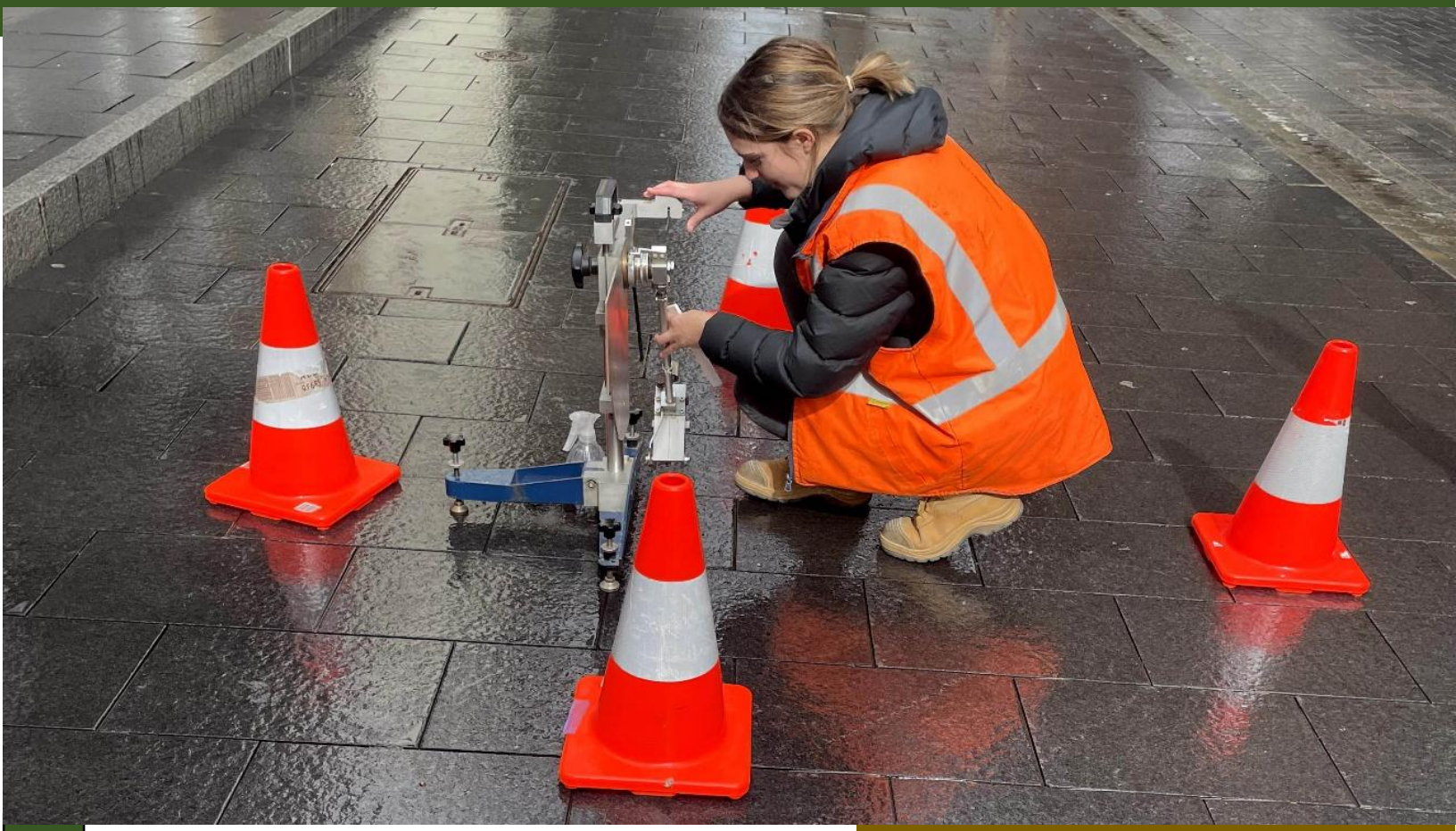
2025

ISSN 1015-5589, Vol. XXXIV, No. 2

World Safety Journal



In This Edition

WSO's Certification Program is accredited, in compliance with the ISO/IEC 17024:2012

World Safety Organization

Statement of Purpose and Objectives

WSO's purpose is to internationalize all safety fields, including occupational and environmental safety and health, accident prevention movement, etc., and to disseminate throughout the world the practices skills, arts, and technologies of safety and accident prevention.

WSO's objective is to protect people, property, resources, and the environment on local, regional, national, and international levels. WSO membership 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.

WSO is in Consultative Category II Status (Non-Governmental Organization - NGO) to the Economic and Social Council of the United Nations.

WSO is a Not-for-Profit Corporation (Missouri, USA), non-sectarian, non-political movement dedicated to:

"Making Safety a Way of Life … Worldwide."

Cover Photo

Measuring slip resistance of flooring surfaces

Various standardized methods of slip testing in Australia range from a rubber slider on a pendulum arm to a pair of bare feet on a platform. Each is designed to measure the slip resistance of flooring surfaces under different conditions.

The choice of method usually depends on the specific requirements of the flooring being tested and the applicable standards. The Australian Standard for new pedestrian surfaces, AS 4586, provides a method for determining dry slip resistance plus a range of different methods for evaluating slip resistance in a wet condition.

What are these methods, and how is slip testing conducted? One of these methods is the Wet Pendulum slip test, which is primarily used by Stone Initiatives. Stone Initiatives can use this test method in their Adelaide laboratory or on-site at projects across Australia.

Retrieved from:
https://stonemtg.com.au/2024/09/20/quick-guide-how-is-slip-testing-conducted/

Table of Contents

Article Submission

The World Safety Journal (WSJ) is a quarterly refereed journal (ISSN: 1015-5589) that includes original full-length papers, review articles and case studies on the most recent outcomes of advanced research in any occupational safety and health fields.

All articles shall be written in concise English and typed with a minimum font size of 12 point. Articles should have an abstract of not more than 300 words. Articles shall be submitted as Times New Roman print and presented in the form the writer wants published. On a separate page, the author should supply the author's name, contact details, professional qualifications, current employment position, a brief bio, and a photo of the author. This should be submitted with the article.

Writers should include all references and acknowledgments. Authors are responsible for ensuring that their works do not infringe on any copyright. Failure to do so can result in the writer being accountable for breach of copyright. The accuracy of the references is the author's responsibility.

References

Articles should be referenced according to the Publication Manual of the American Psychological Association ,7th ed.

Books are referenced as follows:
Author. (Year of publication). *Title of publication*. Publisher.

Articles are referenced as follows:
Author (Year). Title of article. *Name of Journal*. *Volume* (Issue), Page numbers of article.

Internet information is referenced as follows:
Name of author. (Year of publication). *Title*. DOI or web address if no DOI.

Submissions should be mailed to:

WSO – World Safety Journal
Attn: Editorial Staff /
Prof. Dr. Elias M. Choueiri
1601 N. Turner Suite 515
Hobbs, New Mexico, USA
or emailed to: elias.choueiri@gmail.com

Articles, wherever possible, must be up-to-date and relevant to the Safety Industry. ***All articles are Blind Peer Reviewed by at least two referees before being accepted for publication.***

Disclaimer

World Safety Journal

A peer-reviewed journal,
published by the World Safety Organization

Journal Homepage:
https://worldsafety.org/wso-world-safety-journal/

Slip Resistance in Public Buildings: Old Versus New

Baylee A. Bolton[1], Daniel Autenrieth[1], Richard LaDouceur[2], and David P. Gilkey[1*]
[1] Montana Technological University, Department of Safety, Health, and Industrial Hygiene, Butte, Montana, USA
[2] Montana Technological University, Department of Mechanical Engineering, Butte, Montana, USA

KEYWORDS

Tribometer;
Slip Resistance;
Slip and Fall;
Walkway Safety;
Floor Safety.
.

ABSTRACT

Slip and fall injuries are the number one cause of emergency room visits in the United States with a total of more than 10,500,000 visits in 2010. More than 46,000 people died at home or work due to falls in 2022. This study investigated slip resistance (SR) on 10 different flooring surfaces in older vs newer buildings on a university campus in Southwest Montana. The study also compared dry vs wet conditions and found that SR decreased significantly (p-value < 0.01) for both older and newer flooring. The mean scores declined from 0.59 to 0.46 in older buildings and from 0.58 to 0.38 in the newer buildings. Under dry conditions the SR values on all 10 floors were above the 0.50 level indicating high available traction and walkway safety. When wetted, the newer flooring had 13/20 SR values below 0.40 compared to 4/20 for the older flooring and one measurement < 0.30. This research has developed objective data on the SR in public spaces. Results underscore the need to remain diligent in selecting high-traction flooring and coatings as well as preventing contamination of flooring in public spaces. Every walkway safety program should include management practices such as maintenance methods consistent with manufacturer recommendations, frequent cleaning and rapid spill clean-up when contaminated.

1. INTRODUCTION

Slip and fall injuries are the number one cause of emergency room visits in the United States and caused a total of more than 10,500,000 visits in 2010 (Mills, 2023). The National Safety Council reported that there were 46,653 people that died due to falls at home and work in 2022 (NSC, 2024). At work, in 2017, there were 227,760 falls that were documented, and 887 of those falls caused worker fatality (Archchige et al., 2021). Slips and falls were reported to have represented the first or second highest types of workers compensation claims in most industries in 2009 (DeBusk, Dixon, Gill & Gill, 2019). In 2020, Liberty Mutual Insurance Company reported that falls to lower levels were the third leading cause of nonfatal workplace injuries, which resulted in a cost of more than $6 billion, and falls on the same level were the second leading cause of nonfatal workplace injuries which had direct costs of nearly $9 billion (Dixon, DeBusk, Fenley & Gill, 2024). There are many factors that increase the likelihood of a slip and fall event including the surface material, coatings and finish, footwear sole

* *Corresponding Author*: dgilkey@mtech.edu

https://doi.org/10.5281/zenodo.15854268

design and condition, contaminants present, and human factors (Di Pilla, 2010; Gilkey, 2021; Grieser & Frantz, 2018; Snow et al., 2024; Widas, 2024).

There are two major categories of falls; falls to a lower level (for example, a fall that occurs when a person falls off a roof to the level below) and falls on the same level (when someone slips and loses their balance and control and falls on the walking surface at the same level) (Dixon, DeBusk, Fenley & Gill, 2024). Slips and falls occur when there is loss of balance by a pedestrian because there is not enough friction between the foot and floor. Slippery conditions occur typically when there are contaminants between a shoe and the floor (Brady, 2015; Chang, Leclercq, Lockhart & Haslam, 2016; Gao, 2004; Gilkey, 2021; Snow et al., 2024). The most frequent examples of a contaminant are water, other spilled liquids, snow, ice and some floor finishes (Widas, 2024). There are two types of slips that may occur when walking normally. The most common is when the heel strikes the walkway surface and slides forward on the walkway surface (Abeyesekera & Gao, 2001; Di Pilla, 2010; Widas, 2024). The second mechanism is at toe-off, the rear foot can slide backwards when stepping forward (Abeyesekera & Gao, 2001; Di Pilla, 2010; Widas, 2024). The probability of either mechanism is increased when a contaminant is present on the walkway surface (Fischer & Fischer n.d.; Gilkey, 2021; Snow, et al, 2024; Widas, 2024).

To identify the causes and prevention strategies of slip and fall incidents the safety professional may use a variety of investigation methods (Chang, Leclercq, Lockhart & Haslam, 2016; Maynard, Di Pilla, Natalizia & Vital, 2012; Troyer, 2012). The Accident Analysis Model is one such approach which consists of five different elements that include: Design, Remove, Guard, Warn, and Train (Fischer & Fischer, 2014). Step one is to evaluate the design of the environment where the incident occurred. It is important to determine the source of the contaminant, to develop and implement design, management, or environmental changes to improve walkway safety. Second, is to remove the contaminant from the environment when design changes are not feasible. Third, is to use guards or barriers to prevent pedestrians from using the walkway. When contaminants have become present such as water or other liquid, you may not always be able to remove the contaminant in a timely manner, in these cases, use guards or barriers to protect the pedestrians from entering a hazardous zone. A good example of an appropriate temporary response is to use tape off barriers and/or cones. Longer term guards might include anti-slip coatings for floors or anti-slip tape for step treads on stairways. Fourth are warnings, when you cannot guard the pedestrian from walkway hazards, you can post or broadcast warnings in the area. Warning signs posted in the environment alert the pedestrians to know that hazards are present so that they can make an informed decision if they should continue walking on the pathway or stop and avoid the risk and take an alternative safer route. A very good example of this approach is the Finnish Meteorological Institute's broadcast alerts when conditions are hazardous for pedestrians (Hippi et al., 2020). The system tracked conditions and found that the greatest risk was when temperatures were near 32 °F. Public health messages included the use of colored signs to alert pedestrians of increasing risk of slip and fall conditions. Messages also encouraged the use of anti-slip devices to be worn on shoes if outside walking was necessary. The system was so successful, it remains in operation today and runs 24/7/365 (Hippi et al., 2020). The final strategy is training, which consists of training people to walk safely, ensuring they know how to navigate dangerous walkway environments. Training could also include choosing appropriate options for footwear that have good slip resistance, how to don snow cleats when it is icy or snowy, and how to avoid slipping. Training can also include how to walk on slippery surfaces, like walking slowly and paying attention (Fischer & Fischer, 2014.).

Another effective strategy to help prevent slips and falls is through good housekeeping and maintenance practices (Gilkey, 2021; Safe Work Australia, 2012). Contaminated floors can cause slips and falls because the surface asperities or roughness is reduced as contaminants layer, fill surface pores or valleys

https://doi.org/10.5281/zenodo.15854268

in the floor surface thereby reducing available traction (Di Pilla, 2010; Kim, 2017). Through regular cleaning and maintenance, contaminants are removed from the floor surface thereby increasing available traction and making a slip and fall event less likely (Di Pilla, 2010). Defective and damaged floors can also cause slips, trips, and falls as well. The presence of cracks, depressions or raised surfaces can cause contaminants to pool or create trip hazards (Di Pilla, 2010; Gilkey, 2021).

There are various types of cleaners that can be used for floor care including alkaline cleaners, acidic cleaners, neutral pH cleaners, and enzymatic cleaners (Di Pilla, 2010; Maynard, DiPilla, Natalizia & Vidal, 2012). It is always best to select the appropriate cleaning agent recommended by the manufacturer of the flooring material. Using the wrong cleaning agent may damage the floor and/or reduce available traction and increase the risk of a slip and fall event. Scheduled cleaning and maintenance are fundamental strategies to ensuring safe walkway conditions (Di Pilla, 2010; NFSI, 2023).

To reduce the risk of slip, trip and fall events to pedestrians at home and work, numerous organizations such as ADA, ANSI, ASTM, ISO, NFSI, NFPA, and OSHA have developed standards and strategies to improve the many aspects of walkway safety (ADA, 2024; ANSI, 2021; ASTM, 2024; Brady, 2015; ISO; 2016; Chang, Leclereq, Lockhart & Haslam, 2016; Di Pilla, 2010; Maynard, Di Pilla, Natalizia and Vital, 2012; NFSI, 2025; NFPA, 2024; OSHA, 2024). Standards have been developed in the US and internationally. Some organizations create standards and others may only approve and disseminate standards across the world (Di Pilla, 2010). For standards relating directly to SR reference thresholds, ADA, ASTM International, NFPA International, NFSI, OSHA, and were identified (ADA, 2202; ASTM, 2024; NFPA, 2024; NFSI; OSHA, 2024). Ranges can vary per standard such as high > 0.50, moderate < 0.49 – 0.40, and low < 0.40 SR. Some standards may have up to six categories whereas (Di Pilla, 2010) the NFSI uses three (NFSI, 2024).

While most standards and professionals in the US use SR 0.50 = static coefficient-of-friction (SCOF) as a reference value for safe walkway surfaces, there are no laws that require it or any other value as the minimum SR (Di Pilla, 2010; Leffler, 2009). The National Floor Safety Institute (NFSI) publishes standards for both SCOF and DCOF for both dry and wet walkway surfaces (NFSI, 2025). To estimate the coefficient-of-friction (COF), the safety professional must use a device called a tribometer or slip meter to test the walkway surface (Di Pilla, 2010; Gilkey, 2021).

There are only two devices that have an ASTM F-13 standard for wet testing, which include the portable inclinable articulated strut tribometer (PIAST), and the variable incidence tribometer (VIT) or also known as the English XL. Several studies have verified that the two machines are accurate and reliable for dry and wet testing (Di Pilla & Vidal, 2002). There have been at least 70 different types of tribometers developed over the years that have been identified in scientific journals (Di Pilla, 2001).

In the present study, the English XL VIT was used to test the slip resistance in 10 university buildings on a campus in Southwest Montana. The investigative team planned to evaluate the slip resistance in five buildings with older floor/walkway surfaces (>25 years old) and five buildings with newer floor/walkway surfaces (<15 years). The university was originally built in 1900 and there remains many historic buildings on the campus as well as newer ones that provided a range of flooring materials of varied ages. The campus is a large public space and many people from the community and other places often visit to see various campus attractions such as the famous Mineral Museum or World Mining Museum or just come to watch an athletic competition.

https://doi.org/10.5281/zenodo.15854268

The present study was designed using similar methods described by Sarıışık and Çoşkun (2023). These investigators conducted research on the safety of floor surfaces in public buildings with two portable slip testers. The team selected public buildings including: a hospital, education, police station, courthouse, museum theatre, cinema, social service, library, pharmacy, place of worship, and banking (Sariisik & Çoşkun, 2023). The researchers found DCOF measure ranging from 0.32 to 0.54 at a university. Overall, they had a wide range of measures with a low of 0.21 to a high of 0.58 derived from testing 30 public buildings (Sariisik & Çoşkun, 2023).

Another study recently published, evaluated slip resistance on a large university campus in Singapore (Chew, Asmone & Lam, 2024). The researchers used the Pendulum Slip Meter to rank 23 sites and develop a baseline of reliable measures to inform interventions and priority areas. The investigative team set out to develop data for a risk-based approach to walkway safety management at the university (Chew, Asmone & Lam, 2024). Their findings included 386 measurements indicating low to high traction in various locations throughout the university.

Prior research has also been carried out in our laboratory looking at slip resistance of 10 different flooring materials, both wet and dry (Snow et al., 2024). In the study, an intervention was used to improve slip resistance and then retested. Investigators found that using an epoxy coating with asperities greatly improved the slip resistance when wet. Evaluation using the English XL revealed a range of SR values from 0.19 seen on wet flooring uncoated to a high of 0.69 on a wetted tile treated with the anti-slip coating. The current study is a follow-up investigation on our campus.

2. AIMS AND HYPOTHESES

The research aims were to investigate slip resistance in older versus newer floor surfaces, and to investigate slip resistance of dry versus wet conditions in the old and new building.

The hypotheses for the study were:
H01: There is no difference in slip resistance measures between newer versus old floor surfaces.
H02: There is no difference in slip resistance measures between dry versus wet conditions.

3. METHODS

The field investigator achieved competency with the English XL VIT by following the owner's manual with mentoring by the faculty member who was a Certified XL Tribometrist (CXLT). Calibration was defined as +/-0.03 variance from 0.22 which was set by Excel Tribometers. Slip Resistance (SR) readings were initially higher than expected but consistent. The CXLT reached out to Excel Tribometers who provided a new calibration tile, sandpaper for the foot preparation tool, and cleaning brush. The field researcher followed the manual instructions and cleaned the tile with a common dish soap before each calibration and only used distilled water for the calibration and testing. The investigator achieved calibration on a consistent basis using the new tile provided by the manufacturer.

Ten public buildings on the university's campus were identified with assistance from the director of facilities. Five older buildings (>25 years, some > 100 years) and five newer buildings (<15 years, some < 4 years) were selected for evaluation of SR. In each building four zones were identified, based on initial assessment of the buildings including the layout and design and where the most frequently used walkways were. The precise sampling location was marked off in a 6" x 6" square using masking tape. Older and newer flooring surfaces were tested using the English XL Tribometer under dry and wet

https://doi.org/10.5281/zenodo.15854268

conditions. The five older buildings consisted of Main Hall, Chemistry and Biology Building, Science and Engineering Building, Museum Building, and the Mill. The five newer buildings were Natural Resource Research Center, HPER Complex, Student Success Center, the dining hall of the Student Union Building, and the Natural Resources Building.

Sampling was conducted February 20th, 2025 through March 3rd, 2025. Data were collected at a rate of two buildings per day, three to four hours per building, totaling eight hours a day maximum. The strategy in place was to sample two buildings near each other every day. Before and after sampling, the machine was calibrated following the technique provided in the owner's manual (Excel Tribometers, 2016) in compliance with ASTM International standard F 1679-4 (ASTM, 2002).

After the machine was calibrated, the field investigator was able to commence sampling. The sampling technique is similar to the calibration protocol. In each building where the four zones were identified based on walkway use, the precise sampling location was wiped with a clean towel to remove loose debris from the area. Older and newer flooring surfaces were tested using the English XL Tribometer under dry, Figure 1 and wet conditions, Figure 2. Each location was sampled four times in cardinal directions while dry. After each direction, the test foot was prepared, see Figure 3, and the tribometer rotated 90 degrees. Following the dry samples, four wet samples were obtained following the same protocol. In total each building had four locations, each location was tested four times while dry and four times while wet. In addition to sampling SR, water weights were collected before and after each sample.

