace, human security, and sustainable development.

Table 7. *International Protection Mechanisms for Afghan Women: Roles, Contributions, and Limitations*

Protection Mechanism	Principal Actors	Main Contributions	Major Limitations
International Human Rights Law	United Nations Member States	Establishes universal legal standards	Limited enforcement authority
United Nations Agencies	UN Women, UNICEF, UNESCO, OHCHR, UNAMA	Monitoring, reporting, technical assistance, humanitarian coordination	Restricted operational access and political constraints
Humanitarian Organizations	International and national NGOs	Healthcare, education, emergency relief, livelihood support	Funding shortages, access restrictions, security risks
Diplomatic Engagement	States and regional organizations	Dialogue, negotiations, sanctions, conditional assistance	Dependent upon political will and geopolitical interests
Civil Society and Diaspora	Women's organizations, academics, journalists	Advocacy, documentation, awareness raising	Security risks, limited domestic operational space
Digital Advocacy	Online platforms, international networks	Information sharing, education, international visibility	Digital inequality, surveillance, cybersecurity challenges

10. VOICES OF RESISTANCE AND RESILIENCE AMONG AFGHAN WOMEN AND GIRLS

The experiences of Afghan women during recent years cannot be understood exclusively through the lens of vulnerability and deprivation. Although institutional restrictions have profoundly affected

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education, employment, healthcare, and public participation, women throughout Afghanistan have also demonstrated remarkable resilience, adaptability, and determination. Their responses illustrate that even under highly restrictive conditions, individuals and communities continue to exercise agency, preserve social capital, and create alternative pathways for learning, livelihood, and civic engagement. Examining these adaptive strategies provides a more balanced understanding of the Afghan context by recognizing women not merely as recipients of humanitarian assistance but also as active participants in shaping their own futures.

Resilience, within the framework of human security, extends beyond the capacity to survive immediate hardship. It encompasses the ability to adapt to changing circumstances, maintain social cohesion, preserve human dignity, and rebuild opportunities despite prolonged adversity. For Afghan women, resilience has emerged through countless everyday decisions involving education, family life, economic survival, community support, and social engagement. These forms of adaptation frequently occur outside formal institutions, illustrating how communities can generate alternative mechanisms for maintaining continuity when official systems become inaccessible or severely constrained.

One of the clearest expressions of resilience has been the continuation of informal educational initiatives. Across different regions of Afghanistan, families, teachers, and community leaders have organized home-based classrooms, small learning circles, private tutoring, and online educational activities to preserve opportunities for girls whose access to formal education has been interrupted. These initiatives often operate discreetly and depend upon local trust, volunteerism, and community cooperation rather than institutional support. Although their scale remains limited, they demonstrate the high social value that Afghan families continue to attach to education and their determination to protect future generations from the long-term consequences of educational exclusion.

Economic adaptation represents another significant dimension of resilience. Faced with declining opportunities in the formal labor market, many women have developed innovative livelihood strategies that enable households to maintain a degree of financial stability. Home-based enterprises, handicrafts, tailoring, food production, online commerce, language instruction, digital freelancing, and other small businesses illustrate the entrepreneurial capacity that continues to exist despite considerable structural constraints. These activities rarely generate substantial income, yet they reduce household vulnerability, preserve professional skills, and sustain women's participation in local economies. In many communities, informal entrepreneurship has become an essential mechanism for strengthening family resilience during periods of prolonged economic uncertainty.

Community solidarity has likewise emerged as a crucial source of social protection. Extended families, neighborhood associations, religious communities, and informal women's networks frequently provide emotional support, childcare, financial assistance, food sharing, and practical guidance during periods of hardship. These locally generated support systems compensate, at least partially, for the limited availability of formal social services and demonstrate the importance of social capital in strengthening community resilience. Trust, reciprocity, and collective responsibility enable households to pool resources and share risks, thereby reducing the impact of economic and social shocks on vulnerable families.

Digital technology has created additional opportunities for maintaining education, professional development, and international communication. Online learning platforms, encrypted communication applications, virtual professional networks, and social media have enabled many Afghan women to remain connected with educational institutions, humanitarian organizations, and global advocacy networks despite physical restrictions. Digital technologies have also facilitated remote employment, access to information, and participation in international academic and professional communities. Nevertheless, unequal internet access, electricity shortages, technological limitations, and concerns

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regarding digital surveillance continue to restrict the inclusiveness and sustainability of these emerging opportunities.