There were 32 tests performed to estimate the mean SR measurement in each of the 10 buildings totaling 320 samples. At each location the four samples were summed and divided by four for the overall mean. Data were collected using a customized data collection sheet and then transferred to MS Excel for cleaning the data and creation of box plots, and then to Minitab Version 21 for statistical analysis.

Figure 1

Slip resistance assessment of dry flooring with the English XL VIT

https://doi.org/10.5281/zenodo.15854268

Figure 2
Slip resistance assessment of wet flooring with the English XL VIT

Figure 3
Test Foot Preparation for the English XL VIT

The paired T-test was applied to evaluate mean scores for dry vs wet samples from the old buildings as well as in the new buildings. A paired T-test was chosen due to the samples being collected in the same location, just on different floor conditions (wet versus dry). To compare the mean SR scores for the old versus new buildings the Two Sample T-Test was used assuming equal variance. For the equal variance evaluation, the Levene's test was used to ensure that the two populations had the same variance.

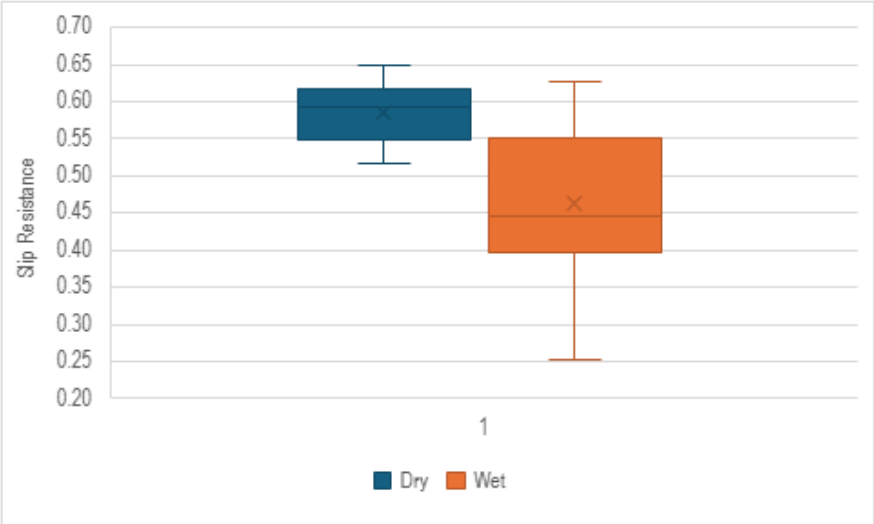
https://doi.org/10.5281/zenodo.15854268

4. RESULTS

This research investigated SR measurements in 10 buildings on a university campus. The project required more than 320 SR measurements using the English XL VIT including the calibrations. Each of 10 building floor surfaces were tested in four strategic locations based on walkway use four times each to develop the mean SR estimate. Five floor surfaces in old buildings, all > 25 years and some were > 100 years, had dry SR mean of 0.59 and a range of estimates from 0.52 to 0.62, see Figure 4. The SR measurements were repeated after wetting with distilled water. The wet surface SR mean was 0.46 with a range of estimates lower in most cases from 0.25 to 0.59, see Figure 4.

Figure 4

Old Buildings SR Measures Dry and Wet, Means – Interquartile, Range and Median



Note: Measures > 0.50 are considered high traction, 0.49-0.40 moderate traction and <= 0.39 low traction

The five floor surfaces, when dry, in newer buildings < 15 years had a mean SR of 0.58 and range from 0.53 to 0.64, see Figure 5. The evaluation was repeated after wetting the floor surface with distilled water. The mean was 0.38 with a range of SR estimates with a low of 0.29 to a high of 0.55, see Figure 5.

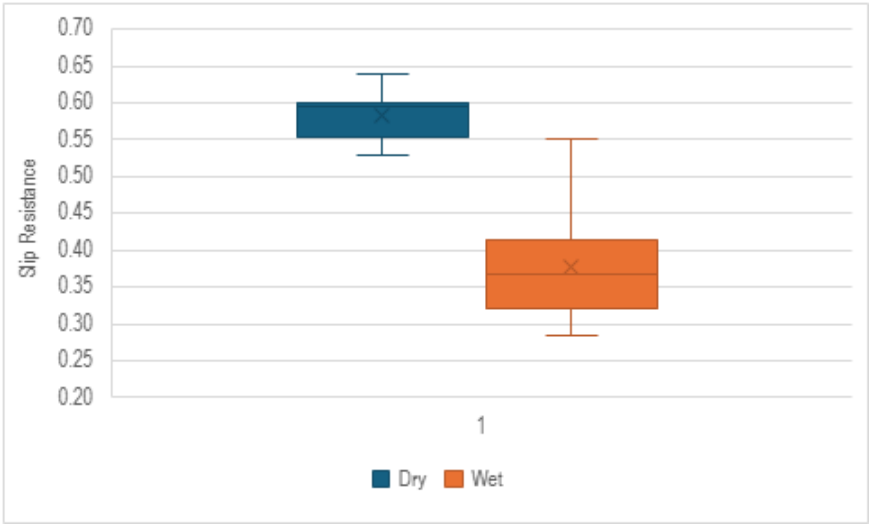
When comparing dry mean values to wet mean values in the old buildings, they were found to be significantly different with p-value < 0.01, see Table 1. The SR mean estimates were compared for new flooring when dry this measured at 0.58, and when wet it was 0.38, which then revealed a significant difference, p-value < 0.01, see Table 1.

When viewing the distribution of dry SR measures between old vs new buildings, we see varied frequencies in each. All dry walkway surfaces had SR measures > 0.50, see Figure 6. We also observed that many readings were above 0.60. The old and new flooring had 50% of flooring > 0.60, see Figure 6.

https://doi.org/10.5281/zenodo.15854268

Figure 5

New Buildings SR Measures Dry and Wet - Interquartile, Range and Median



Note: Measures > 0.50 are considered high traction, 0.49-0.40 moderate traction and <=0.39 low traction

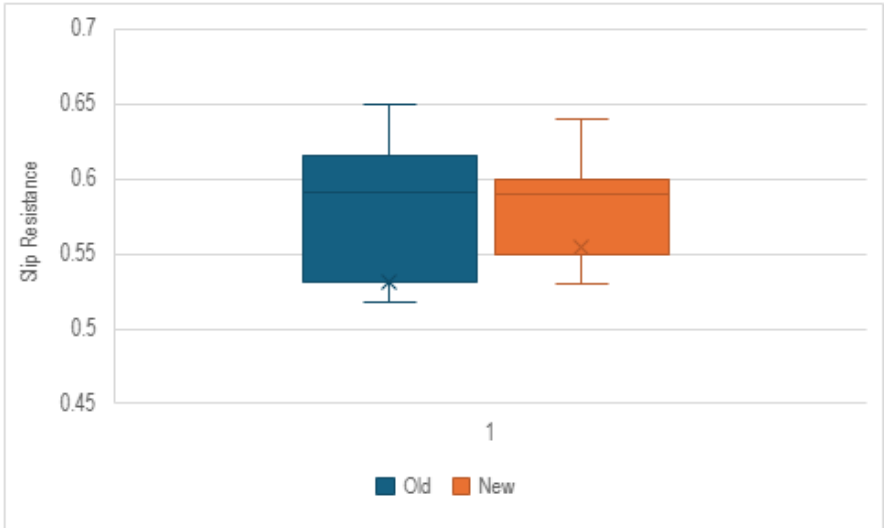
Table 1

Comparisons of SR Measures in Old and New Buildings Wet vs. Dry

Comparisons	N	Mean	SE Mean	P-Value
Old- Dry	20	0.59	0.009	<0.01
Old- Wet	20	0.46	0.024	
New-Dry	20	0.58	0.007	<0.01
New- Wet	20	0.38	0.014	

Figure 6

SR Measurements in Dry Conditions for both Old and New Buildings - Interquartile, Range and Median



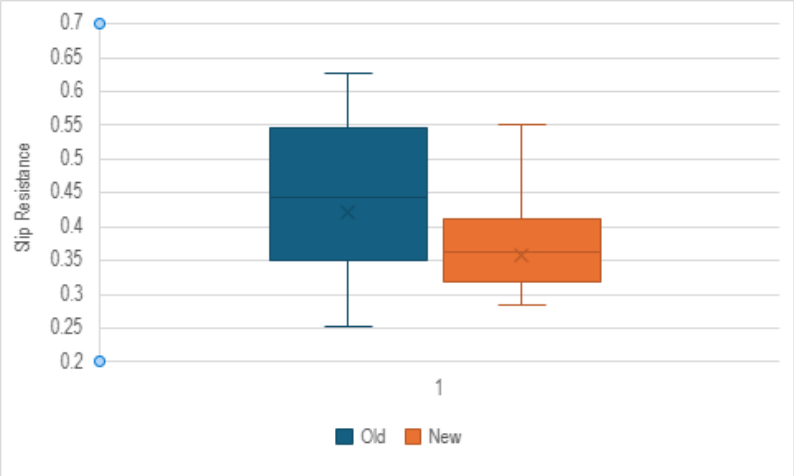
Note: Measures > 0.50 are considered high traction, 0.49-0.40 moderate traction and <=0.39 low traction

https://doi.org/10.5281/zenodo.15854268

When looking at SR measurements in wet condition for old vs new buildings we observed a varied distribution of measures. Testing older flooring revealed 20% of SR measures were > 0.50 compared to new flooring which was seen only in one building. The frequency of SR reduced measures by wetting was similar for old vs new flooring. In the older buildings, there were 7/20 measures and, on new flooring was 6/20 measures between 0.50 and 0.40, see Figure 7.

Figure 7

SR Measurements in Wet Conditions for both Old and New Buildings - Interquartile, Range and Median



Note: Measures > 0.50 are considered high traction, 0.49-0.40 moderate traction and <=0.39 low traction

When looking at the number of SR measures below 0.40 and above 0.30, different patterns were seen. On the old building flooring 4/20 readings were seen whereas in this range. On new flooring 13/20 measures were measured, see Figure 7. Only at a single location in old and new buildings did flooring tests have readings < 0.30, 0.25 and 0.29 respectively.

Comparing dry old flooring to dry new flooring was not significantly different, p-value 0.79, see Table 2. The range for the SCOF was 0.52 to 0.65, see Figure 7.

Table 2

Comparison of SR Measures within Old and New and Dry and Wet

Comparisons	N	Equal Variance P-Value	Mean	SE Mean	P-Value
Dry- Old	20	0.06	0.59	0.009	0.79
Dry- New	20		0.58	0.007	
Wet- Old	20	0.28	0.46	0.024	<0.01
Wet- New	20		0.38	0.014	

The SR scores found while comparing the old versus new on wet flooring had larger variance and was significantly different, p-value < 0.01. The range of the SCOF was 0.25 to 0.63, see Figure 7. In addition to the SR data collection, the floor type and amount of water used when wet sampling was conducted are seen below with SR values for dry and wet flooring, see Table 3.

https://doi.org/10.5281/zenodo.15854268

Table 3
Comparison of SR and water used (oz) on different types of flooring

Type of Flooring	Average SR- Dry	Average SR- Wet	Average water used (oz)
Ceramic/Clay Tile	0.59	0.41	4.82
Concrete	0.57	0.51	3.50
Terrazzo	0.59	0.51	3.65
Synthetic Wood	0.59	0.39	4.55
Wood	0.56	0.30	2.70
Vinyl Tiles	0.58	0.37	3.74

In each building there was a variety of flooring types, there was no statistical analysis carried out on these data. The flooring types with the average slip resistance measures and amount of water used are shown in Table 3. This table shows a range of 0.30 to 0.51 while wet. The average amount of water used was 3.82 oz and ranged from 2.70 oz on wood to 4.82 oz on ceramic and/or clay tiles, see Table 3.

5. DISCUSSION

The present study investigated SR in 10 buildings on a public university campus in Southwest Montana. The aims of the study were to measure, evaluate, and compare SR estimates on older versus newer flooring under dry vs wet conditions. A similar study by Sariisik and Çoşkun (2023) investigated SR in public buildings including six locations on a university campus in a region of Turkey. The researchers used the drag sled (GM 200) and Pendulum type tribometers in their study in contrast to our choice to use the English XL VIT. Their team evaluated 30 different public places to estimate dynamic coefficient of friction (DCOF). The present study used the English XL to derive the SR=SCOF measurements. The DCOF is approximately 70% of the SCOF (Widas, 2024). The present investigation methods were somewhat patterned after the Sariisik and Çoşkun (2023) study.

The researchers on this investigative team also looked carefully at another study by Chew and colleagues (2024) that investigated walkway SR at 23 locations on a large university campus in Singapore. That study was designed to develop objective SR data to be used in ranking risk and prioritization for interventions. The researchers used the Pendulum type tribometer rather than the English XL to assess DCOF (Chew, Asmone and Lam, 2024). Their sampling was conducted both inside buildings and on outside walkways on dry surfaces. Findings revealed SR ranging from high to low DCOF measures using a five-point scale unique to the English Pendulum Tribometer. They tested a variety of flooring and walkways surfaces ranging from tile indoors to outside asphalt and pebbled walkways surfaces. More precisely, investigators found low traction conditions at 47% of locations tested and high traction at 30% of locations tested at the university in Singapore. While the estimated values are different, the conclusions may be similarly compared to understand the overall traction: High, Moderate or Low. Our findings indicated that under dry conditions high traction is noted in all 10 buildings. Most researchers have found that dry conditions, regardless of the walkway flooring surface, provided high available SR (Chang, Lockhart & Haslam, 2016; Di Pilla, 2010; Gao, 2004; Mills, 2024; Snow et al., 2024).

The present study found that dry conditions provided high available traction (SR > 0.50) for safe walking regardless of the age of the flooring surface or type in the 10 buildings. The overall mean SR estimates were 0.58 in the new buildings and 0.59 in the old buildings. We found that 50% of dry older and newer flooring had SR measurements > 0.60, see Figure 7. When compared using the Two Sample T-test, no

https://doi.org/10.5281/zenodo.15854268

significant differences were seen, p-value 0.79. The lowest estimate among all 10 measures was 0.52 and the highest reading was 0.65. Based on US and European standards, the walkways tested would all be considered safe when dry for pedestrian use at work or in the community (ASTM, 2024; ANSI, 2021; NFPA, 2024, NFSI, 2024; OSHA 2024).

Comparatively, Sariisik and Çoşkun (2023) and colleagues found a wider range of DCOF SR on the 30 floor surfaces measured on public spaces from a low of 0.21 in a hospital to a high of 0.58 in a school. Comparing measures at the university, the low as 0.36 to a high of 0.54 DCOF estimates, which should be lower than SCOF readings by approximately 30% and do not provide an exact comparison.

The study completed by Snow et al. (2024) evaluated 10 common indoor walkway surfaces and found high levels of SR on all 10 types of flooring when dry. The dry uncoated flooring tiles had SR estimates ranging from 0.52 to 0.69. So, it appears that most flooring has high traction by all standards under dry conditions. The concern for pedestrian safety arises when the walkway becomes contaminated with water or other liquids (Widas, 2024). Findings revealed significant declines in SR for those uncoated tiles with a range from 0.19 to a high of 0.65. It should be noted that 50% of the flooring tested did maintain high SR > 0.50. These findings correlate nicely with our findings in the current study that all flooring tested dry provided high traction to walkway users and there exists reason to be concerned when walkway surfaces become contaminated with water or other substances that can reduce available traction and walkway safety. We believe that differences when wet are due to the type of flooring material, surface characteristics and coatings or finishes. Further evaluation might have enabled the research team to better understand the reasons for differences in SR values between floor times and locations.

The present study findings revealed that conditions changed when floors were wetted with distilled water, in most cases (30/40), the SR measures declined. Those samples 10/40, that did not decline, were evidence of good SR despite contamination. Again, we believe that differences stem from flooring materials and finishes since we used the same distilled water when testing. Water is the most common contaminant associated with reduced walkway traction (Widas, 2024). In a few cases (2/40), the SR dropped precipitously to a low traction level resulting in an increased risk of slip and fall events for walkway users.

The National Floor Safety Institute classified wet SR measures below 0.30 as low traction and recommended interventions to improve available traction (NFSI, 2024). Interventions could be in the form of applied coatings with asperities to the floor surface enhancing available traction (Snow et al., 2024). The buildings with older flooring had the lowest SR estimate, at 0.25 whereas, the newer flooring had higher SR measures with the lowest estimated at 0.29 yet, the overall means were lower for the newer floors when wet compared to the overall mean of the older flooring, 0.38 and 0.46 respectively. The older buildings had five SR readings between 0.50 and 0.40, very similar to newer buildings with six. The older buildings had only a single test with a measurement below 0.40. Whereas the newer flooring had 13/20 readings between 0.40 and 0.30 and one below 0.30. When compared using the Two Sample T-test, a significant difference was seen, p-value 0.003. These differences may be explained by the newer floor surfaces being made of ceramic and synthetic tiles and wood whereas the older floor surfaces included terrazzo, marble and concrete. Despite the wear associated with older building, they maintained good SR. In one new and one old building, the SR remained the same for both dry and wet. Overall, we found that wet conditions reduce adequate traction for safe walking regardless of the age of the flooring surface on nearly all flooring surfaces in the 10 buildings.

https://doi.org/10.5281/zenodo.15854268

Flooring surfaces fall into six general categories: Stones, concrete, clay, synthetic, ceramic, and woods (NFSI, 2025). Generally, when dry, all types provide necessary available traction for safe walking. However, when contaminated with liquids, traction may be significantly reduced to dangerous levels (Di Pilla, 2010; Gilkey, 2021; Snow et al., 2024; Widas, 2024). Conditions associated with water such as snow, ice and rain may pose challenges to business owners and operators. On the campus investigated, flooring mats are the most common strategy used to reduce water contamination inside buildings. The NFSI (2025) provides standards to help guide owners and occupants on the proper use of floor mats. The NFSI reported that it takes approximately 30' of floor covering to reduce water load by 97% (NFSI, 2025). Mats should also be designed to lay flat with beveled edges and not slide across the walkway surface thereby not creating a trip hazard. The NFSI B101.6 is a standard used as a guide to help commercial facilities in the selection, use and maintenance of floor mats to ensure walkway safety (NFSI, 2021).

Looking at the NFSI standard B1010.0 for the wet surface SCOF guidelines, our wet conditions still showed moderate slip resistance (SCOF 0.40 – 0.59) in most cases, 75% in older buildings but only 35% in newer walkways surfaces met this rating. Again, the likely explanation for our findings are that differences exist in floor materials and finishes and/or coatings applied in general floor maintenance have an impact on the SR under wet conditions. We did not collect information that characterized asperities or types and methods for used by the university for maintaining walkway surfaces. The newer flooring measurements were below 0.40 and considered low traction on 65% of the samples taken, due to the materials and characteristics of the newer flooring.

As shown in Table 3, there was a variety of flooring materials that were sampled, all measurements on dry flooring were considered to have a high slip resistance, ranging from 0.56 to 0.59. When analyzing the wet conditions, there were two types of flooring that demonstrated a high slip resistance both at a 0.51, there was one type of flooring measuring at moderate slip resistance with a 0.41, there were three types of flooring measuring at a low slip resistance at 0.30, 0.37, and 0.39. The amount of water used while sampling can vary greatly based on the person sampling. We did not feel that weight was a good measure of porosity and water absorption. When sampling the investigator put a generous amount of water to ensure coverage of the entire six-inch by six-inch square, whereas the investigator observed others only putting the unbroken film of water in a circle directly under where the test foot strikes.

A limitation was the small sample size; therefore, our findings do not represent other university flooring. This was a convenient sample; our sample of university flooring was not selected randomly. Our data was collected on a small university campus in Southwest MT. Investigators selected 10 buildings, four zones in each and obtained four mean measurements for each zone. Our sample does not represent all buildings on campus or buildings at other universities. Readings may have varied in other areas of buildings that were not sampled. While the English XL was calibrated before and after each test day, there may have been errors in its performance.

6. CONCLUSION

In conclusion, it was found that there was a significant difference between wet and dry flooring in both old and new buildings. Our research revealed that the dry floors provide much higher traction than the wet floor. Findings underscore the need for prompt spill clean-up and effective management strategies to keep floors dry. When flooring becomes contaminated with water or other liquids, it must be cleaned up promptly or clearly marked off or barricaded from foot traffic until it can be cleaned up. When comparing the old to new buildings while they were dry, there was a minimal difference between the

https://doi.org/10.5281/zenodo.15854268

two, which demonstrates high traction regardless of age, even when floors are worn down and old they can still retain high slip resistance. When comparing old to new floors while wet there was a significant difference found between the two. The old floors were more slip resistant than the new ones when wet. This is likely due to the type of floor materials and/or coatings applied during maintenance and routine care of floors and walkways. Further testing to evaluate surface asperities was not carried out, use of a profilometer would have aided in characterizing the surface roughness of the flooring. Investigators did not collect data from the university on types of floor maintenance practices or products. Future research should look at these additional factors. This research adds to the literature on SR in public buildings and university campuses.

The takeaway messages are that more tribometry measurement is needed in public spaces to identify higher risk conditions on walkway surfaces so that interventions can be applied. The study also underscores the need for standards to become enforceable law. Slip and fall events cause pain and suffering for victims of injury. The cost in dollars is staggering and needs to be addressed with systematic solutions. More research is needed to evaluate workplace and community walkway surfaces for potential sources of injury and fatality. Future research should include larger sample sizes and the use of multiple types of tribometers. The variability in tribometry readings can be more uniform with correction factors. The development of correction factors should be a priority for standard setting organizations such as ASTM, NFPA, OSHA, and NFSI.

DECLARATIONS

Authors declare no conflicts of interest with the manufacturer or distributor of the English XL VIT. Authors also declare no conflicts with the university regarding floor selection or distribution of results.

Ms. Baylee Bolton was the master's student for this study. She was involved in all phases of the project. Ms. Bolton was the field investigator that collected all samples for this study. Dr. Autenrieth was involved in all phases of the project and provided statistical guidance and manuscript review. Dr. LaDouceur was involved in all phases of the project and served as the out-of-department committee member and manuscript reviewer. His expertise in material science and engineering was value added to the project. Dr. Gilkey was Ms. Bolton's thesis advisor and involved in all phases of the project, including manuscript preparation. He is a CXLT and provided training for competency with the English XL VIT. He is also a Walkway Auditor Certificate Holder from the NFSI.

ACKNOWLEDGEMENTS

We recognize and thank Mr. Layne Sessions for his support of the project and help in classifying the age of building on the campus. We also recognize Marissa McDanel for her assistance with data collection and support for the project.

Research reported in this publication was supported by the National Institute for Occupational Safety and Health Montana Tech Training Project Grant under Award Number T03OH008630. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute for Occupational Safety and Health.

REFERENCES

Bosco, G. L. (2013). Development and application of portable, hand-held X-ray fluorescence spectrometers. TrAC Trends in Analytical Chemistry, 45, 121-134. doi:10.1016/j.trac.2013.01.006

Abeysekera, J. and Gao, C. (2001). The identification of factors in the systematic evaluation of slip prevention on icy surfaces. Industrial Ergonomics, 28, 303-313. Retrieved from https://www.sciencedirect.com/science/article/pii/S0169814101000270?casa_token=-GeqoT9bIkQAAAAA:ZjUJ61g_1Ir9e4adf_wvGFk8mGPM-K9e4nHp4aakskLk02D943_XC8ldP44EzznPipUEVGpehxak.

ASTM. (2002). Standard test method for using variable incidence tribometer (VIT). Access on May 7, 2025 Search Result | ASTM

Brady. (2015). Slips, trips and fall: Advancing your safety program. Retrieved from https://www.bradyid.com/forms/downloads/slips-trips-and-falls-ebook.

Chang, W., Leclercq, S., Lockart, T. and Haslam, R. (2016). State of science: occupational slips, trips and fall on the same level. Ergonomics, 59(7), 861-883. Retrieved from https://www.tandfonline.com/doi/pdf/10.1080/00140139.2016.1157214.

DeBusk, H., Dixon, L., Gill, J., & Gill, R. (2019, November). Measuring the Static Coefficient of Friction of Non-Fluid Contaminants. In Proceedings of the Human Factors and Ergonomics Society Annual Meeting (Vol. 63, No. 1, pp. 537-541). Sage CA: Los Angeles, CA: SAGE Publications.

Di Pilla, S., & Vidal, K. (2002). State of the art in slip-resistance measurements. Professional Safety, 47(6), 37.

Di Pilla, S. (2001). Walkway surface safety & traction in the workplace: The rest of the equation. Professional Safety, 46(7), 25.

Di Pilla, S. (2010). Slip, trip, and fall prevention: A practical handbook (2nd ed.). Boca Raton, FL: CRC Press.

Dixon, L., DeBusk, H., Fenley, E., & Gill, J. (2024, September). Evaluating the Slip Resistance of Various Walkway Surface Contaminants. In Proceedings of the Human Factors and Ergonomics Society Annual Meeting (p. 10711813241275498). Sage CA: Los Angeles, CA: SAGE Publications.

Excel Tribometers (2016, March 21) English XL VIT User Guide, Version 4. English XL VIT User Guide

Fischer, T. J., & Fischer, J. S. (2014). Forensic Human Factors Analysis of Slip And Fall Incidents Using a Variable Incidence Tribometer. Accessed on May 7, 2025. https://r.search.yahoo.com/_ylt=AwrjZYzRahtoqM4N9UEPxQt.;_ylu=Y29sbwNncTEEcG9zAzEEdnRpZAMEc2VjA3Ny/RV=2/RE=1746656081/RO=10/RU=https%3a%2f%2fwww.jniosh.johas.go.jp%2fen%2fpublication%2fdoc%2fICFPP40.pdf/RK=2/RS=hb6TIL9t6MR80tInokFTm0Ef_sM-

Gao, C. and Abeysekera, J. (2004). A systems perspective of slip and fall accidents on icy and snowy surfaces. Ergonomics, 47(5), 573-598. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/00140130410081658718.

Gilkey, D. (2021). Slips, trips and falls: A call to duty. World Safety Journal. ISSN 1015-5589 Vol. XXX No. 1, 1-18. Available at: Slips, Trips, and Falls: A Call to Duty" by David P. Gilkey (mtech.edu)

Grieser, B. C., & Frantz, J. (2018). Slip resistance assessment of common shoe sole materials on selected floor surfaces. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 62(1), 435–439. https://doi.org/10.1177/1541931218621099

Hippi, M., Kangas, M., Ruuhela, R., Ruotsalainen, J. and Hartonen, S. (2020). RoadSurf-Pedestrian: a sidewalk condition model to predict risk for wintertime slipping injuries. Meteorological Applications, 27(5), e1955. https://rmets.onlinelibrary.wiley.com/doi/pdfdirect/10.1002/met.1955.

ISO. (2016). Part 2: Working platforms and walkways. Accessed on may 7, 2025 https://www.iso.org/standard/61281.html

Kim, J. (2012). Comparison of three different slip meters under various contaminated conditions. Safety and health at work, 3(1), 22-30.

Kim, I. J. (2017). Pedestrian fall safety assessments: improved understanding on slip resistance measurements and investigations. Springer.

Leffler, J. P. (2009). Forensic engineering use of walkway traction testing. Journal of the National Academy of Forensic Engineers, 26(1). https://doi.org/10.51501/jotnafe.v26i1.710

Maynard, W. S., DiPilla, S., Natalizia, D., & Vidal, K. (2012, June). Slip, Trip, and Fall Prevention: Concepts and Controversies. In ASSE Professional Development Conference and Exposition (pp. ASSE-12). ASSE.

NFSI. (2023). B101.8 Standard Guide for Walkway Safety Management Program for Slip, Trip and Fall Prevention. Hurst, TX: https://nfsi.org/downloads/nfsi-b101-8-2023/

NFSI. (2024). NFSI WACH floor coverings and matting. Training materials. Hurst TX. https://nfsi.org/nfsi-standards/standards/

NFSI. (2025). Our standards. https://nfsi.org/nfsi-standards/standards/

NSC. (2024). Make fall safety a top priority. https://www.nsc.org/workplace/safety-topics/slips-trips-and-falls/slips-trips-and-falls-home#:~:text=Make%20Fall%20Safety%20a%20Top%20Priority&text=It%20may%20come%20as%20a,the%20leading%20cause%20of%20death.

Powers, C. M., Brault, J. R., Stefanou, M. A., Tsai, Y. J., Flynn, J., & Siegmund, G. P. (2007). Assessment of walkway tribometer readings in evaluating slip resistance: a gait-based approach. Journal of forensic sciences, 52(2), 400-405.

Safe Work Australia. (2012). Slips and trips at the workplace fact sheet. Retrieved from https://www.safeworkaustralia.gov.au/system/files/documents/1702/slips_and_trips_fact_sheet.pdf.

Sariisik, G., & Çoşkun, G. (2023). Safety of Floor Surfaces in Public Service Buildings: Portable Slip Testers. https://doi.org/10.20944/preprints202311.1623.v1

Snow, C., Hays, C., Girard, S., Birkenbuel, L., Autenrieth, D., & Gilkey, D. (2024). Slip Resistance Evaluation of 10 Indoor Floor Surfaces. IgMin Research. Article ID: igmin199, doi https://dx.doi.org/10.61927/igmin199

Troyer, D.D. (2012). New standards change the landscape of walkway safety. Occupational Health

Safety, 81(9):48, 50. PMID: 23002521. Retrieved from https://ohsonline.com/Articles/2012/09/01/New-Standards-Change-the-Landscape.aspx.

Widas, G. (2024). CXLT certification program. Excel Tribometers, February 7, 2024, Tampa, FL.

MAIN AUTHOR

Baylee Bolton completed her Occupational Safety and Health and Industrial Hygiene (IH) degrees at Montana Technological University. Baylee was a dedicated student, and while working on her degrees she did a variety of internships in mining and construction to ensure hands-on knowledge in the field before beginning her professional career. She will continue her work as a Safety Technician with a bridge and railway construction company. Baylee is looking forward to furthering her knowledge in the construction industry and advancing in her career.

CITATION:

Bolton, B., Autenrieth, D., LaDouceur, R., & Gilkey, D. (2025). *Slip Resistance in Public Buildings: Old Versus New*. World Safety Journal, XXXIV(2), 1–15. https://doi.org/10.5281/zenodo.15854268

World Safety Journal

A peer-reviewed journal,
published by the World Safety Organization

Journal Homepage:
https://worldsafety.org/wso-world-safety-journal/

Lead Exposure in Law Enforcement Using Novel Tasers: A Pilot Study

Kayla D. Lesperance[1], Lorri Birkenbuel[1], and David P. Gilkey[1,*]
[1] Montana Technological University, Department of Safety, Health, and Industrial Hygiene, Butte, Montana, USA

KEYWORDS

Lead;
Heavy Metal;
Shooting Range;
Novel Tasers.

ABSTRACT

Evaluation of hazards associated with Conductive Electrical Weapons (CEWs) (aka tasers) has focused on the physiological effects of electrical shock and not heavy metal exposure. Gun ranges have long been recognized as sources of lead exposure. When evaluating heavy metal exposure on firing ranges, often components of firearms like lead primers or lead ammunition are identified as the primary sources of lead. This paper serves to identify another potential heavy metal hazard at training centers which are employed by law enforcement or military. Novel Taser cartridges can carry similar components of firearm propellants, including lead primer. Many tasers are not considered firearms by class because they use compressed nitrogen gas as the propellant, but this paper aims to create a call to action to study Novel Tasers. Novel Tasers are considered firearms because they use gun powder to propel projectiles and fall under the definition of "firearm" due to the explosive nature of the gunpowder (A.T.F., 2017). Industrial hygiene sampling was performed to test if taser cartridges created a lead hazard to cadets and/or trainers during law enforcement academy certifications. The trainers fired close to 90 rounds to simulate training day where around 100 rounds are fired throughout the day. Lead surface samples were taken from various objects within the training center. The highest level of lead was found on a trainer's keyboard at 47.0 µg/ft2. The other detectable levels of lead were found on the grappling mats in the room where the Novel Taser was fired with three samples having 28.9 µg/ft2, 7.0 ug/ft2 and 1.9 µg/ft2. This study reveals the presence of lead deposition on surfaces due to Novel Taser use and conclude that further research is indicated.

1. INTRODUCTION AND BACKGROUND

Tasers are electroshock weapons that are used as a defense strategy more frequently in law enforcement protocols for assailant take-downs by use of non-lethal force (Thorne, 2023). They work by propelling a small dart from a handgun taser connected by two wires to the taser where electroshock is controlled by a trigger user. The triggered shock by the user disrupts the body's nervous system, resulting in temporary incapacitation (Plouffe, 2025). Prior research has focused on the

* *Corresponding Author*: dgilkey@mtech.edu

https://doi.org/10.5281/zenodo.15858234

physiological effects associated with electrical pulsed shock (Baliatsas et al., 2021). Investigators have identified impacts to cognitive function (White et al., 2014), electroencephalogram patterns (Gibbons et al., 2017), respiratory patterns (Ho et al., 2007), pH balance in the blood (Dawes et al., 2010; Ho et al, 2009), and perturbation to metabolic enzyme levels (Dawes et al, 2010). We were not able to find prior published work that investigated the association of taser use and heavy metal exposure. Primers containing lead are used both handgun and rifle ammunition and tasers as well. Primers have been identified as sources of lead exposure at handgun and rifle ranges (Laidlaw et al., 2017).

Lead exposure associated with gun ranges has long been recognized as a major source of lead contamination for law enforcement and military personnel and more recently recreational shooters (Laidlaw et al., 2017). However, lead exposure has been assumed to be associated with handgun or rifle ammunition projectiles and primers (Laidlaw et al., 2017; Raheed, 2021; Scott, Pavechak and DePersis, 2012; Vandebroek et al., 2019). It has been estimated that there are between 16,000 to 18,000 firing ranges in the US. Much concern has been raised for frequent users with higher levels of exposure on the range as well as potentially adverse impacts to the habitat in proximity to the range. The EPA (2005) has published lead management guidelines for shooting ranges to help reduce lead in the environment. While primers have been identified as sources of lead related to handgun and rifle use, no investigation of lead exposure has focused on primers associated with CEWs.

Exposure of greatest concern has been airborne particulates and secondarily surface contamination in range location on equipment furniture and other surfaces (Laidlaw et al., 2017; Rasheed, 2021; Scott, Pavechak and DePersis, 2012; Vandebroek et al., 2019). Laidlaw and Colleagues (2017) looked at 31 studies and found that researchers have identified elevated blood lead levels (BLLs) among shooters ranging from >10 µg/dL to > 40 µg/dL. Relationships were identified between the blood lead level and aerosol discharge, gun, number of rounds fired and caliber of round. Rasheed (2021) examined 34 studies that investigated shooter BLLs. He identified research related to both indoor and outdoor environments. The review of studies included 10 in relation military, police and intelligence agencies. It was concluded that protection is maximized by preventing exposure. Given that exposure is almost certain (BLLs) should be monitored. Safety measures should be taken respectively with elevated levels, see Table 1.

Lead sampling at shooting ranges have focused on airborne particles (Alcock, Wajak & Oosthuizen, 2022) and in the soils (Hardison et al., 2004). Alcock and colleagues (2022) evaluated both airborne and surface contamination of lead in a newly commissioned indoor range to assess the effectiveness of the ventilation system to reduce contamination and exposure to shooters. The research team obtained air samples from eight shooters using personal IOM samplers placed on the breathing zone of the shooters and seven environmental samples placed 1.5 meters above ground in strategic location where contamination was expected (Alcock, Wajak & Oosthuizen, 2022). The investigators also collected surface wipe samples following NIOSH Method 9100. Their findings revealed airborne concentrations ranging between 0.078 mg/m3 to 0.163 mg/m3 from personal samplers in the breathing zone. Environmental monitoring revealed concentrations ranging from 22 to 40 mg/m3 throughout the range. The surface wipe samples revealed concentrations ranging from 0.02 µg/cm2 to 38.377 µg/cm2 from 17 locations throughout the range (Alcock, Wajrak & Oosthuizen, 2022). The research team concluded that ranges continue to be significant sources of lead exposure and good housekeeping practices are essential. The team reported acceptable levels of surface dust contamination has been published in Australia, see Table 2.

https://doi.org/10.5281/zenodo.15858234

Table 1

The BLL of occupationally exposed workers and required safety measures, January 2020

BLL value (µg/dL)	Safety decision	Health and safety measures
Case definition range		
BLL (0.1µg/dL - 0.49µg/dL)	Case definition for BLL though "no safe value"	Check BLL monthly for 3 months to ensure 0.00µg/dL level is achieved.
BLL (0.5µg/dL – 1.49µg/dL)	-Remove pregnant women from lead exposure or women in reproductive age. -Evaluate workplace lead exposure, available controls and safety measures.	Check BLL monthly for 3 months, then every 3 months until the value of 0.00µg/dL - 0.01µg/dL level is achieved.
Range that call for caution		
BLL (1.5µg/dL – 1.99µg/dL)	-Implement workplace changes to reduce exposure to lead. -Inform workers of the health implication of high BLL. -Evaluate sources of excessive exposure to lead, and identify ineffective work safety measures.	Check BLL monthly and ensure value of 0.00µg/dL- 0.01µg/dL is achieved
Range dangerous to health		
BLL (2.0µg/dL – 2.49µg/dL)	-Is mandatory to inform worker of the health implication of BLL. -Remove worker from lead pollutants and apply medical treatment until BLL returns to acceptable level. -Enhance safety measures to reduce exposure to lead using administrative and engineering controls to ensure safe practices.	Check BLL monthly until the value of 0.00µg/dL- 0.01µg/dL is achieved
Range that signify lead toxicity		
BLL ≥ 5.0µg/dL	-inform affected workers about their current BLL level. -Remove worker from lead exposure and commence medical treatment to return the BLL to acceptable level. -Notify medical director. -Identify sources of lead exposure at workplace and implement corrective actions to reduce or stop the exposure. -Control measures at workplace must be implemented to reduce exposure.	Check the BLL monthly until the value of 0.00µg/dL- 0.01µg/dL is achieved

Note: Table 1. Designed from the reviewed literature of ABLES/CDC/NIOSH, 2015, µg/dL = microgram per deciliter.

Source: Rasheed, T. (2021). Occupational Lead Exposure and Safety Measures at Shooting Ranges: A Systematic Review. Archives of Occupational Health, 5(3), 1084-1091.

Table 2

Acceptable surface dust lead loadings [18]

Location	Lead Loading	Unit
Interior floors	0.1	$\mu g/cm^2$
Interior windowsills	0.5	$\mu g/cm^2$
Exterior Surfaces	0.8	$\mu g/cm^2$

Source: Alcock, R., Wajrak, M., & Oosthuizen, J. (2022). Assessment of the effectiveness of ventilation controls in managing airborne and surface lead levels at a newly commissioned indoor shooting range. International Journal of Environmental Research and Public Health, 19(18), 11711.

This pilot study was designed to investigate the potential of lead exposure directly associated with the Novel Taser. The hypothesis was that lead would be present on surfaces within the non-range locations due to Novel Taser use. Investigation strategies were developed to identify and evaluation lead contamination on various surfaces within the training facility.

2. METHODS

A partnership existed between the local health department and a police training facility in Colorado. To study concentrations of heavy metal distribution using a Taser 10 model, a replicate study was conducted on January 29, 2025 at a law enforcement training facility in Colorado. The training center has grappling mats, a weight room, two bathrooms and an office with normal commercial ventilation. The trainers fired approximately 90 rounds to simulate training day conditions. Lead surface samples were taken following NIOSH Method 9100 from various objects within the training center. Wipe Sampling was performed in designated locations where cadets would be grappling and also firing the tasers. These samples designated an area of one foot squared and were taken with the "S" sampling method and analyzed as discrete samples per area. Samples were submitted to Eurofins in Denver Colorado, an accredited National Environmental Laboratory Accreditation Program with Eurofins Reservoirs is an analytical laboratory also accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association (AIHA LAP, LLC), Lab ID 101533 (Eurofins, 2024).

3. RESULTS

Wipe samples taken in three locations in the training center. Findings revealed levels ranged from a low of 7µg/ft2 on a grappling mat to a high of 47 µg/ft2 on one trainer keyboard, see Table 3.

Table 3

Wipe Results for Lead on Surfaces

LOCATION	Concentration µg/ft2 (µg/cm2)
Grappling mat control	28.9 (0.0311077 µg/cm2)
Grappling mat after firing	7.0 (0.00554737 µg/cm2)
Trainer 1 keyboard	47.0 (0.050590377 µg/cm2)
Trainer 2 keyboard	BRL*

**BRL- Below Reportable Limits*

4. DISCUSSION

This pilot study was carried out in a law enforcement training center in Colorado to evaluate the need for more sampling and research. To that end, our findings suggest that additional sampling is needed. We also feel that future sampling should include additional surfaces and air samples as well. The investigation did not find levels of lead above recommended levels set by prior authorities for dust in shooting environment (Alcock, Wajrak & Oosthuizen, 2022). Although samples were not taken from windowsills and floors but did include grappling mats placed on the floors and thus standards are applicable. The recommend level for safe lead dust exposure is 0.1 µg/cm2. The NIOSH method 9100 recommends sampling with wipes per ft2. We found a concentration of lead at 7 µg/ft2 after firing the Novel Taser, to convert this concentration to the units in the Australian standard we used the following equation 7 x 0.00107639104 = 0.007534737 µg/cm2. On the control mat we found a concentration of 28.9 µg/ft2 we converted this following the same formula 28.9 x 0.00107639104 = 0.0311077 µg/cm2.

https://doi.org/10.5281/zenodo.15858234

The highest concentration was seen on the computer keyboard 47 µg/ft2. Converting the concentration, we use the same formula: 47 µg/ft2 x 0.00107639104 = 0.050590377 µg/cm2.