Civil society activism has also adapted to changing political realities. While many organizations have faced significant operational constraints, Afghan women continue to advocate for their rights through local initiatives, regional partnerships, international organizations, academic institutions, and diaspora communities. Journalists, researchers, lawyers, educators, healthcare professionals, and human rights defenders have contributed to documenting developments, preserving historical records, conducting research, and maintaining international awareness. Their work demonstrates that advocacy can evolve even when conventional civic spaces become increasingly restricted, illustrating the dynamic nature of social movements under conditions of political constraint.

The Afghan diaspora has become an increasingly influential actor in sustaining international attention and supporting women inside the country. Afghan academics, professionals, entrepreneurs, students, and activists living abroad have mobilized financial resources, established scholarship programs, coordinated humanitarian initiatives, organized international conferences, and engaged policymakers through sustained advocacy campaigns. These transnational networks strengthen connections between domestic and international civil society while facilitating knowledge exchange, fundraising, and policy dialogue. The growing role of the diaspora highlights how migration, although often driven by crisis, can also generate new forms of social and institutional support.

Psychological resilience constitutes another essential yet often overlooked dimension of adaptation. Women confronted with prolonged uncertainty frequently rely upon family relationships, religious faith, cultural identity, educational aspirations, and shared community experiences to preserve hope and emotional stability. These psychological resources help individuals cope with chronic stress while maintaining motivation to pursue education, support family members, and participate in community life whenever opportunities arise. Although such coping mechanisms cannot eliminate structural inequalities, they contribute significantly to individual well-being and strengthen collective resilience within communities experiencing sustained adversity.

At the same time, resilience should not be romanticized or interpreted as evidence that structural barriers are becoming less significant. Adaptive strategies emerge because women are responding to restrictive circumstances rather than because these circumstances have become acceptable or sustainable. Community initiatives, informal education, entrepreneurship, and social solidarity can mitigate some immediate consequences of exclusion, but they cannot replace comprehensive public institutions that guarantee equal rights, accessible education, quality healthcare, and meaningful economic opportunities. Treating resilience as a substitute for institutional reform risks shifting responsibility from governments and policymakers to individuals who are already bearing disproportionate burdens.

Ultimately, the experiences of Afghan women illustrate the coexistence of vulnerability and agency within contexts of prolonged political and social uncertainty. Their resilience demonstrates the remarkable capacity of individuals and communities to preserve dignity, knowledge, and social cohesion despite formidable challenges. At the same time, these experiences reinforce an equally important conclusion: resilience is most effective when supported by inclusive institutions, effective governance, and equitable access to opportunities. Sustainable progress therefore requires not only recognizing the courage and adaptability of Afghan women but also creating political, legal, and socioeconomic conditions in which resilience is no longer a necessity for survival but a foundation for human flourishing and national development.

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Table 8. *Dimensions of Resilience and Adaptive Capacity Among Afghan Women*

Dimension of Resilience	Principal Strategies	Positive Contributions	Structural Constraints
Informal education	Home-based learning, tutoring, online classes	Preservation of knowledge and educational continuity	Limited resources and regulatory uncertainty
Economic adaptation	Home enterprises, digital work, handicrafts	Household income diversification and financial resilience	Restricted markets and unstable earnings
Community solidarity	Family networks, mutual assistance, neighborhood cooperation	Social protection and emotional support	Limited resources and local capacity
Digital engagement	Online education, virtual networks, communication platforms	Information access and international connectivity	Digital inequality and cybersecurity risks
Civil society advocacy	Documentation, awareness campaigns, policy engagement	Preservation of human rights visibility	Restricted civic space and security concerns
Diaspora participation	Scholarships, fundraising, advocacy, humanitarian support	International cooperation and resource mobilization	Distance from local implementation realities
Psychological resilience	Family support, faith, hope, cultural identity	Emotional well-being and adaptive capacity	Chronic stress and prolonged uncertainty

11. FUTURE SCENARIOS FOR WOMEN AND GIRLS IN AFGHANISTAN

Forecasting the future of women and girls in Afghanistan requires recognition of the country's complex political, economic, and institutional dynamics. Rather than assuming a single trajectory, scenario analysis provides a structured framework for examining multiple plausible futures based on different combinations of domestic governance, international engagement, economic conditions, and societal adaptation. Such an approach does not seek to predict a definitive outcome; instead, it explores how varying political and social developments may influence women's rights, human security, and national stability over time. By identifying alternative pathways, scenario analysis can assist policymakers, humanitarian organizations, and researchers in anticipating risks while developing more resilient and adaptable policy responses.