All three samples were below the Australian lead dust standard. However, there is no safe level of exposure to lead (Gundacker etal., 2021; WHO, 2023). Lead toxicity can adversely affect multiple systems including: Nervous, renal, cardiovascular, hematological, immunological, reproductive, and developmental (ATSDR, 2020). Further work is needed to adequately evaluate sources of lead from CEWs in law enforcement. It is clear that law enforcement and military personnel are at risk for exposure and lead toxicity. There exists BLL data suggesting lead exposure is associated shooting traditional weapons. Blood samples obtained from law enforcement personnel from 2006 through 2009 revealed the average BLL at 24.2 µg/dL in that primary population (Scott, Pavelichak & DePersis, 2012). The CDC (2021) established thresholds for lead cases at 10 µg/dL for adults and 3.5 µg/dL for children (CDC, 2025). Recreational shooters have also been studies and found to have significantly lower BLLs compared to law enforcement, the average concentration was found to be less than 2µg/dL (Scott, Pavelichak & DePersis, 2012). It is not known what proportion of lead exposure is associated with CEWs. Further research is needed.

Housekeeping in lead environments such as ranges is important for reducing exposure to particulates from ammunition and all types of lead containing primers (Alcock, Wajrak & Oosthuizen, 2022; Scott, Pavelichak & DePersis, 2012) including CEWs. Scott and colleagues (2012) examined an indoor range using both air and wipe samples for the detection of lead. Significant TWA were seen ranging from a low of 26 µg/m3 to a high of 350 µg/m3 with and overall average of 121.4 µg/m3. Wipe samples also revealed significant surface contamination with concentrations ranging from < 5 µg/ft2 to a high of 132,000 µg/ft2 on a bracket inside the shooting range with and overall average of 14,709 µg/ft3. Authors concluded that measures were needed to reduce potential exposure including ventilation, lead free primers and effective housekeeping cleaning activities (Scott, Pavelichak & DePersis, 2012).

Several limitations in this pilot study are recognized and include the small sample size. The was an exploratory study only, findings do not represent all training facilities. Future work should a include a larger sample size. Also, wipe sampling on this day were performed under abnormal conditions and were simulated to be like taser training day. This simulation may not accurately represent the actual exposure during training. The sampling was done to test whether the Taser 10 cartridge created a lead hazard to cadets or trainers. We suggest that more research is needed to answer this question. Our findings do not suggest immediate lead hazards exist with the number of taser firings.

Additionally, the trainers fired close to 90 rounds to simulate training day where around 100 rounds are fired. The highest level of lead was found on a trainer's keyboard at 47.0 ug/ft2. The other detectable levels of lead were found on the grappling mats with three samples having 28.9 ug/ft2, 7.0 ug/ft2 and 1.9 ug/ft2. Since there was detectable lead on one trainer's keyboard and on the grappling mats, it is plausible that the lead would be from the cartridges. Although the Novel Taser cartridges have may create a lead hazard, it must be noted that there are also other lead hazards known in this area where there is also a shooting range on-site.

Finally, the trainers at this facility do not train with firearms for the cadet academy but they may share keyboards with other shooting range trainers. Dust and soil may also be tracked from the range to the grappling mats inside of the grappling center. This is likely but, the shooting range is more than 1,000 yards away from the area that we examined. There is potential in this case for contamination from the

https://doi.org/10.5281/zenodo.15858234

shooting range to be tracked in on shoes, clothing or hands and more study needs to be performed to categorize the risk of Novel Tasers and heavy metals.

The exposure to taser primers is directly associated with the training process. Typically, the cadet will fire a taser and a training officer will certify that the cadet has correctly fired a taser for the academy module. In essence, these modules are a one-day event, and every cadet will be certified this day so the exposure by the lead primer is most likely to occur during this scenario. The training schedule increases frequency of exposure to inhalable aerosol primer and for increased distribution of the particulate aerosol substance on surfaces, grapple mats, office equipment, and trainers' field equipment.

5. CONCLUSION AND RECOMMENDATIONS

There needs to be further occupational study in indoor and outdoor firing ranges or other training facilities which use Novel Tasers. Some taser training for cadets and other specialized users occurs during module style academy training where the length ranges from 16 to 40 weeks (C.P.O.S.T., 2025). This means that the taser module is designated and exclusively timed in the cadet training. Trainers and management need to be aware of the limitations in their ventilation system and practice good housekeeping with regular cleaning of surfaces such as grappling mats and keyboard where contact is certain. There should be a particulate filtering ventilation system to capture firearm and CEW discharged lead particulates in the air. There should also be proper hygiene with cleaning solutions designed for lead cleaning then the lead in aerosol or lead on surfaces could become an exposure. Since many law enforcement officers are part of government entities like municipal or county level structures, they are exempt from OSHA and there may be more exposure risk from indoor and outdoor gun ranges on site than by Novel Tasers (O.S.H.A., US).

AUTHORS' CONTRIBUTIONS

Mrs. Kayla Lesparence was the graduate student who conceived the project and worked in all phases of the study and manuscript preparation. Mrs. Lespearence defended her work and graduated and now is recognized as a Graduate Safety Professional (GSP) and practicing Industrial Hygienist. Kayla earned her bachelor's degree in Environmental Health at Colorado State University and her master's in IH at Montana Tech University. Dr. Birkenbuel is an Associate Professor who provided support for the project and review for this manuscript. Dr. Gilkey was the Co-Major Advisor who worked with Kayla through all phases of the project.

FUNDING AND ACKNOWLEDGMENTS

This study was supported in part by the National Institute for Occupational Safety and Health Training Project Grant (grant no. T03OH008630). The contents of this publication are solely the responsibility of the authors and do not represent the official views of the CDC or NIOSH.

REFERENCES

Alcock, R., Wajrak, M., & Oosthuizen, J. (2022). Assessment of the effectiveness of ventilation controls in managing airborne and surface lead levels at a newly commissioned indoor shooting range. International Journal of Environmental Research and Public Health, 19(18), 11711.

A.T.F., Bureau of Alcohol, Tobacco, Firearms and Explosives. (2017, April 27). Bureau of Alcohol, Tobacco, Firearms and Explosives. Firearms - Guides - Importation & Verification of Firearms, Ammunition - Gun Control Act Definitions - Firearm | Bureau of Alcohol, Tobacco, Firearms and Explosives. https://www.atf.gov/firearms/firearms-guides-importation-verification-firearms-ammunition-gun-control-act-definitions

ATSDR. (2020). Toxicological profile for lead. Access June 5, 2025 https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=96&tid=22

Axon Enterprise Inc. . (2024). Taser 10. Axon. https://www.axon.com/products/taser-10

Baliatsas, C., Gerbecks, J., Dückers, M. L., & Yzermans, C. J. (2021). Human health risks of conducted electrical weapon exposure: a systematic review. JAMA network open, 4(2), e2037209-e2037209.

CDC. (2021). Lead, elevated blood levels, adult (>16 years) 2010 case definition. Accessed on June 4, 2025 Lead, Elevated Blood Levels, Adult (≥16 Years) 2010 Case Definition | CDC

CDC. (2025). Childhood lead poising prevention: Recommended actions based on blood lead level. Access on June 4, 2025 Recommended Actions Based on Blood Lead Level | Childhood Lead Poisoning Prevention | CDC

C.P.O.S.T., Colorado Peace Officers Standards and Training. (2025). Basic academies. Colorado POST. https://post.colorado.gov/academies/basic-academies

Dawes DM, Ho JD, Reardon RF, Sweeney JD, Miner JR. (2010). The physiologic effects of multiple simultaneous electronic control device discharges. West J Emerg Med, 11(1):49-56.

Environmental Protection Agency (EPA). (2005). Best management practices for lead at outdoor shooting ranges. The US EPA Region II Agency.

Eurofins Scientific. Air and Vapor. (2024). https://www.eurofinsus.com/environment-testing/services/air-and-vapor/

Gibbons JA, Mojica AJ, Peele ME. (2017). Human electrical muscular incapacitation and effects on QTc interval. J Forensic Sci, 62(6):1516-1521. doi:10.1111/1556-4029.13490

Gundacker, Claudia, Martin Forsthuber, Tamás Szigeti, Réka Kakucs, Vicente Mustieles, Mariana F. Fernandez, Elizabeth Bengtsen, Ulla Vogel, Karin Sørig Hougaard, and Anne Thoustrup Saber. "Lead (Pb) and neurodevelopment: A review on exposure and biomarkers of effect (BDNF, HDL) and susceptibility." International Journal of Hygiene and Environmental Health 238 (2021): 113855.

Hardison Jr, D. W., Ma, L. Q., Luongo, T., & Harris, W. G. (2004). Lead contamination in shooting range soils from abrasion of lead bullets and subsequent weathering. Science of the Total Environment, 328(1-3), 175-183.

Ho JD, Dawes DM, Bultman LL, et al. (2007). Respiratory effect of prolonged electrical weapon application on human volunteers. Acad Emerg Med, 14(3):197-201. doi:10.1197/j.aem.2006.11.016

Ho JD, Dawes DM, Cole JB, Hottinger JC, Overton KG, Miner JR. (2009). Lactate and pH evaluation in exhausted humans with prolonged TASER X26 exposure or continued exertion. Forensic Sci Int., 190(1-3):80-86. doi: 10.1016/j.forsciint.2009.05.016

Jauchem, J. R. (2015). Exposures to conducted electrical weapons (including TASER® devices): how many and for how long are acceptable?. Journal of forensic sciences, 60, S116-S129.

Laidlaw, M. A., Filippelli, G., Mielke, H., Gulson, B., & Ball, A. S. (2017). Lead exposure at firing ranges—a review. Environmental Health, 16, 1-15.

O.S.H.A., Occupational Safety and Health Administration. U.S. Department of Labor. State plan frequently asked questions- State and Local Government Workers . Occupational Safety and Health Administration. (n.d.). https://www.osha.gov/stateplans/faqs

Plouffe, W. C. (2025, May 5). Taser. Electrical control device. Encyclopedia Britannica. https://www.britannica.com/science/electrical-shock

Rasheed, T. (2021). Occupational Lead Exposure and Safety Measures at Shooting Ranges: a Systematic Review. Archives of Occupational Health, 5(3), 1084-1091.

Scott, E. E., Pavelchak, N., & DePersis, R. (2012). Impact of housekeeping on lead exposure in indoor law enforcement shooting ranges. Journal of Occupational and Environmental Hygiene, 9(3), D45-D51.

Thorne, R. (2023). Taser 101: What are tasers & how they work (the ultimate guide). Access June 3, 2025 https://theperfectdefense.com/what-are-tasers/

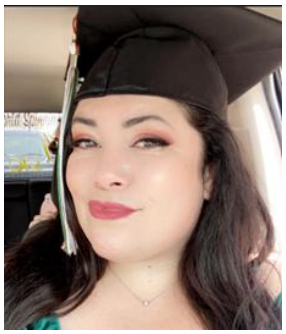
White MD, Ready JT, Kane RJ, Dario LM. (2014). Examining the effects of the TASER on cognitive functioning: findings from a pilot study with police recruits. J Exp Criminol,10(3):267-290. doi:10.1007/s11292-013-9197-9

Vandebroek, E., Haufroid, V., Smolders, E., Hons, L., & Nemery, B. (2019). Occupational exposure to metals in shooting ranges: a biomonitoring study. Safety and health at work, 10(1), 87-94.

Widemo, F. (2021). Shooting habits and habitats-effects of education and legislation on the phasing out of lead shot. Environmental Science & Policy, 118, 56-62.

World Health Organization (WHO). Lead poisoning. Accessed June 4, 2025 Lead poisoning

MAIN AUTHOR



Kayla Lesparence earned her BS degree in Environmental Health from Colorado State University in 2013. During her undergraduate studies, she worked in the OSHA Lab for 12 months during her senior year. She learned a great deal about Occupational Safety and Health (OSH) and Industrial Hygiene (IH) and became passionate about preventing injury and illness to workers and the community. During her time in the lab, she mastered over 100 pieces of IH equipment. Kayla completed an OSH and IH internship at Broadcom, where she gained experience conducting OSH audits in ladder safety, lockout tagout, confined space, hazardous chemical hygiene, evacuation training, ADA compliance, noise exposure, and environmental project tracking. Her experiences at Broadcom only intensified her passion for OSH and IH. She joined the Tri-County Health Department as an IH professional. Kayla began her graduate studies in 2022 and graduated with her MS degree in 2025 in IH. She continues to work as an IH professional at the Adams County Public Health Department, Colorado, USA, serving the citizens in the region. Kayla loves her work and will continue to make the world a safer place for many years as a practicing IH professional.

CITATION:

Lesperance, K., Birkenbuel, L., & Gilkey, D. (2025). *Lead Exposure in Law Enforcement Using Novel Tasers: A Pilot Study*. World Safety Journal, XXXIV(2), 16–23. https://doi.org/10.5281/zenodo.15858234

World Safety Journal

A peer-reviewed journal,
published by the World Safety Organization

Journal Homepage:
https://worldsafety.org/wso-world-safety-journal/

Wildfire Threat, Mitigation, Risk Transfer and Insurability: Texas and the Western US

Steven E. Moore [1], and David P. Gilkey[1,*]
[1] Montana Technological University, Department of Safety, Health, and Industrial Hygiene, Butte, Montana, USA

KEYWORDS

Wildfires;
Mitigation;
Risk Transfer;
Insurability.

ABSTRACT

Wildfire risk in the US and around the world has increased dramatically in recent years. In the US, the western states including Montana, Washington, Oregon, and California have been most impacted. Texas has now become a hot spot for wildfires with significant losses as well. Risk transfer has been traditionally through insurance and dependent on community funded responses. However, due to staggering losses, the insurance community has chosen to non-renew policies throughout the western states and in Texas, significantly impacting the health and wellbeing of communities and individuals. Mitigation from wildfire risk is possible and should be a common practice in the at-risk states. Communities and individuals can reduce fuel load on properties, create safety zones around structures, manage sources of human caused ignition, use fire resistant building materials, and ensure rapid and effective response resources are available. Insurability is becoming more difficult causing home and business owners to rely on default state or federal programs as the last means of risk transfer. Vulnerable communities are especially impacted with options too expensive to engage leaving many uninsured and/or underinsured. New strategies are needed to provide asset protection. The National Flood Protection Program serves as an encouraging model to address the growing wildfire risk in the west and Texas. This type of program would require communities and individuals to be more engaged in all phases of wildfire management. Stakeholders would be partners in cohesive planning, mitigation, response and recovery. The challenges are significant and this paper provides and overview of the wildfire threat, insurability, mitigation strategies, and program alternatives.

1. INTRODUCTION AND BACKGROUND

Wildfires have increased significantly in the US and globally (Zhang et al., 2022). The impacts to humans, animals and the environment have been devastating (Cunningham, Williamson & Bowman, 2024). Australia's wildfire in 2019-2020 claimed an estimated 2.8 billion vertebrates and decimated 116 plant species in the fire ravaged area. Asia's fires were associated with more than 100,000 premature deaths due to air pollution with an estimated economic impact of over $16

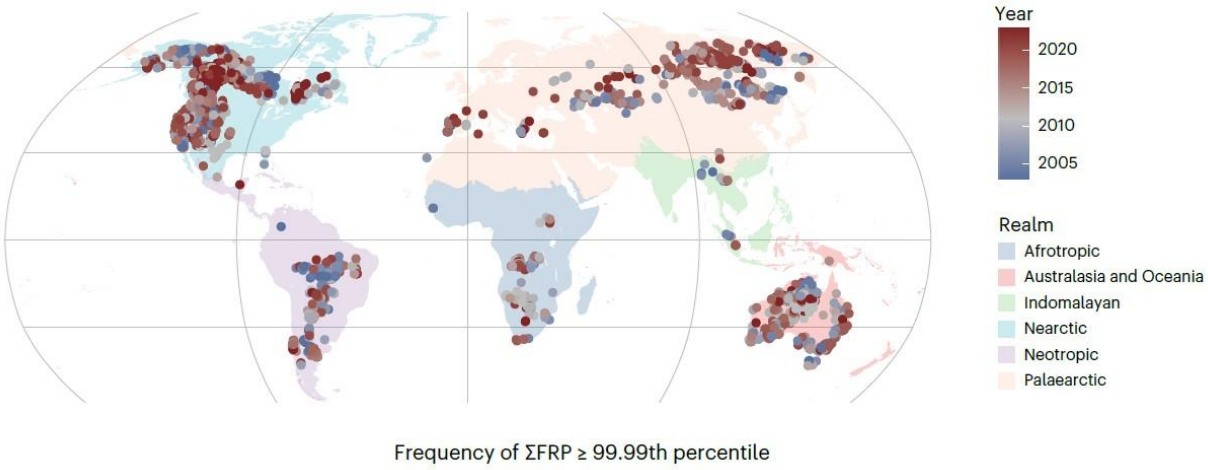
* *Corresponding Author*: dgilkey@mtech.edu

https://doi.org/10.5281/zenodo.15854460

billion (Cunningham, Williamson & Bowman, 2024). Satellite images over a 20-year period from 2003 to 2023 show a 2.2-fold increase in wildfires around the world, see Figure 1

Figure 1

Extreme Wildfire Events 2003 – 2023



Source: Cunningham, C. X., Williamson, G. J., & Bowman, D. M. (2024). Increasing frequency and intensity of the most extreme wildfires on Earth. Nature Ecology & Evolution, 8(8), 1420-1425

The frequency and intensity of wildfires have increased exponentially. Increasing aridity associated with climate change has been the major driver of fires in the western US between 1979 to 2015 (Abatzoglou & Williams, 2016). Over the past four decades, wildfires have quadrupled their devastation in the US (Burke et al., 2021). In January 2025, Southern California was impacted by several wildfires that burned into the greater Los Angeles area causing devastating impacts. The Palisades and Eaton Fires both burned uncontrolled into heavily populated areas, ultimately claiming the lives of 29 individuals and destroying thousands of homes and businesses (MacCarthy & Richter, 2025). In the months prior to the destructive firestorm, many residents within the impacted areas were forced to seek new homeowners' insurance (MacCarthy & Richter, 2025). The situation was due to insurance companies within California non-renewing policies for homes located in high wildfire risk areas. The strategy was intended to reduce the insurance company's financial risk. This type of business decision has become a common strategy for insurance companies to insulate investments from the growing list of wildfire disasters with a high number of claims requiring payout (MacCarthy & Richter, 2025). While this issue may seem limited to California, it is occurring across the United States in areas prone to wildfires.

As communities expand into adjacent rural areas, homes are built on landscapes that have historically had frequent wildfires. Urban expansion into what is known as the Wildland Urban Interface (WUI) classifies homes as those at greater risk of being impacted by wildfire (Jones et al., 2011). In response to the growing threat, insurance companies elect non-renewal policies, or in many cases, deny coverage for new policies due to the homes being in a high wildfire risk area and their potential payout. While areas within California, Colorado, and Montana are known for their wildfires, Texas has come to the forefront by having numerous areas with high wildfire risk as well.

In the summer of 2024, the Austin, TX news station KVUE released a segment highlighting several communities around Austin that were being impacted by the same strategy (Sanchez, 2024). The article highlighted several homeowners who live adjacent to the Balcones Canyonland Preserve, an area known to protect the endangered Golden-Cheeked Warbler and the now delisted, Black Capped Vireo. Due to

https://doi.org/10.5281/zenodo.15854460

the wildfire risk from these protected habitat lands, insurance companies opted not to renew homeowners existing policies. While the practice of non-renewal for wildfire threat is a recent problem for Texas, it has been a common issue for residents of the Gulf Coast for years. Texas Monthly highlighted the growing struggles many homeowners face with obtaining and maintaining coverage for homes along the hurricane-prone coast (Hardy, 2024). With the issue now expanding to impact inland communities, what resources are available to residents, and what are the potential long-term solutions?

2. INSURANCE REGULATIONS AND UNDERWRITING

Severe weather events, such as hurricanes and floods, pose a significant risk to homes located in these disaster-prone areas. This is especially true within Texas, where the Gulf Coast is known for its hurricanes. Recently, however, there has been a growing impact on homeowners who reside inland within areas deemed as "high risk" for wildfires. If an insurance company determines that a home has high potential for damage or loss due to a specific type of disaster, the policy may be non-renewed. A non-renewal is the equivalent of being dropped by a carrier, forcing a homeowner to seek other options. In most cases, the homeowner will be unable to obtain another policy due to the risk and will be forced to utilize a last-resort coverage. Questions are often raised regarding how and why insurance companies manage their policies in this way. This can be answered by reviewing the insurance industry and how each company manages risk in its portfolio of insureds structures.

Within the United States, Insurance companies are regulated at the state level (NAIC, 2011). This state-level regulation is traced back to the 19th century, with the McCarren-Fergeson Act of 1945 clarifying that "states should regulate and tax the business of insurance" (NAIC, 2011). This regulation ensures that insurance companies comply with all required standards to operate within a given state. While states may vary regarding specific regulations, issuing policies and managing risk to a company's portfolio is standard. When an individual inquires about coverage with a company, the insurance agency reviews data for the individual and properties being covered in a process called underwriting.

Underwriting is used to evaluate the financial risk associated with a policy. The underwriting process is broken down into six functional areas: 1) Objective Analysis, 2) Risk Assessment, 3) Insurance Tariff Calculation, 4) Insurance Premium Calculation, 5) Negotiating the Franchise, and 6) Negotiating the Insurance Amount (Narzullaevich, 2022). Our focus is on the risk assessment process.

During the risk assessment process, an underwriter focuses on identifying any potential risk of losses a policy could bring to the insurer. This includes financial risk due to the individual themselves or the property (Narzullaevich, 2022). Risk due to potential claims associated with the property includes an evaluation of any noted threats that could result in damage or loss of the property. While this is a broad category, areas with well-known threats, such as weather-related events, are easier to evaluate due to available data. The underwriter utilizes data on known risks along with documented claims within the area to assess the overall risk of the policy (Narzullaevich, 2022). At that point, a policy will either move forward to cost determination or be denied. This process is also completed during a policy renewal evaluation period.

3. WILDFIRE RISK

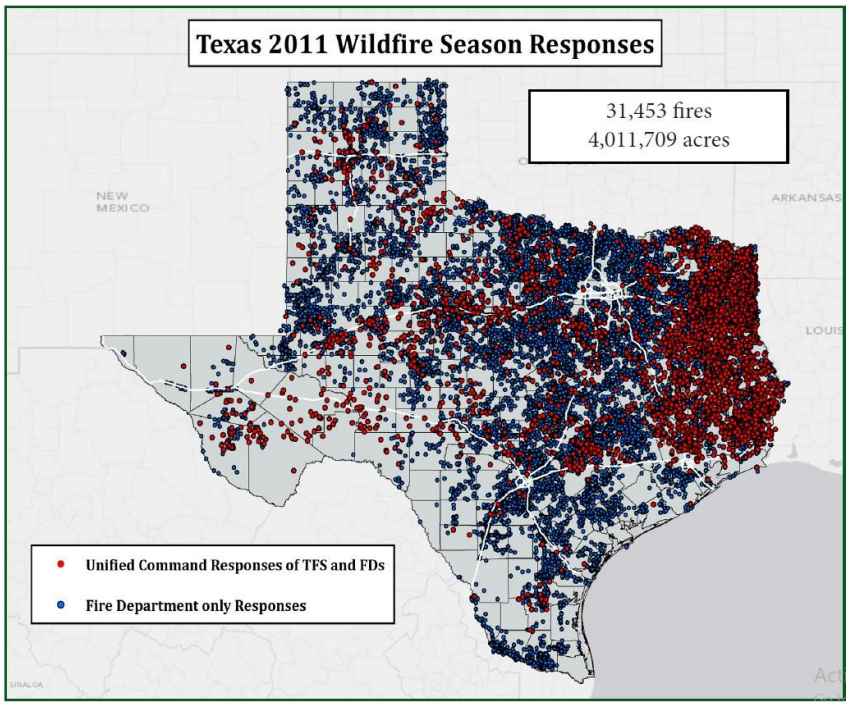
Each year, the underwriting process eliminates properties from eligibility due to the risk associated with the coverage. This has been a known issue along the Gulf coast of Texas, where property losses have been significant and risk is deemed high associated with hurricanes and coastal flooding.

https://doi.org/10.5281/zenodo.15854460

Within California, insurance companies have been denying and non-renewing policies for wildfire danger and associated risk of losses for years. While the issue of insurance non-renewal for wildfire threat in Texas is relatively new, the data shows that home loss due to wildfires in Texas has been a consistent and growing problem. According to a report by the Texas A&M Forest Service, 2011 was one of the most destructive wildfire years recorded for the state. Over 31,000 wildfires were reported, resulting in over 4 million acres being burned and 2,947 homes destroyed (Jones et al., 2012) with costs estimated at $505 million (NOAA, 2011), see Figure 2.

Figure 2

Texas Wildfires 2011



Source: Texas A&M Forest Service. (2025). Texas Wildfire Risk Explorer. TXWRAP. https://wrap.texaswildfirerisk.com/ page 10

While many wildfires burned throughout 2011, the report highlighted several notable fires that resulted in a high number of homes destroyed or damaged. Four significant wildfires included: 1) Rockhouse Fire in Jeff Davis and Presidio Counties, resulting in 23 homes being destroyed; 2) the Possum Kingdom Complex in Palo Pinto, Young, and Stevens Counties, resulting in 168 homes destroyed; 3) the Bastrop Complex Fire in Bastrop County resulting in 1,660 homes destroyed; and finally, 4) the Riley Road Fire in Montgomery, Grimes, and Waller Counties, resulting in 73 homes destroyed.

Since 2011, Texas has continued to experience high impacts from wildfires that result in property damage and loss. In January of 2024, the Texas Panhandle was impacted by the Smokehouse Creek Fire, which burned over 1.2 million acres in Texas and Oklahoma destroying over 100 homes and businesses (Asch, 2025). All the fires are the result of conditions that could be evaluated to determine an area's fire risk utilizing a publicly available rating system. The National Fire Danger Rating System (NFDRS) is utilized by underwriters to determine potential risks to a property from wildfires.

https://doi.org/10.5281/zenodo.15854460

For wildfire to propagate, there must be three key elements in place as outlined in the fire triangle: Fuel, Heat, and Oxygen (NWCG, 2025). The most consistent of the three elements is fuel. Fuel is characterized as any grass, brush, timber, and slash that is consumed during the combustion of the fire and directly relates to fire behavior (NWCG, 2025). Since fuel is a constant on the landscape, it is easy to map and categorize into groups known as "fuel models." Fuel models are utilized to determine fire behavior at specific sites on the landscape, utilizing mathematical models (Anderson, 1982). This means that the more grass, brush, and trees that are adjacent to a structure, the more likely it is to be impacted by high-intensity fire. Ultimately, insurance companies interpret these circumstances as increased exposure, risk, and probable losses due to wildfires.

While fuels are relatively consistent, weather and ignition sources are dynamically changing. Modeling fire risk assumes weather conditions are conducive to wildfire spread and extreme behavior. Ignition modeling is based on historical data that captures every wildfire that has been responded to by organized resources. If a property is adjacent to an area that historically has had numerous wildfires, it would be at greater risk of being impacted by wildfire within any given year. This type of information has become easier to access due to open-source data, such as the Texas Wildfire Risk Explorer (2025). Individuals within any area of Texas can quickly assess the threat to their home from potential wildfires to identify their perceived risk. Since fuel is the most constant variable in determining fire behavior, they are one of the easiest inputs that can be altered to reduce risk; resulting in a more insurable home and being less prone to damage or loss in a disaster.

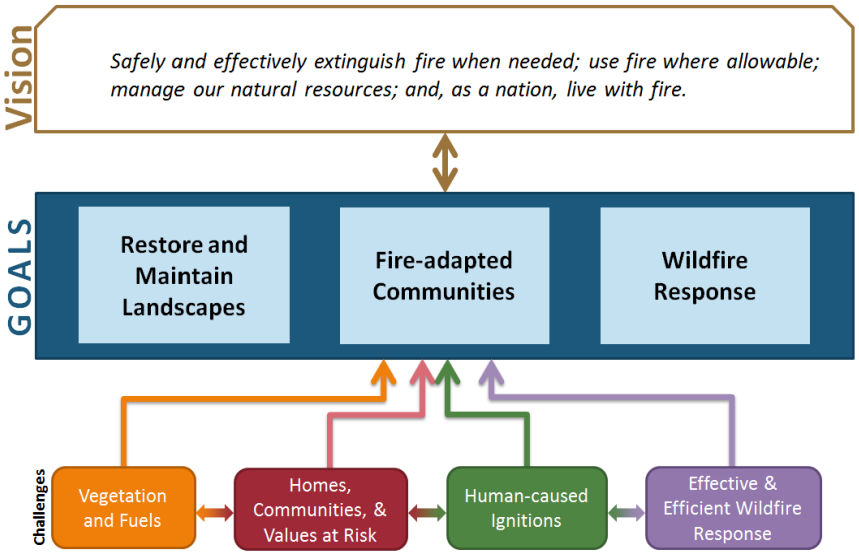
4. WILDFIRE MITIGATION STRATEGIES

Coordinated wildfire mitigation strategies became a reality after the Federal Land Assistance, Management, and Enhancement Act of 2009 (FLAME Act) was passed by congress (US forest Service, 2014). The three-phase cohesive program established national goals. The FLAME Act required that the Nation address the broad challenges including managing vegetation/fuels; protecting homes, communities, and other values at risk; managing human-caused ignitions; and effectively and efficiently responding to wildfires (US Forest Service, 2014). The FLAME Act provided general guidance for designing and prioritizing fuel treatments; strategically placing fuel treatments; increasing use of wildland fire for meeting resource objectives. The act supported expanding methods to improve the resiliency across the nation. The next priority focused on engaging homeowners and communities in taking proactive steps prior to wildfires to mitigate risk and losses. Next, the act emphasized programs and activities tailored to address local needs in preventing human-caused fires. Lastly, the plan aimed to safely and effectively extinguish fires, use fire to mitigate risk when and where allowable, manage natural resources, and support safe strategies to coexist with wildland fires (US Forest Service, 2014). The vision, goals and challenges from the National Cohesive Management Strategy are seen in Figure 3.

One of the most effective methods to reduce the severity of wildfire risk has been the practice of using prescribed burns that reduce fuel loads. This method is both effective and cost-efficient. Prescribed burns reduce wildfire hazards by decreasing available fuel vegetation. They also support ecosystem restoration, maintenance and silviculture (US Forest Service, 2014). The focus was placed on five key factors associated with wildfire, see figure 2. Fundamentally, controlled fires are particularly effective tools for areas with fire-adapted or fire-dependent vegetation and a history of wildfire (US Fire Service, 2014).

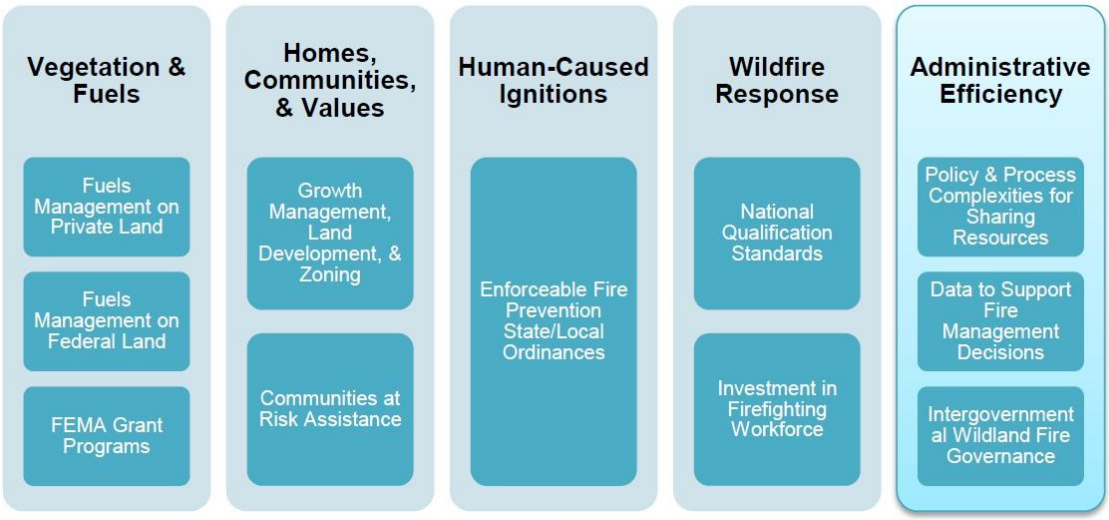
https://doi.org/10.5281/zenodo.15854460

Figure 3
National Cohesive Management Strategy



Source: US Forest Service. (2014). National cohesive wildland fire management strategy. Access June 11, 2025 https://www.fs.usda.gov/restoration/cohesivestrategy.shtml page 6

Figure 4
Five Key Factors Associated with Wildfire Mitigation, Response and Management.



Source: US Forest Service. (2014). National cohesive wildland fire management strategy. Access June 11, 2025 https://www.fs.usda.gov/restoration/cohesivestrategy.shtml page 25

Additional non-fire methods are also used to reduce fuel hazards. Common strategies include using mechanical devices such as equipment for thinning and disposal of vegetation and debris. Additionally, livestock grazing can be used to reduce fuels in rangeland areas. Less desirable methods may also include using herbicides to eliminate and/or control vegetation (US forest Service, 2014).

https://doi.org/10.5281/zenodo.15854460

Wildfire prevention and protection begins with proper zoning, careful planning and cautious expansion into the WUI (Reams et al., 2005). An estimated 1/3 of all homes are located in the WUI (Lee, Ma & Li, 2022). Communities proximate to WUI should develop Community Wildfire Protection Plans that include researching the wildfire history in the area, mapping the topography, use of fuel and vegetation maps, research about the demographics of the areas and identifying at-risk individuals, proper risk assessment, and an action plan for mitigation and response (USFA, 2025). Areas with high risk of wildfires should include coordinated mitigation strategies with involvement of all stakeholders (US Forest Service, 2014).

Community actions to reduce risks for wildfires may include the installation of fire break zones in hazardous areas (Lee, Ma & Li, 2022). Adhering to building codes are important especially those that require fire resistant materials be used in homes and businesses (Reams et al., 2001; US forest Service, 2014). The NFPA 299 is an example of such a code that provides standards to reduce wildfire risk by recommending proper risk assessment of property and structure, defensible zones by keeping vegetation 30’ to 100’ from structures, proper building design and materials, community planning and action (NFPA, 1997).

Despite push back, community residents should engage effective management practices to reduce fuel loads (Reams et al., 2005). Working collectively is more effective than recommending individuals take independent action. However, landowners may be reluctant to commit resources to an event that they feel is uncontrollable (Reams et al., 2005). Generally speaking, ordinances aimed at controlling vegetation are not well accepted. Property owners prefer to do as they wish with their property and not be told what vegetation is preferred or its location in proximity to structure (Reams, et al., 2005). Residents often reject recommendations to remove vegetation in proximity to their home pointing to negative valuation as one major reason. Prior research revealed that citizens prefer to believe that technology would protect their property in the event of wildfire (Mileti & Peek-Gottschlich, 2001).

The public is willing to accept education on the topic and the right to choose mitigation strategies (Reams et al., 2001). Educational initiatives have been expanding and successful across the US. Many forms of education include demonstration gardens, public events and meetings, newspapers, radio and television broadcasts (Reams et al., 2005). Property owners are taught the importance of hazard reduction and home hardening through thinning vegetation and creating fire protection and safety zones around their homes and structures. Other successful programs have included public assistance such as free home and property inspections, free clearing and chipping of debris as well as cost-share programs that support similar services (Reams, et al., 2001). The most common approach to wildfire protection is transfer of risk via insurance however, this is becoming more difficult in fire prone area across the nation, especially in the west and now in Texas leading to underinsurance and non-renewal challenges.

5. UNDERINSURANCE

Insurance companies utilize the underwriting process to evaluate the financial risk of their policies. With the increasing number of wildfires that result in numerous home losses, the financial risk to these companies has been amplified. While the risk associated with the environment in which the home is built has a direct effect on risk, there are additional factors that influence financial risk. One of those being rising construction costs, especially following a significant disaster. In the article “The Unnatural Disaster of Insurance, Underinsurance, and Natural Disasters”, Klein (2023) assessed numerous fires across the United States that resulted in home loss to determine insurance coverage and shortfalls. Upon review of California’s Camp Fire that burned through the city of Paradise in 2018, it was determined that

https://doi.org/10.5281/zenodo.15854460

the average cost to rebuild a lost home far exceeded the coverage most insurance policies provided. Following the Camp Fire, Merced Property and Casualty underwent financial hardship, resulting in the seizure and liquidation of the company by California (Boyett & Yan, 2018). Since insurance is regulated at the state level, California handled the liquidation of an insurance company and the settlement of any claims through the guarantor as needed (Boyett & Yan, 2018).

While the issue may seem specific to California, Klein (2023), evaluated the central Texas fires of 2011 and reported that 56% of individual owners had an average underinsured cost of $110,000. The author reported that this trend continued throughout all the disasters that he reviewed (Klein, 2023). Further research in Colorado by the Department of Insurance noted that the average baseline cost to rebuild is $250 per square foot with only 35% of policies being underwritten to cover these costs (Auer & Hexamer, 2022). As the baseline cost to reconstruct a home increased, the percentage of uninsured policies also increased, with 67% of all policies being insufficient at a rebuild cost of $350 per square foot (Auer & Hexamer, 2022). This means that insurance companies are paying the maximum amount on at least 30% of all claims per disaster.

6. THE FAIR RISK TRANSFER PLAN

Insurance companies are denying the renewal of policies within high-risk areas instead of increasing rates, which are also capped under state regulation (Hardy, 2024). Once denied or dropped, homeowners must seek last resort insurance coverage. Some mortgage companies offer these types of policies to their customers. A last resort policy may also be obtained through a state-run Fair Access to Insurance Requirements (FAIR) Plan. In 1968, California developed the first FAIR Plan following a series of wildfire outbreaks that affected communities around the Los Angeles area (Kousky et al., 2019). A FAIR Plan is the last resort of insurance option for residents who cannot find a carrier on the open market. All insurance companies licensed to operate within California must participate in the state's FAIR Plan. Any policies issued through the FAIR Plan are randomly assigned to a carrier from the pool of all participating insurance companies that operate in the state (About FAIR Plan, 2024). This process of random policy assignment ensures that the risk associated with the FAIR Plan Policies is shared evenly across all insurance companies.

Currently, Texas is one of 35 states that offers a FAIR Plan as a last resort of insurance. Unlike California, the Texas FAIR Plan Association (TFPA) manages all issued policies through the voluntary market and does not rely on primary carriers (Coverage & Eligibility, 2024). Applicants to TFPA must meet eligibility requirements, including at least two declinations from insurers. This framework provides a last resort of insurance for homeowners within the state of Texas, with most current policies being issued along the Gulf Coast for flood and hurricane threat (Coverage & Eligibility, 2024). One noted issue with this type of coverage is that premiums are higher than open market options but are still below the premium amount needed to cover a policy payout for home loss. This can create a false market based on artificially low premiums that do not reflect the actual risk to a home (Lueck and Bradshaw, 2012). They also fail to account for the elevated costs to repair or rebuild following a disaster. This issue can compound the financial impacts to a FAIR Plan if a disaster results in the loss of a high number of homes utilizing these policies. Following the Palisades and Eaton Fires, the California FAIR Plan required a $1 billion bailout from the insurance companies that operate within the California market (Ma, 2025). This funding was needed for the FAIR Plan to settle all payouts for policies affected by the fires.

https://doi.org/10.5281/zenodo.15854460

As a result of the government regulated bailout, insurance companies have received approval to enact an emergency rate increase (Ma, 2025). One of the largest carriers, State Farm Insurance Company, received preliminary approval for an increase of 22% after stating, "the multibillion-dollar payouts in the Los Angeles area would threaten its balance sheet and the broader market" (MA, 2025). Another option for insurers' response to these growing threats is to cease operations within the state. In his doctoral dissertation, Dr. Almuhana (2024) notes that insurance companies' withdrawal from California markets are a direct result of disaster related losses, financial risk and limitations to adjust rates to offset impacts to portfolios in the event of a future disaster. Since the FAIR Plan is comprised of companies operating within the California market, there is still some risk of a high number of payouts from a disaster to private companies. The sustainability of the FAIR Plan is then brought into question if events like the Paradise Fire or Palisades Fires are becoming far more common.

7. RISK TO VULNERABLE POPULATIONS

The process of dropping insured homes and business owners is becoming a more common practice by insurance companies when evaluation of wildfire risk is high and unfairly impacting vulnerable populations (Klein, 2025). Evaluation of the insurability due to wildfire risk shows a disproportionate risk to low-income populations (Auer & Hexamer, 2022). This relationship between risk and low-income was identified through an analysis of counties within the United States with the highest wildfire risk compared to the county poverty level. The findings highlighted those areas with the highest wildfire risk also had higher poverty rates (Auer & Hexamer, 2022). This correlation was consistent for numerous states, including California and Texas. With an established relationship between wildfire risk and insurance non-renewal, lower-income populations are at a higher risk of being adversely affected. This is mainly due to low-income families' inability to pay higher coverage rates, including those of the FAIR Plan. These individuals are also less likely to have the means to recover from a disaster on their own. With the noted increased rebuilding costs, homeowners who lack insurance or are underinsured must rely on FEMA for assistance during a disaster.

8. FEDERAL FEMA PROGRAMS

Meant as a last resort of assistance, the FEMA Individual Assistance program assists those affected by a federally declared disaster who lack insurance or are substantially underinsured (Webster, 2025). While this program serves the vulnerable populations impacted by a disaster, the cost of any payout is deferred to taxpayers through FEMA (Webster, 2025). FEMA's Individual Assistance program was not designed to replace primary insurance and is only available for communities impacted by a disaster that receive a Federal Disaster Declaration (Webster, 2025). FEMA also manages the National Flood Insurance Program (NFIP) to provide an affordable flood insurance option for residents who would otherwise be unable to obtain a policy (Liao et al., 2024). The NFIP offers policies for flood insurance that are sold through private companies and underwritten by the federal government. The NFIP also coordinates with local governments to ensure that flood zones are correctly delineated and that any residential structures within those areas conform to specific building codes (Liao et al., 2024). The framework for NFIP could be adapted to develop a similar wildfire-type policy. While Liao et al. acknowledge that the framework exists for a wildfire specific policy, there are also some drawbacks. The most notable is the potentially high cost of coverage if prices are set based on evaluated risk (Liao et al., 2024). This would likely compound the issue of disproportionate risk to those in lower socioeconomic areas. There are also numerous benefits, including guaranteed access to coverage and potential mitigation requirements to help reduce home loss. Mitigating high-risk fuel types can directly increase a home's survivability and thus would be justified under the program.

https://doi.org/10.5281/zenodo.15854460

If there were an NFIP type system for wildfire insurance, required mitigation work could be implemented within high-risk fire sheds. While this can create additional restrictions on coverage, it would benefit the overall survivability of a home. This mitigation is done by altering the fuels surrounding a home to reduce potential impact from direct flame contact and firebrands, or embers (Hazra & Gallagher, 2022). By requiring mitigation work in connection with insurance coverage, homeowners must meet mitigation standards to maintain coverage. This is a benefit since it is noted that most homeowners only prioritize mitigation after impacts from a wildfire (Hazra & Gallagher, 2022). The research further highlights that most homeowners prioritize home amenities over wildfire mitigation work. By having a program that holds homeowners accountable, the risk to homes could be managed on a per-home basis. To fully implement this type of program, there would remain the need for federal legislation, similar to the National Flood Insurance Act of 1968.