The first and perhaps most probable scenario involves the continuation of current conditions with relatively limited institutional change. Under this trajectory, existing restrictions on education, employment, public participation, and mobility would largely remain in place, although their implementation might continue to vary across regions. Humanitarian organizations would maintain essential assistance, but structural reforms would remain limited. In such circumstances, Afghan women would continue relying heavily on informal education, home-based economic activities, family support systems, and humanitarian aid. While these adaptive mechanisms could mitigate immediate hardship, they would be insufficient to reverse the gradual erosion of human capital and socioeconomic opportunities. Consequently, long-term development would likely remain constrained by persistent gender inequality and declining institutional capacity.

A second scenario envisions the further consolidation of restrictive governance accompanied by additional limitations on women's participation in public life. Under this pathway, restrictions affecting education, employment, healthcare, and civic engagement could become more comprehensive and systematically enforced. Such developments would likely accelerate the decline of female labor-force participation, increase educational disruption, intensify economic dependency, and further weaken access to healthcare and social services. The cumulative effects would extend beyond women themselves to influence household welfare, child development, institutional effectiveness, and national productivity.

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From a human security perspective, this scenario would represent the greatest risk because multiple dimensions of vulnerability would reinforce one another over an extended period.

A more moderate scenario involves the selective relaxation of specific restrictions while maintaining the broader political framework. Such adjustments could emerge through internal administrative reforms, economic necessity, humanitarian negotiations, or sustained diplomatic engagement. Limited reopening of secondary education, expanded employment opportunities in selected sectors, increased humanitarian access, or improved healthcare services could generate measurable improvements in women's daily lives without fundamentally transforming the overall governance model. Although this scenario would not restore full gender equality, it could strengthen household resilience, reduce humanitarian pressures, and preserve portions of the country's human capital while creating opportunities for gradual institutional evolution.

A fourth scenario considers a broader process of institutional reform and progressive social reintegration. This trajectory would require sustained political commitment, constructive engagement with international partners, strengthening of public institutions, and renewed investment in education, healthcare, and economic development. Expanded educational opportunities, improved access to employment, greater civic participation, and stronger legal protections would contribute not only to advancing women's rights but also to enhancing national productivity, institutional legitimacy, and social cohesion. International evidence consistently demonstrates that societies investing in women's education and economic participation experience higher rates of economic growth, improved public health, stronger governance, and greater resilience to future crises. Consequently, this scenario offers the greatest potential for sustainable peace and long-term national recovery.

Economic conditions will significantly influence which of these scenarios becomes more likely. Afghanistan's future cannot be separated from broader questions of macroeconomic stability, investment, employment creation, food security, and institutional financing. Persistent inflation, declining commercial activity, and limited economic diversification may reinforce existing restrictions by reducing available policy options and increasing dependence on humanitarian assistance. Conversely, gradual economic recovery could create incentives for expanding workforce participation, rebuilding educational systems, and strengthening public institutions capable of supporting inclusive development. Economic policy therefore represents both a driver of future change and a determinant of human security outcomes.

The international community will also remain an influential actor in shaping Afghanistan's future, although its influence is neither unlimited nor uniform. Diplomatic engagement, humanitarian assistance, development cooperation, technical support, and multilateral dialogue can encourage institutional reform while helping to preserve essential services during periods of political transition. However, international actors operate within significant political and diplomatic constraints, and external pressure alone cannot substitute for domestic institutional commitment. Sustainable improvements ultimately depend upon constructive interaction between international support and nationally led governance reforms that recognize the long-term value of gender inclusion for social stability and economic development.

Equally important are the actions of Afghan women themselves, whose resilience and adaptive capacity have already demonstrated their ability to preserve educational opportunities, sustain livelihoods, support communities, and maintain international advocacy under exceptionally difficult circumstances. Informal schools, community enterprises, digital education, local solidarity networks, and civil society initiatives represent valuable social assets that may facilitate future recovery if institutional conditions improve. These grassroots initiatives preserve human capital, strengthen community trust, and maintain aspirations for education and professional participation, thereby reducing the long-term societal costs of prolonged exclusion.