9. CONCLUSION

The threat from wildfire continues to be a growing risk to communities across the United States as urban areas expand outward. Homes are now built on larger lots in natural areas intermixed with grass, brush, and trees. This expansion has resulted in residential areas with a high risk of being impacted by wildfire. While wildfires have burned on the landscape for decades, those areas were largely unpopulated. With the increase in homes lost during wildland fire incidents, insurance companies must address their portfolio's financial solvency and risk by not insuring at-risk homes. While not all fires cause home loss, incidents like the Bastrop Complex, Camp, and Palisades fires all resulted in thousands of homes lost, requiring numerous policy payouts from insurance companies. As a result, insurance companies now opt to non-renew or deny coverage for homes in high wildfire risk areas.

While denying a policy may protect the insurance company from loss, it increases the homeowner's vulnerability in the event of a disaster. Individuals must then seek a replacement policy on the open market or through their mortgage company. If no coverage is available due to repeated declinations, they may pursue coverage through a FAIR Plan. These policies are managed within each state to provide coverage when no other options exist. These plans often provide minimal coverage for higher rates than open market competitors. However, they often fail to have rates reflecting the risk to all covered structures. This means a false market can be developed, and in the event of a large wildfire, funds may not be available to cover all the payouts. This recently occurred with the Palisades and Eaton Fires, with the California FAIR Plan requiring a $1 billion bailout. This brings into question the sustainability of these programs with the steady increase of residents needing FAIR Plan coverage, along with the growing frequency of catastrophic fires that impact urban areas.

With the growing reliance on FAIR Plans and the questions regarding the sustainability of the programs, the question then shifts to a need for federal legislation. For federal oversight to occur, legislation would need to be developed similar to that of the National Flood Insurance Act (Liao et al. 2024). This federal program is managed through FEMA and provides flood insurance to homeowners located within a floodplain. The NFIP could be utilized as a model of a potential solution for wildfire insurance and risk transfer. This type of program would come with many challenges, including high policy costs. There are also some noted advantages, like the ability to require wildfire mitigation measures around structures to increase survivability if impacted.

Ultimately, residents are left responsible for seeking coverage and accepting the risk of not having an insurance policy or underinsured coverage levels. Meanwhile, emergency managers face the challenge of responding to residents who are no longer covered due to the risk of the wildland fire. Mitigation

https://doi.org/10.5281/zenodo.15854460

efforts can assist with reducing risk, but are often time-consuming, costly, and only cover small areas on public lands. Homeowners implementing mitigation efforts on their own home is the most valuable option, but is often downplayed by residents as important, even though it could help reduce the chance of losing coverage to their home.

This issue has implications for emergency management and economics. Additional research on this topic is needed to effectively evaluate the nuances of all aspects, including the impacts on a FAIR Plan following multiple high-loss incidents, such as those in California in January 2025. As this issue grows, more data will be available for researchers to fully identify the underlying cause and effect of a problem impacting residents across the United States. The current process utilized by insurance companies to manage financial risk merely shifts the risk back to homeowners. Further research should also focus on oversight that protects homeowners, especially those within vulnerable populations.

AUTHOR'S CONTRIBUTIONS

Mr. Steven Moore earned his Associates of Science degree in Homeland Security & Emergency Management and his Bachelors of Science and Arts in Emergency Management at West Texas A&M graduating in 2025. This paper was the central theme for his Senior Capstone project to graduate. He conceived the project and was the primary author for the paper. Dr. Gilkey is a Safety Professional at Montana Technological University interested in the wildfire risk and management and provided additional content to the paper and review for publication.

REFERENCES

About FAIR Plan. The California FAIR Plan. (2024, March 12). http://www.cfpnet.com/about-fair-plan/

Abatzoglou, J. T. & Williams, A. P. (2016). Impact of anthropogenic climate change on wildfire across western US forests. Proc. Natl Acad. Sci. USA, 113, 11770–11775.

Anderson, H. (1982, April). Aids to Determining Fuel Models For Estimating Fire Behavior. Forest Service. https://www.fs.usda.gov/rm/pubs_int/int_gtr122.pdf

Asch, S. (2025, February 28). Texas' biggest wildfire started a year ago. how does the Panhandle Look Now? Texas Standard. https://www.texasstandard.org/stories/smokehouse-creek-fire-texas-panhandle-one-year-later/

Almuhana, M. I. (2024). A Mixed-Methodology Study of Insurers' Withdrawal from California's Home Insurance Market Amidst the Wildfire Crisis. ProQuest Dissertations & Theses.

Auer, M. R. (2024). Wildfire risk and insurance: Research Directions for policy scientists. Policy Sciences, 57(2), 459–484. https://doi.org/10.1007/s11077-024-09528-7

Auer, M. R., & Hexamer, B. E. (2022). Income and Insurability as Factors in Wildfire Risk. Forests, 13(7), 1130. https://doi.org/10.3390/f13071130

Awasthi, R. K. Direct Disaster Losses: A Case Study of Los Angeles and California Wildfire. Accessed May 12, 2025 https://www.academia.edu/download/120867296/SR25115144046.pdf

Ball, G., Regier, P., González-Pinzón, R., Reale, J., & Van Horn, D. (2021). Wildfires increasingly impact western US fluvial networks. Nature Communications, 12(1), 2484.

Bayham, J., Yoder, J. K., Champ, P. A., & Calkin, D. E. (2022). The economics of wildfire in the United States. Annual Review of Resource Economics, 14(1), 379-401.

Boyette, C, &. Yan, H. (2018, December 4). Insurance company goes under after California's Camp Fire. CNN. http://www.cnn.com/2018/12/04/us/camp-fire-insurance-company-liquidation/index.html

Burke, M., Driscoll, A., Heft-Neal, S., Xue, J., Burney, J., & Wara, M. (2021). The changing risk and burden of wildfire in the United States. Proceedings of the National Academy of Sciences, 118(2), e2011048118.

Coverage & eligibility. Texas FAIR Plan Association. (2025). https://www.texasfairplan.org/about-us/coverage-eligibility/

Cunningham, C. X., Williamson, G. J., & Bowman, D. M. (2024). Increasing frequency and intensity of the most extreme wildfires on Earth. Nature ecology & evolution, 8(8), 1420-1425.

Hardy, M. (2024, April 24). What the Bleep is going on with Texas Home Insurance?. Texas Monthly. https://www.texasmonthly.com/news-politics/texas-home-insurance-crisis/

Hazra, D., & Gallagher, P. (2022). Role of insurance in wildfire risk mitigation. Economic Modelling, 108. https://doi.org/10.1016/j.econmod.2022.105768

Headwaters Economics. (2025). Cascading wildfire insurance issues impact local and state budgets

January 17, 2025. Access June 13, 2025 https://headwaterseconomics.org/natural-hazards/wildfire-insurance-local-state-budgets/

Izuchukwu Precious, O., Zino Izu, O., Frank Chudi, A., Theresa Ojevwe, A., & Chinwe Sheila, N. (2025). THE ECONOMIC COSTS OF CLIMATE DISASTERS: ANALYZING DATA FROM RECENT FLOODS, WILDFIRES, AND HURRICANES. Manuscripts on Sustainable Economics, Finance and Management, 2(3), 1-22.

Jones, J., Saginor, A., & Smith, B. (2012). 2011 Texas Wildfires: Common Denominators of Home Destruction. Texas A&M Forest Service. https://tfsweb.tamu.edu/uploadedFiles/TFSMain/Preparing_for_Wildfires/Prepare_Your_Home_for_Wildfires/Contact_Us/2011%20Texas%20Wildfires.pdf

Klein, K. S. (2023). The Unnatural Disaster of Insurance, Underinsurance, and Natural Disasters. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4396622

Kousky, C., Zilberman, D., & Rausser, G. (2019). The Role of Natural Disaster Insurance in Recovery and Risk Reduction. Annual Review of Resource Economics, 11(1), 399–418. https://doi.org/10.1146/annurev-resource-100518-094028

Lee, J. Y., Ma, F., & Li, Y. (2022). Understanding homeowner proactive actions for managing wildfire risks. Natural Hazards, 114(2), 1525-1547.

Li, Z., Li, H., Yang, Y., Wang, S., & Zhu, Y. (2025). Integrating earth observation data into the tri-environmental evaluation of the economic cost of natural disasters: a case study of 2025 LA wildfire. arXiv preprint arXiv:2505.01721.

Liao, Y. (Penny), Walls, M., & Wibbenmeyer, M. (2024, July). Facing wildfire insurance challenges: Five lessons from the National Flood Insurance Program. Resources for the Future. https://www.rff.org/publications/reports/facing-wildfire-insurance-challenges-five-lessons-from-the-national-flood-insurance-program/

Ludden, J., & Baker, L. (2025, February 4). Before they lost their homes in the LA fires, many lost their insurance. NPR. https://www.npr.org/2025/02/03/nx-s1-5269609/la-fires-homes-insurance-state-farm-allstate

Lueck, D., & Bradshaw, K.M. (Eds.). (2012). Wildfire Policy: Law and Economics Perspectives (1st ed.). Routledge. https://doi.org/10.4324/9780203153048

Ma, M. (2025, March 25). California at risk of new insurance bailout amid fire danger. Bloomberg. https://www.bloomberg.com/news/articles/2025-03-25/california-at-risk-of-new-insurance-bailout-amid-fire-danger

MacCarthy, J., & Richter, J. (2025, February 5). 4 graphics explain Los Angeles' rare and devastating January fires. World Resources Institute. https://www.wri.org/insights/los-angeles-fires-january-2025-explained

Mileti, D. S., & Peek-Gottschlich, L. (2001). Hazards and sustainable development in the United States. Risk Management, 3(1), 61-70.

Narzullaevich, K. S. (2022). FUNCTIONS OF UNDERWRITING IN PROPERTY INSURANCE. International Journal of Economic Perspectives, 16(11), 108–114. https://doi.org/ISSN-L 1307-1602

NFPA. (1997). NFPA 299, Standard for Protection of Life and Property from Wildfire (1997)

Access on June 12, 2025 https://www.nfpa.org/product/nfpa-299-standard/p0299code

NOAA. (2011). Storm Events Database. Access June 11, 2025. https://web.archive.org/web/20160304095623/http://www.ncdc.noaa.gov/stormevents/listevents.jsp?beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2011&endDate_mm=12&endDate_dd=31&endDate_yyyy=2011&eventType=(Z)+Wildfire&county=ALL&zone=ALL&submitbutton=Search&statefips=48,TEXAS

North, M. P., Bisbing, S. M., Hankins, D. L., Hessburg, P. F., Hurteau, M. D., Kobziar, L. N., ... & Stevens-Rumann, C. S. (2024). Strategic fire zones are essential to wildfire risk reduction in the Western United States. Fire Ecology, 20(1), 50.

The Fire Triangle. NWCG. (2025, February 26). https://www.nwcg.gov/training-courses/rt-130/operations/op803

Reams, M. A., Haines, T. K., Renner, C. R., Wascom, M. W., & Kingre, H. (2005). Goals, obstacles and effective strategies of wildfire mitigation programs in the wildland–urban interface. Forest policy and economics, 7(5), 818-826.

Sanchez, K. (2024, June 21). Homeowners in high-risk brush fire areas say they're getting dropped by insurance companies. KVUE. https://www.kvue.com/article/news/local/brush-fire-risk-homeowners-deer-creek-ranch-texas/269-91f3c029-a816-4bd5-aed3-5cd2cbc9585e

Song, J., Wang, Y., & Li, B. (2024). Insurance Underwriting Decision Study Based on Analysis of Extreme Weather Intensity. Highlights in Business, Economics and Management, 36, 209–214. https://doi.org/10.54097/32s6zj47

USFA (U.S. Fire Administration) (2025) Creating a community wildfire protection plan. Federal Emergency Management Agency. Accessed June 12, 2025 https://www.usfa.fema.gov/downloads/pdf/publications/creating_a_cwpp.pdf

US Forest Service. (2014). National cohesive wildland fire management strategy. Access June 11, 2025 https://www.fs.usda.gov/restoration/cohesivestrategy.shtml

Texas A&M Forest Service. (2025). Texas Wildfire Risk Explorer. TXWRAP. https://wrap.texaswildfirerisk.com/

Webster, E. (2025, March 3). A brief overview of FEMA's Individual Assistance Program. Congress.gov. https://crsreports.congress.gov/product/pdf/IF/IF11298

Zhang, Y., Fan, J., Shrivastava, M., Homeyer, C. R., Wang, Y., & Seinfeld, J. H. (2022). Notable impact of wildfires in the western United States on weather hazards in the central United States. Proceedings of the National Academy of Sciences, 119(44), e2207329119.

MAIN AUTHOR

Steven Moore earned his Associate of Science degree in Homeland Security & Emergency Management in 2020 and his Bachelor of Science and Arts degree in Emergency Management from West Texas A&M in 2025. Mr. Moore is the Wildfire Manager for Travis County, Texas, USA. Steven has been working for nearly 20 years as a professional in wildfire management and mitigation. He plans and implements prescribed fires on park and conservation lands, including coordination with local jurisdictions and emergency service providers. He coordinates the organizational and operational activities of the parkland management program for Travis County Parks. Mr. Moore also recommends and implements policies and procedures as well as coordinating and reviewing the work plan for assigned land management contracted services and activities. His duties also include prioritizing and specifying contracted work activities and projects. He reviews and evaluates work products, methods, and procedures. Steven represents Travis County Parks at meetings, public events, and with the media. Mr. Steven Moore enjoys educating and conducting presentations to the public to better inform them on wildfire risks and mitigation strategies.

CITATION:

Moore, S., & Gilkey, D. (2025). *Wildfire Threat, Mitigation, Risk Transfer and Insurability: Texas and the Western US*. World Safety Journal, XXXIV(2), 24–37. https://doi.org/10.5281/zenodo.15854460

World Safety Journal

A peer-reviewed journal,
published by the World Safety Organization

Journal Homepage:
https://worldsafety.org/wso-world-safety-journal/

Unethical Hospital Practices and Public Safety: A Systemic Analysis of Ethical Failures and Reform Imperatives in Modern Healthcare

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

Medical Ethics;
Hospital Corruption;
Patient Safety;
Healthcare Regulation;
Corporate Healthcare;
Unethical Practices.

ABSTRACT

This paper investigates the growing prevalence of unethical practices in hospitals and their detrimental impact on public health and safety. Despite the existence of medical ethical standards, many healthcare institutions, particularly corporate and profit-driven hospitals, frequently engage in behaviors such as overcharging, unnecessary treatments, and compromised patient consent. Through a mixed-methods study involving 306 Health, Safety, and Environment (HSE) professionals in India during 2024–2025, the research identifies eight core themes behind such practices, including institutional pressure, regulatory failures, workforce shortages, and ethical illiteracy. The findings highlight a systemic erosion of trust and patient-centered care in favor of financial metrics. The paper concludes by recommending robust ethics programs, strengthened regulation, and a cultural shift toward transparency and accountability to restore integrity and safety in healthcare delivery.

1. INTRODUCTION AND OBJECTIVES

The healthcare system, often regarded as a pillar of societal well-being, is increasingly plagued by ethical challenges that compromise its foundational purpose—saving and protecting lives. While medical ethics are extensively taught in academic curricula and codified by professional bodies, their application within hospital settings often deviates significantly from the theoretical ideals. This disconnect is particularly pronounced in environments where healthcare has become commodified, and the delivery of medical services is driven more by financial performance than by patient outcomes. As a result, the fundamental principle of "do no harm" is routinely overshadowed by the pressure to meet revenue targets, leading to widespread ethical violations.

In recent years, numerous reports and investigations have highlighted unethical behaviors within both public and private healthcare institutions. These include overbilling, performing unnecessary diagnostic tests and procedures, withholding critical information from patients, and even denying treatment based on financial considerations. Such practices not only erode the trust between patients and medical

* *Corresponding Author*: kailahl@hotmail.com

https://doi.org/10.5281/zenodo.15854529

professionals but also pose direct threats to patient safety and well-being. The COVID-19 pandemic further exacerbated these trends, revealing systemic vulnerabilities and a disturbing willingness among some institutions to exploit crises for profit.

The rise of corporate healthcare has introduced a new layer of complexity to the ethical landscape. Unlike traditional medical models rooted in community service and public welfare, corporate hospitals often operate with profit-maximization as a central objective. While they may offer advanced technologies and specialized services, their business models inherently prioritize financial outcomes. This shift has led to increased patient dissatisfaction, growing disparities in healthcare access, and ethical compromises that disproportionately affect the most vulnerable populations. Furthermore, the absence of robust regulatory oversight allows many of these institutions to continue unethical practices with impunity.

This paper aims to explore the underlying causes, manifestations, and consequences of unethical practices in hospitals, with a particular focus on the Indian healthcare system as a case study. By analyzing data collected from over 300 Health, Safety, and Environment (HSE) professionals across various sectors, the study identifies key themes that characterize the ethical decline in medical institutions. These include institutional pressures, inadequate training in ethics, regulatory loopholes, and a growing culture of commercialization that treats patients as customers rather than individuals in need of care.

Addressing these challenges requires more than isolated interventions; it demands a systemic transformation rooted in accountability, transparency, and a renewed commitment to patient-centered care. This paper not only diagnoses the problem but also proposes actionable recommendations to foster an ethical culture in hospitals. By highlighting both the human and systemic costs of unethical practices, this research contributes to the broader discourse on healthcare reform and aims to inform policy, education, and institutional behavior that prioritize life over profit.

2. METHODOLOGY

This study employs a mixed-methods research design combining both qualitative and quantitative approaches to comprehensively examine unethical hospital practices and their impact on public safety. The dual methodology allows for both statistical generalization and in-depth contextual analysis, providing a fuller understanding of the problem. The research was conducted over a 12-month period, from early 2024 to early 2025, across multiple regions in India to ensure demographic and institutional diversity. The study population included health professionals, administrators, safety officers, and ethics experts working in various sectors of the healthcare industry.

The primary data collection involved a structured survey administered to 306 Health, Safety, and Environment (HSE) professionals working across private, public, and corporate hospitals. The survey was designed to assess perceptions, experiences, and awareness regarding unethical practices within their institutions. It included both closed-ended questions for statistical analysis and open-ended questions to gather qualitative insights. The participants were selected using purposive sampling, targeting individuals with direct exposure to or responsibility for ethical and safety-related issues in healthcare settings.

In addition to surveys, semi-structured interviews were conducted with 42 key informants, including hospital administrators, senior physicians, nursing supervisors, and policy experts. These interviews explored underlying motivations for unethical behavior, the structural pressures faced by hospital staff,

https://doi.org/10.5281/zenodo.15854529

and suggestions for systemic reforms. Interviewees were selected based on their professional standing and willingness to provide candid, informed perspectives. Each interview lasted between 45 to 60 minutes and was transcribed for thematic analysis.

The research also utilized secondary data sources, including governmental reports, academic studies, medical ethics codes, court rulings, and media investigations. These documents were analyzed to supplement primary data and establish a comprehensive background on the state of hospital ethics, legal accountability, and regulatory challenges in the healthcare system. This triangulation of sources ensured robustness and validity in the interpretation of findings.

For data analysis, the quantitative data from surveys were processed using statistical software (SPSS). Descriptive statistics were used to assess the frequency and types of unethical behaviors observed by respondents. Cross-tabulation and chi-square tests helped identify correlations between hospital type (corporate vs. public) and the prevalence of unethical conduct. The survey also measured perceptions of risk, trust, and ethical climate using a Likert scale, enabling a nuanced quantification of respondents' views.

The qualitative data from interviews and open-ended survey responses were analyzed using thematic coding and content analysis. Eight major themes emerged from this analysis: institutional culture, ethical dilemmas, regulatory shortcomings, healthcare worker shortages, financial pressures, cybersecurity risks, ethical illiteracy, and patient rights violations. These themes were validated through iterative coding by two independent researchers, enhancing the reliability and inter-rater agreement of the findings.

To contextualize the data, field visits and observational research were conducted in selected hospitals where HSE professionals had reported ethical concerns. These visits focused on workplace conditions, transparency in billing, consent procedures, staff training, and adherence to safety protocols. Observations were documented using an ethnographic approach, highlighting discrepancies between stated policies and observed practices.

In parallel, the study engaged in expert consultations and stakeholder workshops to assess the feasibility of proposed reforms. Medical educators, bioethicists, patient advocates, and legal experts participated in structured discussions to evaluate the practicality of ethical training programs, regulatory interventions, and hospital accreditation reforms. Feedback from these sessions informed the final set of recommendations proposed in the study.