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Demographic dynamics also deserve careful consideration when evaluating future scenarios. Afghanistan possesses one of the youngest populations in the region, meaning that current educational and economic policies will shape the opportunities available to millions of young people over the coming decades. Excluding girls from secondary and higher education affects not only current generations but also future labor markets, public administration, healthcare systems, scientific research, and national innovation capacity. The demographic consequences of today's policy decisions will therefore continue influencing Afghanistan's development trajectory long after immediate political circumstances have changed.

From a strategic perspective, the future of Afghanistan is inseparable from the future of its women. Human security, institutional resilience, economic growth, and sustainable peace all depend upon the productive participation of the entire population. Societies that systematically exclude women from education, employment, and decision-making inevitably reduce their capacity for innovation, governance, and socioeconomic development. Conversely, expanding opportunities for women strengthens household welfare, increases human capital, improves public institutions, and enhances national resilience. Gender equality should therefore be understood not merely as a human rights objective but as a strategic investment in state-building and long-term development.

Ultimately, none of the scenarios presented here should be viewed as predetermined. Afghanistan's future will emerge from the interaction of political leadership, institutional reforms, economic performance, international cooperation, and the continued resilience of Afghan society itself. The trajectory ultimately adopted will have profound implications not only for women and girls but also for the country's prospects for stability, prosperity, and sustainable development. Ensuring that future policies expand rather than restrict women's capabilities will remain essential for transforming human security from an aspiration into a durable reality.

Table 9. *Comparative Scenario Analysis for the Future of Women and Girls in Afghanistan*

Future Scenario	Main Characteristics	Expected Impact on Women's Rights	Human Security Outlook
Status quo continuation	Existing policies largely maintained	Limited access to education, employment, and public life	Persistent structural vulnerability
Intensified restrictions	Expansion of institutional controls	Further contraction of rights and opportunities	Severe deterioration across all human security dimensions
Partial policy relaxation	Selective reforms and humanitarian accommodation	Moderate improvements in selected sectors	Gradual but fragile enhancement of well-being
Comprehensive institutional reform	Progressive reintegration and legal reforms	Broad restoration of rights and participation	Significant improvements in development and social stability
Internationally supported transition	Coordinated domestic reforms with external support	Incremental expansion of opportunities	Sustainable long-term gains in human security and national resilience

12. CONCLUSION

The condition of women and girls in Afghanistan represents one of the most significant contemporary challenges at the intersection of human rights, human security, governance, and sustainable development. This study has examined the multifaceted consequences of the political and institutional transformations that have reshaped women's lives since 2021, demonstrating that restrictions on education, employment, mobility, healthcare, and public participation cannot be understood as isolated policy measures. Rather, they constitute interconnected components of a broader system of structural exclusion whose cumulative effects extend across every dimension of individual and societal well-being. By adopting a human

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security perspective, this study has shown that the erosion of women's rights generates far-reaching consequences that affect not only personal freedoms but also economic resilience, public health, institutional effectiveness, and national development.

A central finding of this research is that the denial of fundamental rights creates multiple and mutually reinforcing forms of vulnerability. Educational exclusion reduces opportunities for employment and professional advancement while simultaneously increasing exposure to early marriage, economic dependency, and social marginalization. Restrictions on employment diminish household incomes, weaken women's economic autonomy, and reduce national productivity by excluding a substantial proportion of the country's human capital from formal economic participation. Constraints on mobility and public engagement further isolate women from healthcare, legal protection, social support, and civic participation, thereby compounding existing inequalities. These interconnected dynamics illustrate that human security is inherently multidimensional and that deterioration in one domain inevitably influences outcomes across others.

The historical analysis undertaken in this study further demonstrates that the status of women in Afghanistan has consistently reflected broader political transformations. Periods characterized by institutional reform and international engagement expanded educational opportunities, increased labor-force participation, and strengthened women's representation within public institutions. Conversely, periods marked by political instability and restrictive governance have generally been associated with the contraction of these gains. This recurring historical pattern highlights the fragility of gender equality in contexts where legal protections and institutional safeguards remain closely linked to changing political circumstances. Sustainable progress therefore requires governance structures capable of protecting fundamental rights irrespective of political transitions or shifting ideological priorities.

The analysis has also demonstrated that women's exclusion generates significant consequences extending far beyond individual households. National economies depend upon educated and productive populations capable of contributing to innovation, entrepreneurship, healthcare, education, and public administration. Limiting women's participation reduces labor-force capacity, constrains economic diversification, weakens institutional performance, and diminishes long-term development potential. Similarly, restricting girls' access to education undermines future human capital formation, affecting subsequent generations through reduced educational attainment, poorer health outcomes, lower household incomes, and diminished civic participation. Gender equality should therefore be understood not only as a matter of social justice but also as an essential prerequisite for sustainable economic growth and institutional resilience.