Ethical approval for the research was obtained from an independent ethics review board, and informed consent was secured from all participants. Confidentiality and anonymity were rigorously maintained throughout data collection, processing, and publication stages to ensure compliance with ethical research standards.

This comprehensive and multi-pronged methodology enabled a deep exploration of the structural, cultural, and policy-level factors driving unethical practices in hospitals. The findings, grounded in empirical data and real-world insights, offer a robust foundation for advancing ethical reform in healthcare institutions.

https://doi.org/10.5281/zenodo.15854529

3. FINDINGS: THEMATIC ANALYSIS

The analysis of data gathered from 306 HSE professionals and 42 expert interviews revealed eight major themes that illustrate the complexity and pervasiveness of unethical practices in hospital environments:

1. Institutional Drivers of Unethical Practices
2. Ethical Dilemmas in Clinical Decision-Making
3. External Scrutiny and Public Accountability of Hospitals
4. Financial Targets and Manipulation of Health Records
5. Exploitation of Government Health Insurance Schemes
6. Corporate Healthcare: Prioritizing Profit over Patient Care
7. Structural and Cultural Roots of Ethical Lapses
8. Risks Posed by Revenue-Oriented Hospital Models

These themes highlight both internal and external drivers of unethical behavior, with a strong emphasis on profit-driven motives, regulatory gaps, ethical illiteracy, and systemic inefficiencies. Each theme is elaborated below to illustrate how it contributes to the erosion of ethical standards and compromises public safety.

1. Why do hospitals adopt unethical practices?

Hospitals often adopt unethical practices due to a lack of regulatory enforcement, allowing corruption to thrive and endangering public safety. In China, medical staff face intense work pressure and emotional exhaustion, leading institutions to implement performance-based systems with financial incentives. While these systems can improve team efficiency, they can also foster unhealthy competition and neglect the broader social value of healthcare. This environment can result in unethical behaviors, such as excessive medical costs and bribery. The rising demand for care, coupled with inflation in labor and supply costs, further complicates the situation, pushing healthcare toward lower-cost settings. Ethical dilemmas arise when financial goals outweigh patient needs, leading to inadequate accountability. The shortage of healthcare workers intensifies these challenges, impacting patient care, increasing medical errors, and raising legal risks. Corporate hospitals, driven by profit motives, often prioritize revenue over patient safety, leading to over-treatment and reduced care quality. This emphasis on profit may exacerbate healthcare disparities and result in higher costs for patients. It is crucial for regulatory oversight and ethical practices to balance the pursuit of profit with patient safety and care quality.

2. Ethical Dilemmas

Ethical dilemmas in healthcare often arise from the dominance of profit motives over patient well-being. This prioritization can lead to compromised care and reduced accountability for negative outcomes. Health services frequently encounter ethical conflicts, according to research. The study utilized diverse and numerous data sources to ensure originality and depth. Rather than relying on limited perspectives, it incorporated a wide range of views. This comprehensive approach highlighted recurring tensions between ethics and financial goals. Such dilemmas demand deeper reflection on institutional priorities and values. The findings demonstrate the importance of systemic change and ethical realignment. Healthcare institutions

https://doi.org/10.5281/zenodo.15854529

must adopt a transformational stance to navigate these challenges. Gayir (2025) advocates for urgent reforms to uphold ethical integrity in care delivery.

3. Hospitals are under scrutiny.

Hospitals are increasingly under scrutiny as commercial interests often override genuine patient care. According to B. Modi (2025), humanity in healthcare is at an all-time low, with compassion lacking in hospitals. A major concern is the chronic shortage of health workers, which undermines patient safety and quality of care. This shortage leads to increased medical errors, higher malpractice claims, and legal penalties for understaffing. Overworked staff face labor violations, such as denied rest periods and unfair compensation. The reliance on contract workers raises legal issues around working conditions and accountability. Failure to maintain mandated staffing ratios exposes hospitals to lawsuits and regulatory sanctions. Addressing these issues is both an ethical and legal necessity to protect patients and staff. Solutions include enforcing minimum staffing laws and offering incentives for recruitment in underserved areas. A comprehensive workforce policy reform is vital to ensure sustainable, ethical healthcare delivery (Brenda, 2025).

4. Hospital targets and health records

Hospitals now chase daily patient and revenue targets, treating healthcare like a business, not a humane service. Unlike airports, where efficiency is vital, hospitals deal with human lives—priceless and irreplaceable. Comparing flight targets to patient care ignores the ethical weight and emotional stakes involved. Meanwhile, digital transformation has revolutionized healthcare through electronic health records and IoMT. Paperwork has shifted to smart systems and cloud-based platforms, improving efficiency and accessibility. However, weak cybersecurity awareness among healthcare staff poses major risks to patient data. Negligence in protecting sensitive health information can result in severe ethical and legal consequences. Ethical leadership, change management, and strategic models can help mitigate these cyber threats. A strong organizational culture that values security and ethics is essential to protect patient privacy. Hall (2023) stresses that securing health data is not just technical—it's a moral obligation.

5. Government health schemes

The Ayushman Bharat-PMJAY scheme was launched to offer free, cashless healthcare to the poor. Despite its promise, it faces a crisis—₹1.21 lakh crore in unpaid claims, hospital closures, and doctor bankruptcies. Doctors are often forced to fund patient care from their pockets due to delayed or denied reimbursements. While politicians claim success, the system suffers from deep-rooted inefficiencies and corruption. Middlemen—police, ambulance staff, ASHAs, and quacks—exploit the scheme through unethical commissions. Financial crippling forces private hospitals to resort to unethical practices in order to survive. Such conduct undermines the integrity of care and erodes trust between doctors and patients. Without any support from authorities, doctors find themselves caught between their ethical duty and financial collapse. The scheme has unintentionally incentivized malpractice rather than promoting quality healthcare. Rathore (2025) argues that Ayushman Bharat, instead of empowering healthcare, is systematically dismantling it.

https://doi.org/10.5281/zenodo.15854529

6. The word corporate is for profits, not life.

This statement highlights the troubling trend of prioritizing profit over patient safety in hospitals. Project 2025, proposed by U.S. conservative think tanks, seeks to reduce regulations and privatize public services. While advocates claim it promotes economic freedom, the plan threatens the stability of public health systems. Key concerns include weakened oversight, reduced public health funding, and greater healthcare disparities. Privatization may erode protections essential for disease prevention and equitable healthcare access. Such reforms risk increasing the burden on vulnerable populations and undermining national health resilience. Public health infrastructure plays a crucial role in promoting safety, equity, and community well-being. Dismantling it in favor of profit-driven models endangers long-term societal health outcomes. Bossert (2024) warns that these shifts jeopardize the foundational principles of public health. Maintaining strong, regulated systems is essential to uphold fairness and patient-centered care.

7. Roots of Unethical Practices

A hospital-based survey revealed alarming gaps in healthcare providers' understanding of medical ethics. Over 30% of respondents couldn’t define healthcare ethics, and 40% failed to name a single ethical principle. More than half had witnessed ethical breaches, including patient dissatisfaction, gender bias, and confidentiality lapses. These findings underscore a serious lack of ethical awareness among both physicians and non-physician staff. The situation demands urgent attention in both private and public hospitals across the country. Public concern is rising over the ethical conduct of healthcare professionals and the quality of care. Integrating clinical ethics into medical education has become a critical necessity. Ethics training must go beyond theory to address real-world challenges and accountability. Dr. S. Dharaskar attributes the crisis to systemic collusion between private hospitals and corrupt officials. Subramanian et al. (2016) emphasize that ethics must be central to restoring trust in healthcare.

8. Revenue-driven corporate hospitals pose huge risks.

HSE professionals express concern over the life safety risks posed by corporate hospitals, yet acknowledge the lack of alternatives. These hospitals are largely revenue-driven, often prioritizing profit over patient welfare and safety. Profit motives lead to unnecessary procedures, reduced focus on preventive care, and poorer patient outcomes. To cut costs, hospitals may reduce staffing or hire less experienced personnel, impacting care quality and increasing burnout. Weak communication, limited personalization, and inadequate follow-up often compromise a patient-centric approach. Corporate hospitals invest in lucrative services while neglecting essential care, creating service disparities. High treatment costs form financial barriers, pushing many to delay or forgo necessary care. Oversight, ethical practices, and transparent governance are vital to balance technology with compassionate care. Suresh Khurana reported firsthand the financial burden and unnecessary procedures during a recent hospital stay. Pavan Rao added that patients often skip second opinions, falling prey to costly and avoidable diagnostics (Personal Communications, 2025).

https://doi.org/10.5281/zenodo.15854529

4. DISCUSSION

The findings of this study underscore a deeply entrenched ethical crisis within modern hospital systems, particularly in environments where corporate priorities overshadow patient-centered care. As demonstrated by the thematic analysis, unethical practices are no longer the exception—they are becoming systemic. Hospitals, especially those operating under profit-driven models, increasingly equate medical services with revenue generation, which distorts the ethical mission of healthcare. This distortion compromises not only individual patient outcomes but also the credibility and social contract of the medical profession as a whole.

One of the most alarming insights is the normalization of unethical behavior within institutional cultures. The imitation of harmful practices across hospitals reveals a phenomenon akin to "institutional contagion," where one facility's financial success from unethical behavior encourages others to follow suit. Regulatory oversight, rather than acting as a deterrent, often appears too weak, complicit, or fragmented to halt this spread. In such an environment, even well-intentioned healthcare professionals find it difficult to uphold ethical standards without risking job security or professional marginalization.

The frequent ethical dilemmas faced by healthcare workers reflect a systemic conflict between professional duties and institutional pressures. Physicians and nurses are routinely caught between the moral obligation to advocate for their patients and the financial expectations set by hospital management. These ethical conflicts are exacerbated by performance metrics focused on profitability rather than quality of care. Without structural safeguards such as active ethics committees or protection for whistleblowers, the ability of individuals to resist these pressures is severely limited.

The findings also expose the growing influence of commercialization in reshaping hospital priorities. Health, traditionally regarded as a public good, is increasingly treated as a market commodity. This commodification translates into over-treatment, unnecessary diagnostics, and inflated billing—all of which violate the ethical principles of beneficence and non-maleficence. In public perception, hospitals are rapidly transitioning from places of healing to centers of exploitation, especially among economically vulnerable populations.

The role of technology, while transformative in many respects, also introduces new ethical vulnerabilities. The misuse of electronic health records to manipulate billing, conceal malpractice, or breach patient confidentiality reflects the dual-edge nature of digital tools in healthcare. Additionally, poor cybersecurity infrastructure exposes patient data to theft, undermining trust in institutions and violating legal rights to privacy. These developments call for urgent attention to digital ethics as an emerging subfield within hospital governance.

Workforce-related findings reveal how structural shortages translate into both ethical and legal failures. Overworked and understaffed hospitals not only degrade care quality but also increase the likelihood of medical errors, patient harm, and subsequent litigation. The reliance on undertrained contract workers further erodes institutional accountability. These human resource deficiencies are not just operational issues—they are ethical failures with life-and-death consequences.

The widespread lack of ethical literacy among healthcare providers points to fundamental gaps in medical education and professional development. Many practitioners, especially in high-pressure corporate environments, lack even basic knowledge of ethical principles such as informed consent and confidentiality. This lack of awareness, when combined with systemic pressure and the absence of role

https://doi.org/10.5281/zenodo.15854529

models, creates an environment where unethical behavior is not only tolerated but often goes unrecognized as such.

Public narratives captured during this research—through both testimony and media reports—illustrate the emotional and psychological toll unethical practices inflict on patients and families. Stories of unnecessary surgeries, coerced treatments, and denied access to records are more than isolated grievances; they represent a breakdown in the fiduciary relationship between doctor and patient. Restoring this relationship requires a transparent and responsive healthcare system that acknowledges and corrects its failings.

The manipulation of public health schemes like Ayushman Bharat by private hospitals highlights the broader policy implications of unethical practices. When funds meant for the poor are misused or delayed, the health inequities that public policy seeks to address are only deepened. This underscores the need for better auditing, stricter penalties for fraud, and a comprehensive re-evaluation of how public-private partnerships are managed in healthcare.

In conclusion, the systemic nature of unethical hospital practices demands systemic solutions. These include institutional reforms, legal safeguards, continuous ethics education, and robust public engagement. Ethical healthcare is not a luxury; it is a non-negotiable foundation for a just and effective health system. The findings of this study highlight not only the depth of the crisis but also the possibility for transformative change—provided there is collective will across institutions, professions, and policymakers to place ethics back at the center of medicine.

5. RECOMMENDATIONS

In light of the systemic and multi-layered ethical challenges identified in this study, it is imperative to implement a comprehensive and strategic framework of reforms aimed at restoring integrity in healthcare. The following recommendations address institutional governance, professional accountability, patient empowerment, regulatory reform, and educational interventions—all of which are essential to cultivating a more ethical healthcare environment.

- **Institutionalize Ethics Programs in All Hospitals**

  Hospitals must establish structured ethics programs that are integrated into their governance frameworks. These should include the formation of ethics committees, ethics officers, and dedicated reporting mechanisms for patients and staff. Ethics programs must be empowered to investigate complaints, review treatment decisions, and recommend disciplinary or corrective actions. Such structures foster accountability and can serve as internal safeguards against unethical practices.

- **Mandate Regular Ethics Training for Healthcare Professionals**

  Continuous professional development in medical ethics should be mandatory for all healthcare personnel. Training should go beyond theoretical principles to include case-based learning on informed consent, patient rights, data confidentiality, whistleblower protections, and conflict-of-interest situations. Hospitals should also conduct scenario simulations to strengthen ethical decision-making under pressure. Medical licensing bodies should tie certification renewals to successful completion of these trainings.

https://doi.org/10.5281/zenodo.15854529

- **Introduce Transparent Billing and Consent Mechanisms**

  Hospitals must be required to provide detailed, itemized bills and obtain fully informed consent before proceeding with any invasive or costly treatment. This includes explaining risks, alternatives, and likely outcomes in language understandable to patients and caregivers. Consent should be documented not merely as a formality but as a critical ethical and legal obligation. Independent patient advocates could be introduced within hospital settings to ensure that patients are fully aware of their rights.

- **Strengthen Regulatory Oversight and Legal Penalties**

  Governmental health authorities must upgrade their regulatory frameworks to monitor ethical compliance more rigorously. Hospitals found engaging in fraudulent or exploitative behavior should face severe penalties, including license suspension, financial sanctions, and public listing. There must also be independent health ombudsman bodies that receive, investigate, and resolve patient complaints promptly and fairly.

- **Audit Public Health Insurance and Reimbursement Schemes**

  Publicly funded health insurance programs must be protected from abuse through real-time audit systems and digital tracking of claims. Artificial intelligence tools can help flag unusual billing patterns and detect fraud. There should also be mechanisms for independent verification of procedures claimed under insurance schemes, with clear consequences for institutions found engaging in overcharging or fictitious billing.

- **Reorient Medical Education Toward Ethical Practice**

  Medical and nursing schools must embed ethics deeply into the curriculum as a core competency, not an ancillary subject. Students should be taught to navigate real-life ethical dilemmas, confront institutional pressures, and develop a moral compass that resists unethical conduct. Moreover, residency programs should include modules on communication, empathy, and patient-centered care to nurture not just competent clinicians, but conscientious ones.

- **Implement Safe Staffing Ratios and Workforce Protections**

  To minimize ethical breaches related to overwork and burnout, governments and hospital administrators must enforce safe staffing ratios, particularly in emergency and intensive care units. Legal mandates on duty hours, rest periods, and fair compensation should be strictly applied. Adequate staffing is not merely an operational concern—it is an ethical imperative that directly influences care quality and safety.

- **Promote Patient Empowerment and Rights Education**

  Public awareness campaigns should educate patients about their healthcare rights, including their entitlement to clear communication, second opinions, and protection from exploitative billing. Empowered patients are less likely to be victimized and more likely to hold institutions

https://doi.org/10.5281/zenodo.15854529

accountable. Hospitals should also visibly display patients' rights charters and provide multilingual resources on navigating hospital procedures ethically.

- **Deploy Technology for Ethical Compliance and Accountability**

  Smart technologies such as electronic audit trails, biometric verification at treatment points, and automated billing transparency tools can reduce human manipulation and fraud. Hospitals should invest in digital systems that not only improve efficiency but also reinforce ethical behavior. Cybersecurity standards must be enforced to protect patient data integrity and prevent misuse of electronic health records.

- **Foster a Culture of Ethical Leadership and Organizational Integrity**

  Hospital leadership must commit to ethical excellence not just in policy but in practice. This includes modeling transparent decision-making, respecting staff feedback, and refusing to compromise on core values for financial gain. Ethical leadership should be evaluated as a key performance metric for administrators. Only when ethics are prioritized at the highest levels can the entire organization follow suit in restoring public trust.

6. CONCLUSION

The findings of this study reveal a pressing ethical crisis in modern hospital systems, particularly those operating under corporate or profit-driven models. Despite the existence of well-established medical ethics frameworks, the practical application of these principles is often absent in daily clinical operations. This disconnect between theory and practice has profound implications, not only for the quality of care but for public trust in the healthcare system. From unnecessary procedures to fraudulent billing and lack of informed consent, the institutional behaviors identified throughout this research endanger patient welfare and erode the moral foundations of medicine.

One of the most concerning revelations is the normalization of unethical practices, which have become deeply embedded in hospital culture. Driven by financial incentives and compounded by weak regulation, healthcare institutions often place profitability above patient safety. This culture trickles down to healthcare workers who, under pressure to meet institutional targets, may compromise ethical standards even when aware of the risks involved. The commercialization of healthcare has led to a loss of compassion, empathy, and professional integrity, shifting the system away from its original humanitarian mission.

Moreover, the study underscores that ethical breaches are not solely the result of individual misconduct but stem from systemic failures. These include inadequate ethics education, poor leadership, insufficient regulatory oversight, and overburdened staff. Addressing these issues requires a holistic approach that integrates legal reform, education, accountability mechanisms, and technological safeguards. Ethical violations cannot be effectively curbed through isolated interventions; they demand a structural transformation of the entire healthcare ecosystem.

Restoring ethical standards in hospital care is essential not only for protecting individual patients but for preserving the credibility and functionality of healthcare systems worldwide. When ethics are compromised, the consequences go beyond poor health outcomes—they include increased litigation, deteriorating public health, and growing inequalities in access to care. Hospitals must move away from

https://doi.org/10.5281/zenodo.15854529

models that treat patients as revenue sources and return to the core values of medicine: beneficence, non-maleficence, autonomy, and justice.

In conclusion, the path toward an ethical healthcare system requires sustained commitment from all stakeholders—medical professionals, administrators, regulators, educators, and the public. Hospitals must lead by example, embedding ethics at the heart of their operations and creating environments where ethical behavior is expected, rewarded, and protected. Only then can we ensure that hospitals remain places of healing, safety, and dignity for all who walk through their doors.

BIBLIOGRAPHY

Abedi, Ghassem & Abedini, Ehsan & Bahrami, Sobhan & Charati, Jamshid (2020). Ethical Predictability of Hospital: A remarkable concept to make the beneficiaries-hospital interaction stronger. Archives of Pharmacy Practice. 11. 107-120.

Agheorghiesei, Doina-Monica & Bercu, Ana-Maria (2025). Ethics of The Financial Services – Relationship Between Health Stakeholders. European Financial Resilience and Regulation. 10-19. 10.47743/Eufire-2024-1-1.

AMA Principles of Medical Ethics: II (2025). Retrieved from: https://code-medical-ethics.ama-assn.org/

AMA (2023, Dec 4). The top 10 ethical issues medical students must be taught. RETRIEVED FROM: https://www.ama-assn.org/education/changemeded-initiative/top-10-ethical-issues-medical-students-must-be-taught

Anand, A. S. & Jadav, Shreyas S. (2023). Unethical Practices in Healthcare Sector. Asian Journal of Professional Ethics & Management, 15(2), 23–26. Retrieved from https://www.informaticsjournals.co.in/index.php/ajpem/article/view/41804

Ayala, Brenda. (2025). Ethical and Legal Implications of Healthcare Worker Shortages. The Journal of Healthcare Ethics & Administration. 11. 1-6. 10.22461/jhea.1.71649.

Bossert, Jason (2024). Project 2025 and Its Implications for Public Health. Retrieved from: https:// www.researchgate.net/publication/ 384294114_Project_2025_and_Its_Implications_for_Public_Health

Bhardwaj, Chitrakshi & Malhotra, Vani & Malhotra, Parveen & Khurana, Rajasvi & Malhotra, Pranav & Malhotra, Navya & Gupta, Ritwik. (2025). Ethical Issues In Medical Field In Current Era. IOSR Journal of Dental and Medical Sciences. 24. 47-49. 10.9790/0853-2403014749.

Chatterjee, Chirantan & Srinivasan, Vasanthi (2013). Ethical issues in health care sector in India. IIMB Management Review. 25. 49–62. 10.1016/j.iimb.2012.11.004.

Gayır, Gülfer (2025). Ethical Dilemma In Health Care Services: “Doing The Job Right/Well” Or “Doing The Right/Good Job”?. International Journal of Health Services Research and Policy. 10. 23-40. 10.33457/ijhsrp.1600518.