An equally important contribution of this study lies in its emphasis on the resilience and agency demonstrated by Afghan women despite exceptionally challenging circumstances. Throughout the analysis, evidence has shown that women continue to preserve educational opportunities through informal learning initiatives, maintain household livelihoods through entrepreneurship and home-based enterprises, strengthen community resilience through mutual support networks, and sustain international awareness through advocacy, research, and digital engagement. These adaptive strategies illustrate that Afghan women remain active social actors whose contributions extend well beyond narratives of victimhood. Nevertheless, the study also argues that resilience should never be interpreted as an alternative to institutional responsibility. Community adaptation can mitigate immediate hardship, but it cannot substitute for comprehensive legal protections, inclusive governance, and equal access to public institutions.

The evaluation of international protection mechanisms reveals both their indispensable role and their structural limitations. International legal instruments, United Nations agencies, humanitarian organizations, and civil society networks have played a critical role in documenting human rights conditions, delivering humanitarian assistance, supporting education and healthcare, and maintaining

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global attention on the situation of Afghan women. At the same time, the Afghan experience demonstrates the limitations of international governance when enforcement mechanisms remain dependent upon political cooperation and state compliance. The gap between international legal norms and effective implementation continues to represent one of the most significant challenges confronting the global human rights system. Strengthening accountability, improving coordination among international actors, and supporting locally led initiatives will therefore remain essential components of future engagement.

The scenario analysis presented in this study further demonstrates that Afghanistan's future remains open to multiple possible trajectories rather than predetermined outcomes. Continued restrictions, selective policy adjustments, gradual institutional reform, or broader political transformation each carry distinct implications for women's rights, national development, and human security. The eventual direction adopted will depend upon the interaction of domestic governance, economic recovery, international diplomacy, institutional capacity, and the continued resilience of Afghan society itself. While uncertainty remains considerable, one conclusion emerges consistently across all scenarios: societies that invest in women's education, economic participation, and civic inclusion are substantially better positioned to achieve sustainable peace, stronger institutions, and long-term socioeconomic stability.

From a policy perspective, the findings of this study suggest several broader implications. First, protecting women's rights should be recognized as an essential component of national security rather than solely a social or humanitarian objective. Second, educational access must remain a central priority because of its direct influence on economic productivity, public health, institutional development, and intergenerational resilience. Third, expanding women's opportunities for economic participation should be viewed as a strategic investment capable of strengthening household welfare while supporting national economic recovery. Fourth, international engagement should increasingly combine humanitarian assistance with long-term institutional capacity building, recognizing that sustainable progress requires strengthening domestic governance alongside emergency relief. Finally, policies addressing women's rights should adopt integrated approaches that acknowledge the interconnected nature of education, health, employment, legal protection, and social inclusion.

This study also highlights several areas requiring further academic investigation. Future research would benefit from longitudinal analyses examining the long-term socioeconomic consequences of educational disruption, comparative studies exploring women's resilience across different conflict-affected societies, and empirical investigations into the effectiveness of community-based adaptation strategies. Additional research examining digital education, remote employment, informal economic networks, and diaspora engagement may also provide valuable insights into innovative mechanisms capable of strengthening human security under conditions of institutional constraint. Such scholarship would contribute to a more comprehensive understanding of how gender, governance, and development interact within fragile political environments.

In conclusion, the future of Afghanistan is inseparable from the future of its women and girls. No society can achieve lasting stability, sustainable development, or inclusive prosperity while systematically excluding half of its population from education, employment, decision-making, and public life. The protection of women's rights should therefore be understood not only as a legal obligation under international human rights law but also as a strategic imperative for national reconstruction and human security. Ensuring equal opportunities for women is fundamentally an investment in stronger institutions, healthier communities, more resilient economies, and a more peaceful society. The experiences of Afghan women over recent years illustrate both the devastating consequences of structural exclusion and the extraordinary capacity of human resilience. Transforming that resilience into lasting progress, however, ultimately requires political commitment, institutional reform, sustained international cooperation, and an unwavering recognition that human dignity, equality, and security are indivisible foundations of sustainable development.

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AUTHOR

Prof. Dr. Elias M. CHOUEIRI has been very active in academic and research settings for over 35 years. He is the author/co-author of over 20 books and booklets, and hundreds of refereed publications, technical reports, conference presentations and newspaper articles. He has won more than 20 awards for his scholarship, and has held faculty and managerial positions at several public and private institutions in Lebanon and the USA. He is a member of the WSO Board of Directors, and serves as WSO Liaison Officer to the United Nations. Besides, he assumes the roles of Director of the WSO National Office for Lebanon, Chairperson of the WSO Highway Transportation Committee, and Chairperson of the WSO Transportation of Dangerous Goods Committee.

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World Safety Organization (WSO)

The WSO was founded in 1975 in Manila, The Republic of the Philippines, as a result of a gathering of over 1,000 representatives of safety professionals from all continents at the First World Safety and Accident Prevention Congress. The WSO World Management Center was established in the United States of America in 1985 to be responsible for all WSO activities, the liaison with the United Nations, the co-operation with numerous Safety Councils, professional safety/environmental (and allied areas) organizations, WSO International Chapters/Offices, Member Corporations, companies, groups, societies, etc. The WSO is a non-profit, non-sectarian, non-political organization dedicated to: ***"Making Safety a Way of Life … Worldwide."***

World Safety Organization Activities

WSO publishes WSO Newsletters, World Safety Journal, and WSO Conference Proceedings.
WSO provides a network program linking various areas of professional expertise needed in today's international community.
WSO develops and accredits educational programs essential to national and international safety and establishes centers to support these programs.
WSO receives proposals from professional safety groups/ societies for review and, if applicable, submits them to the United Nations for adoption.
WSO presents annual awards: The James K. Williams Award, Glenn E. Hudson International Award, J. Peter Cunliffe Transportation Award, Concerned Citizen, Concerned Company/Corporation, Concerned Organization, Educational Award, WSO Chapter/National Office of the Year, and Award for Achievement in Scientific Research and Development.
WSO provides recognition for safety publications, films, videos, and other training and media materials that meet the WSO required educational standards.
WSO establishes and supports divisions and committees to assist members in maintaining and updating their professional qualifications and expertise.
WSO has Chapters and National/International Offices located throughout the world, providing contact with local communities, educational institutions, and industrial entities.
WSO organizes and provides professional support for inter- national and national groups of experts on all continents who are available to provide expertise and immediate help in times of emergencies.

Benefits of Membership

WSO publishes the "WSO Consultants Directory" as a service to its Members and to the Professional Community. Only Certified Members may be listed.
WSO collects data on the professional skills, expertise, and experience of its Members in the WSO Expertise Bank for a reference when a request is received for professional expertise, skill, or experience.
WSO provides a network system to its Members whereby professional assistance may be requested by an individual, organization, state, or country or a personal basis. Members needing assistance may write to the WSO with a specific request, and the WSO, through its Membership and other professional resources, will try to link the requester with a person, organization, or other resource which may be of assistance.
WSO provides all Members with a Membership Certificate for display on their office wall and with a WSO Membership Identification Card. The WSO awards a Certificate of Honorary Membership to the corporations, companies, and other entities paying the WSO Membership and/or WSO Certification fees for their employees.
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Members receive special hotel rates when attending safety pro- grams, conferences, etc., sponsored by the WSO.

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The World Safety Organization has members who are full time professionals, executives, directors, etc., working in the safety and accident prevention fields, including university professors, private consultants, expert witnesses, researchers, safety managers, directors of training, etc. They are employees of multinational corporations, local industries, private enterprises, governments, and educational institutions. Membership in the World Safety Organization is open to all individuals and entities involved in the safety and accident prevention field, regardless of race, color, creed, ideology, religion, social status, sex, or political beliefs.

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- **Associate Membership**: Individuals connected with safety and accident prevention in their work or individuals interested in the safety field, including students, interested citizens, etc.
- **Affiliate Membership**: Safety, hazard, risk, loss, and accident prevention practitioners working as full time practitioners in the safety field. Only Affiliate Members are eligible for the WSO Certification and Registration Programs.
- **Institutional Membership**: Organizations, corporations, agencies, and other entities directly or indirectly involved in safety activities and other related fields.
- **Sustaining/Corporate Member**: Individuals, companies, corporations, organizations or other entities and selected groups, interested in the international effort to "Make Safety A Way of Life ... Worldwide."

The WSO Membership Application is available on the WSO website: https://worldsafety.org/quick- downloads/

WSO – National Offices

WSO National Office for Algeria
c/o Institut des Sciences et de la Technologie (I.S.T.)
attn.: Mr. Ferhat Mohia, Director
contact: ferhatmohia@yahoo.fr

WSO National Office for Australia
c/o Curtin University of Technology
attn.: Dr. Janis Jansz, Director
contact: j.jansz@curtin.edu.au

WSO National Office for Austria
c/o Payesh System Mehr Engineering Company
attn.: Dr. Majid Alizadeh, Director
contact: majidealizadeh@gmail.com

WSO National Office for Cameroon
c/o Cameroon Safety Services
attn: Mr. Clement B. Nyong, Director
contact: ny.clement@yahoo.com

WSO National Office for Canada
c/o Apex One Management Group
attn.: Mr. Michael Brown, Director
contact: michael.brown@worldsafetycanada.ca | mike@apexone.com
website: worldsafetycanada.ca

WSO National Office for Ghana
c/o Ghana National Fire Service
attn.: Mr. Peter Oko Ahunarh, Director
contact: pahunarh23@gmail.com

WSO National Office for India
c/o Indian Society of Safety Engineers (I.S.S.E)
attn.: Mr. T. Shankar, Director
contact: support@worldsafety.org.in

WSO National Office for Indonesia
c/o Prosafe Institute
attn.: Mr. Soehatman Ramli, Director
contact: soehatmanramli@yahoo.com

WSO National Office for Iran
c/o Payesh System Mehr Engineering Company
attn.: Mrs. Fatemeh Gilani, Director
contact: gilani@imsiran.ir

WSO National Office for Iraq
c/o NAYA Engineering Services & Training
attn.: Dr. Eng. Khaldon Waled Suliman, Director
contact: naya_engineering_services@yahoo.com

WSO National Office for Lebanon
c/o Ministry of Transport
attn.: Dr. Elias M. Choueiri, Director
contact: elias.choueiri@gmail.com

WSO National Office for Myanmar
c/o Win Oshe Services Co., Ltd
attn.: Mr. Win Bo, Director
contact: winbo@osheservices.com

WSO National Office for Nigeria
c/o DanaRich Creative Concept, LTD
attn.: Mr. Soji O
okun, WSO-RSD, Director
contact: info@worldsafety.org.ng
website: worldsafety.org.ng

WSO National Office for Pakistan
c/o Greenwich Training & Consulting
attn.: Mr. Tayyeb Shah, Director
contact: doctimes@gmail.com

WSO International Office for Philippines
attn.: Engr Alfredo A. De La Rosa Jr., Director
contact: info@wsophil.org

WSO National Office for Saudi Arabia (KSA)
c/o The Academy of Sciences for Medical Education
attn.: Mr. Rocky Binuya, Director
contact: info@aos-ksa.com | binuya.rocky@gmail.com
website: https://aos-ksa.com/en

WSO National Office for United Arab Emirates (UAE)
c/o Tatweer Industrial Inspection & Training Services LLC
attn.: Miss Nazya Robin, Quality Manager & Director
contact**:** info@tiits.ae

WSO National Office for Vietnam
c/o Safety Training & Consulting Limited
attn.: Mr. Binh Pham, WSO-CSI(ML), Director
contact**:** binh.pt@worldsafety.org.vn
binh.pt@safety.edu.vn
website: worldsafety.org.vn

World Safety Organization

Code of Ethics

Members of the WSO,
by virtue of their acceptance of membership into the WSO,
are bound to the following Code of Ethics
regarding their activities associated with the WSO:

****

Members must be responsible for ethical and professional conduct in relationships with clients, employers, associates, and the public.

****

Members must be responsible for professional competence in performance of all their professional activities.

****

Members must be responsible for the protection of the professional interests, reputation, and good name of any deserving WSO member or member of another professional organization involved in safety or associated disciplines.

****

Members must be dedicated to the professional development of new members in the safety profession and associated disciplines.

****

Members must be responsible for their complete sincerity in professional service to the world.

****

Members must be responsible for the continuing improvement and development of professional competencies in safety and associated disciplines.

****

Members must be responsible for their professional efforts to support the WSO motto:

"Making Safety a Way of Life … Worldwide"

Published by the WSO National Office for Lebanon
www.worldsafety.org
info@worldsafety.org | elias.choueiri@gmail.com