Godschalx-Dekker, Judith & Pronk, Sebastiaan & Olthuis, Gert & Hoopen, Rankie & Mook, Walther (2025). Ethical issues in unprofessional behavior of residents who dispute dismissal: ten year analysis of case law in hospital-based specialties. BMC Medical Ethics. 26. 1-10. 10.1186/s12910-025-01180-x.

Government of India (2019, February 08,). Unethical Practices by Private Hospitals.

Hall, Jo (2023). Current Ethical Issues in Healthcare Settings. 10.4018/979-8-3693-1630-6.ch013.

Hassan, Norasyikin & Wong, Yoke Ping. (2024). Nurses’ adherence to ethical principles – A qualitative study. Nursing Ethics. 1-15. 10.1177/09697330241291159.

Henriksen, Kerm et al. (2025). Envisioning Patient Safety in the Year 2025: Eight Perspectives. Retrieved from: https://www.ahrq.gov/downloads/pub/advances2/vol1/Advances-Henriksen_104.pdf

Ilori, Oluwatosin & Kolawole, Tolulope & Olaboye, Janet (2024). Ethical dilemmas in healthcare management: A comprehensive review. International Medical Science Research Journal. 4. 703-725. 10.51594/imsrj.v4i6.1251.

Kaptein, Muel. (2014). The Effectiveness of Ethics Programs: The Role of Scope, Composition, and Sequence. Journal of Business Ethics. 132. 415-431. 10.1007/s10551-014-2296-3.

Lal, H., & Choueiri, E. (2025). Industry Incidents: Cultural Failure or Human Error?. World Safety Journal, XXXIV(1), 31–38. https://doi.org/10.5281/zenodo.15206454

Naib, Parul (2024). A typology framework for unethical medical practices under public health insurance schemes in India: Analysis of evidence over the past 12 years. Indian Journal of Medical Ethics, [S.l.], v. IX, n. 4(NS), p. 278, aug. 2024. ISSN 0975-5691.

Personal Communications (2025, April). Interactions and interviews with EHS Heads.

Rathore, Chandra Vikas. (2025). Ayushman Bharat: A Failing Model That Exploits Doctors and Corrupts Healthcare. Retrieved from: https://www.researchgate.net/publication/389738979_Ayushman_Bharat_A_Failing_Model_That_Exploits_Doctors_and_Corrupts_Healthcare/citation/download

Rehman, Fazal Ur & Anwar, Muhammad. (2022). Knowledge, Attitude and Practice Of Healthcare Ethics Among Doctors Working In Selected Hospitals of Pakistan: An Online Survey. Gomal University Journal of Research. 38. 389-401. 10.51380/gujr-38-04-011.

Subramanian, Thilakavathi ; Mathai, A K; Kumar, Nandini (2016). Knowledge and practice of clinical ethics among healthcare providers in a government hospital, Chennai. Indian Journal of Medical Ethics, [S.l.], v. 10, n. 2, p. 96, nov. 2016. ISSN 0975-5691.

Sermo (2024, Dec 13). Common ethical issues in healthcare: Identifying & navigating them. RETRIEVED FROM: https://www.sermo.com/resources/ethical-issues-in-healthcare/

Torre, Kim Dalla & India, Mike (2025). Health care transformation and growth: 2025 and beyond. RETRIEVED FROM: https://www.ey.com/en_us/insights/strategy/health-care-transformation-and-growth-2025-and-beyond

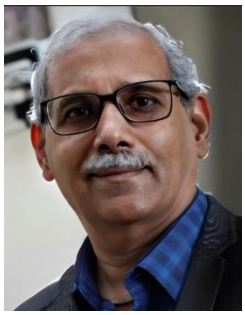
Ukaidi, Chris & Hussein, Tanvir & Ukaidi, Evelyn & Wanjiru, Muriithi & Omweno, Enock (2025). Emerging Management Issues and Workplace Performance: An Analysis of the Healthcare Systems in Nigeria and South Sudan. 10.1007/978-3-031-75960-4_30.

Quora (2025). What are unethical practices that hospitals use? Retrieved from: https://www.quora.com/What-are-unethical-practices-that-hospitals-use

Zhi Z, Yijuan H, Jiahuan Z, Xiaohan J, Zhanjie L, Dandan C, Xin Y. An Empirical Study on the Relationship Between Organisational Support and Unethical Pro-Organisational Behaviour of Medical Staff: The Mediation of Organisational Identification. Psychol Res Behav Manag. 2024;17:2083-2097. https://doi.org/10.2147/PRBM.S457284

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.



CITATION:

Lal, H., & Choueiri, E.M. (2025). *Unethical Hospital Practices and Public Safety: A Systemic Analysis of Ethical Failures and Reform Imperatives in Modern Healthcare*. World Safety Journal, XXXIV(2), 38–50. https://doi.org/10.5281/zenodo.15854529

World Safety Journal

A peer-reviewed journal,
published by the World Safety Organization

Journal Homepage:
https://worldsafety.org/wso-world-safety-journal/

Abortion Rights in The MENA Region (Middle East and North Africa)

Elias M. Choueiri[1,*]

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

KEYWORDS

Abortion Rights;
MENA Region;
Reproductive Health;
Women's Autonomy;
Religious Influence;
Legal Restrictions.

ABSTRACT

Abortion rights in the MENA region remain a deeply contested and complex issue, shaped by a confluence of religious doctrines, patriarchal norms, restrictive legal frameworks, and political conservatism. While a few countries like Tunisia have taken progressive steps toward legalizing abortion, the majority impose severe restrictions, often criminalizing the practice and endangering women's health and autonomy. This paper explores the legal, social, and ethical dimensions of abortion across the region, highlighting the impact of religious interpretations, state policies, and grassroots movements. By examining regional variations and comparing them with global trends, the study underscores the urgent need for comprehensive reproductive health reforms that respect women's rights, prioritize public health, and reconcile tradition with modern human rights standards.

1. INTRODUCTION AND OBJECTIVES

The issue of abortion rights has long been a point of global contention, reflecting deeper societal values around gender, morality, autonomy, and life itself. While many regions of the world have progressively moved toward liberalizing abortion laws in the name of public health and women's rights, the Middle East and North Africa (MENA) region presents a stark contrast. Here, abortion remains heavily restricted or outright criminalized in most countries, forcing women into unsafe, underground procedures that pose serious health risks. These legal barriers do not eliminate the demand for abortion but instead push it into unregulated and dangerous spaces.

The complexity of abortion in the MENA region stems largely from the entanglement of religious beliefs, political ideologies, and traditional social norms. Predominantly influenced by Islamic jurisprudence—both Sunni and Shia—many MENA countries frame abortion through the lens of religious morality rather than individual rights or medical necessity. Additionally, conservative cultural attitudes and patriarchal structures reinforce the stigmatization of abortion, often portraying it as a moral failing rather than a

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

https://doi.org/10.5281/zenodo.15854596

personal or medical choice. Even where religious texts allow for certain exceptions, political regimes and legal codes often adopt more rigid interpretations, limiting access in practical terms.

However, the region is far from monolithic. Tunisia stands out as a progressive exception, having legalized abortion since the 1970s, while other countries like Morocco and Lebanon have seen growing civil society efforts pushing for reform. These differences reflect not only varying political landscapes but also differing colonial legacies, legal traditions, and degrees of civic engagement. The role of international human rights organizations and feminist movements has become increasingly important, bringing abortion rights into broader discussions about bodily autonomy, gender equality, and public health in the Arab world.

This paper aims to analyze abortion rights across the MENA region from a multidimensional perspective. It will examine the legal frameworks in selected countries, evaluate the role of religious and cultural norms, assess public health outcomes, and explore the activities of grassroots and international movements advocating for reform. By adopting a comparative approach, the research will highlight both the shared challenges and the unique national contexts that shape reproductive rights in the region.

Ultimately, this study seeks to contribute to the growing discourse on women's rights in the MENA region by emphasizing the urgent need for legal, social, and political reforms. Recognizing the intersection of religion, law, and health, the paper will argue that advancing abortion rights is not merely a question of liberalization but of justice, dignity, and respect for women’s bodily autonomy in a region undergoing complex and often contradictory transformations.

2. LEGAL FRAMEWORKS ACROSS THE MENA REGION

The legal frameworks governing abortion across the Middle East and North Africa (MENA) region are among the most restrictive in the world. While laws vary between countries, the general trend is toward criminalization, with abortion permitted only under narrow exceptions—typically when the life of the mother is at risk. This legal rigidity stems from a mixture of religious interpretations, colonial legal legacies, and deeply rooted sociopolitical conservatism. In many countries, both the woman seeking an abortion and the provider can face harsh penalties, including imprisonment and professional sanctions.

In countries like Egypt, abortion is criminalized under the penal code unless it is necessary to save the life of the mother. Even in life-threatening cases, access is not guaranteed, as the law lacks clear procedural guidelines, leaving doctors hesitant to act for fear of legal consequences. This ambiguity drives many women toward unsafe, clandestine procedures. Egypt’s abortion laws are inherited from the French legal system, which historically influenced much of North Africa and the Levant, reinforcing punitive approaches to abortion.

Lebanon, despite being one of the more socially liberal countries in the region, maintains a legal stance that is highly restrictive. Abortion is illegal under Articles 539–546 of the Lebanese Penal Code except to save the mother’s life. However, in practice, the enforcement of these laws is inconsistent. Abortions are often accessible in private clinics for those who can afford them, but remain out of reach for poorer women, especially refugees. This duality creates a de facto system of reproductive inequality based on wealth and class.

https://doi.org/10.5281/zenodo.15854596

In contrast, Tunisia is the only country in the Arab world where abortion is legal on demand during the first trimester, thanks to reforms passed in 1973 under President Habib Bourguiba. The law permits abortions up to 12 weeks without conditions, and after that point if the woman's health is at risk or in cases of fetal impairment. This progressive stance has made Tunisia a rare example in the region of aligning reproductive law with international human rights norms. Nevertheless, women in rural areas still face barriers in accessing safe procedures due to poor healthcare infrastructure and lingering stigma.

Morocco presents a more nuanced case. For decades, abortion was legal only to save the life of the mother. However, growing public discourse and advocacy, especially following high-profile cases of unsafe abortions, prompted legal reconsideration. In 2015, the Moroccan king authorized reforms to allow abortion in cases of rape, incest, fetal malformation, and maternal mental health risk. While these reforms are more progressive than most of the region, they are still pending full implementation, and procedural hurdles remain significant.

In the Gulf states, including Saudi Arabia, Qatar, and Kuwait, abortion is heavily criminalized, though exceptions are sometimes made when the mother's life is endangered. In Saudi Arabia, abortion may be permitted up to four months of gestation if the pregnancy poses a significant risk to the woman's physical or mental health. However, such exceptions require approval from multiple medical professionals and are subject to the discretion of religious authorities, making access extremely limited. The influence of Wahhabi interpretations of Islamic law contributes to the rigidity of these frameworks.

Iran, a Shia-majority country, permits abortion under strict conditions, primarily when the fetus has severe abnormalities or the mother's life is in danger. Iranian law underwent notable reform in 2005 with the passage of legislation allowing abortion before 19 weeks in cases of fetal impairment, provided that a medical board approves the procedure. While this appears progressive compared to Sunni-majority nations, the process remains bureaucratic and opaque, discouraging many from pursuing legal abortions. Additionally, recent political shifts in Iran have threatened to roll back these modest gains.

In Algeria and Sudan, abortion laws are similarly restrictive and criminalized except when the mother's life is at risk. In Algeria, the penal code penalizes both women and practitioners involved in abortion procedures. Sudan enforces strict Islamic law, and abortion is generally illegal unless necessary to save the woman's life or, in rare cases, when pregnancy results from rape—a provision primarily applied to conflict zones like Darfur, but with limited implementation. The laws in both countries serve as tools of control over women's reproductive choices, deeply rooted in state and religious ideologies.

Despite the overall restrictive landscape, there is growing advocacy across the region for reform. Civil society organizations, women's rights groups, and some legal scholars are increasingly calling for the decriminalization of abortion and for policies that align with international human rights standards. Legal reform, however, is often slow and contentious, as it requires confronting both deeply entrenched religious doctrines and authoritarian political structures resistant to social change. In many MENA countries, any attempt to liberalize abortion laws is framed as an attack on national or religious identity, further complicating reform efforts.

Ultimately, the legal frameworks on abortion in the MENA region reflect broader societal dynamics concerning women's rights, religious authority, and political control. Where laws are silent, ambiguous, or restrictive, the burden falls disproportionately on women—especially the poor and marginalized—who must navigate a system that denies them autonomy over their bodies. Understanding these legal structures is essential not only for assessing reproductive health in the region but also for situating abortion rights within the larger struggle for gender equality and civil liberties in the Arab and Islamic world.

https://doi.org/10.5281/zenodo.15854596

A comparative table summarizing the legal status of abortion in selected MENA countries, based on key criteria: legality, exceptions allowed, penalties, and accessibility, is shown in Table 1.

Table 1

Legal Status of Abortion in Selected MENA Countries

Country	Legal Status of Abortion	Exceptions Allowed	Penalties	Access & Enforcement
Tunisia	Legal on demand (up to 12 weeks)	No conditions first trimester; health/life/fetal anomaly after	None for legal abortions	Relatively accessible, especially in urban centers
Egypt	Illegal	To save the mother's life	Imprisonment for both woman and provider	Highly restricted; unsafe abortions common
Lebanon	Illegal	To save the mother's life	6 months to 3 years for woman; up to 5 years for doctor	Enforced inconsistently; private clinics offer illegal access
Morocco	Illegal (reforms pending)	Life risk, rape, incest, fetal anomaly, mental health (proposed)	Up to 2 years in prison for illegal abortions	Limited access; awaiting implementation of reforms
Saudi Arabia	Illegal (highly restricted)	Life risk, serious fetal anomaly (within 4 months), rape (rare)	Harsh; includes fines and jail time	Requires medical/religious approval; highly limited
Iran	Illegal with exceptions	Life risk, fetal anomaly (before 19 weeks, with approval)	Prison or fines if unapproved	Somewhat accessible if conditions are met
Algeria	Illegal	To save the mother's life	Up to 5 years imprisonment	Very limited; access nearly impossible without authorization
Sudan	Illegal	Life risk, rape (rare and limited to conflict zones)	Harsh criminal penalties	Enforcement tied to strict Islamic law
Kuwait	Illegal	Life risk	Imprisonment and professional sanctions	Access restricted; requires multiple medical approvals
Qatar	Illegal	Life risk (with strict guidelines)	Up to 5 years in prison	Highly regulated and bureaucratic

3. RELIGIOUS AND CULTURAL INFLUENCES

Religion plays a foundational role in shaping abortion laws and societal attitudes across the MENA region. Predominantly Islamic, the region's interpretations of Sharia (Islamic law) have significantly influenced the criminalization or restriction of abortion in most countries. Although the Qur'an does not explicitly mention abortion, Islamic scholars have historically debated the issue based on interpretations of when life or "ensoulment" begins—usually believed to occur at 120 days of gestation. Yet despite this scholarly nuance, most contemporary Islamic legal frameworks in MENA adopt highly restrictive views, reflecting conservative interpretations rather than the full spectrum of Islamic thought.

Sunni and Shia traditions, the two main branches of Islam, offer differing stances on abortion. In Sunni-majority countries like Egypt, Saudi Arabia, and Morocco, the dominant opinion prohibits abortion unless the mother's life is in danger, though some schools allow exceptions for rape or severe fetal anomalies before ensoulment. Shia-majority Iran, meanwhile, has shown comparatively more openness to permitting abortion in cases of fetal deformity or when the mother's health is threatened, although

https://doi.org/10.5281/zenodo.15854596

strict medical and religious approvals are required. These differences illustrate how religious doctrine is not monolithic, and that state interpretation plays a large role in policy formulation.

Despite room for religious flexibility, conservative cultural norms and patriarchal values often override more lenient religious interpretations. In many MENA societies, a woman's reproductive capacity is closely tied to her social value, family honor, and communal expectations. This patriarchal framework sees motherhood as a duty and abortion as a deviant act that challenges traditional gender roles. Even where abortion may be permissible by religious law, the cultural stigma attached to it acts as a powerful deterrent, discouraging women from seeking even lawful terminations.

In many cases, honor culture intersects with religious belief to intensify the taboo around abortion, particularly when it involves unmarried women. An unintended pregnancy outside of marriage can lead to social ostracism, violence, or even honor killings in extreme cases. Thus, abortion is not merely a medical or legal issue in the MENA region but one that is heavily entangled in communal morality and social reputation. This drives many women to seek unsafe, clandestine abortions, risking their health and lives to avoid social disgrace.

Christian communities in the MENA region, such as those in Lebanon, Egypt, and Syria, are also influenced by religious teachings that generally oppose abortion. The Catholic and Orthodox Churches both uphold pro-life doctrines, viewing abortion as morally impermissible under most circumstances. These stances contribute to the conservative legal environments in countries with sizable Christian populations, where religious influence often crosses into state legislation or public discourse, reinforcing anti-abortion sentiment across religious divides.

Religious authorities—such as muftis, imams, and clerical councils—hold considerable sway over public opinion and policy. Their interpretations and fatwas can either open space for reform or reinforce restrictive norms. In Tunisia, for example, religious leaders were relatively silent or cooperative during the liberalization of abortion laws, allowing secular governance to take precedence. Conversely, in Saudi Arabia or Sudan, religious authorities actively shape abortion policies through strict Islamic interpretations that frame abortion as a sin unless absolutely necessary.

Religious discourse is also politicized in the region, often used by ruling regimes to bolster their legitimacy among conservative populations. Governments sometimes appeal to religious orthodoxy as a tool of political control, using the sanctity of life to suppress debates around women's rights and bodily autonomy. This politicization hinders reform efforts, as challenging abortion laws is portrayed not just as a legal issue but as an attack on national or religious identity.

In recent years, however, some religious scholars and feminist theologians have begun to challenge rigid interpretations by arguing for more compassionate, context-sensitive approaches to abortion. These voices stress the importance of women's mental and physical well-being, poverty, and sexual violence as valid grounds for abortion within Islamic ethics. Such reinterpretations advocate for ijtihad (independent reasoning), encouraging dynamic jurisprudence that responds to contemporary social realities.

Despite these emerging perspectives, popular culture and media in the region often reinforce the stigma rather than question it. Abortion is rarely discussed openly, and when it is portrayed in films, TV, or literature, it is typically depicted as shameful or tragic. This lack of representation contributes to widespread misinformation and moral panic, deterring open dialogue and education about reproductive health and rights.

https://doi.org/10.5281/zenodo.15854596

In summary, religious and cultural influences on abortion in the MENA region form a powerful matrix of control over women's reproductive choices. While Islamic teachings are not inherently inflexible, their political and cultural interpretations often skew toward restriction. When combined with patriarchal honor codes and conservative religious discourse, these influences create a deeply hostile environment for reproductive autonomy. Reforming abortion rights, therefore, requires not only legal change but also a broader cultural and theological shift toward recognizing the moral agency and dignity of women.

4. PUBLIC HEALTH AND SOCIAL IMPLICATIONS

Restrictive abortion laws in the MENA region have significant and often devastating consequences for public health. In countries where abortion is criminalized or heavily restricted, many women turn to unsafe methods that endanger their lives and long-term health. These procedures, often performed in unsanitary conditions by unlicensed individuals, contribute to high rates of maternal morbidity and mortality. The World Health Organization consistently identifies unsafe abortion as one of the leading causes of preventable maternal death worldwide, and the MENA region is no exception.

Women in poor and rural communities are disproportionately affected by these restrictions. In many MENA countries, wealthier women can access discreet, often illegal but relatively safe abortions through private clinics, while lower-income women are forced to seek dangerous alternatives or carry unwanted pregnancies to term. This creates a deeply inequitable healthcare landscape where reproductive autonomy is reserved for the privileged, and the poor bear the brunt of restrictive policies.

The impact on mental health is equally severe. Women denied abortion services may suffer from chronic psychological distress, especially when pregnancies result from rape, incest, or abusive relationships. The burden is compounded by cultural shame, fear of legal prosecution, and the lack of mental health support systems in much of the region. In cases where women are forced to carry pregnancies under traumatic conditions, the long-term psychological damage can be profound and enduring.

Public health systems across the MENA region often lack comprehensive reproductive health services, including access to contraception, family planning education, and post-abortion care. The stigma surrounding abortion deters even trained healthcare professionals from offering care or information, further restricting women's options. As a result, many women remain unaware of safer alternatives or do not seek help until complications arise—by which point it may be too late.

Young women and adolescents are especially vulnerable in this environment. With little access to sex education and social taboos surrounding premarital sexuality, teenage girls who become pregnant face not only physical risks but also social exile. In some cases, young women are coerced into unsafe abortions or forced into early marriage to "legitimize" a pregnancy. The lack of legal protections and youth-centered reproductive services intensifies their exposure to exploitation and harm.

Refugee and displaced women in conflict zones face an even more precarious situation. In Lebanon, Jordan, and other countries hosting large numbers of Syrian or Palestinian refugees, reproductive healthcare is severely limited, and abortion is often entirely inaccessible. Humanitarian settings are marked by resource scarcity, insecurity, and cultural sensitivity, leaving reproductive health needs dangerously unmet. The consequences are higher maternal death rates, untreated complications, and increased vulnerability to sexual violence.

https://doi.org/10.5281/zenodo.15854596

There is also a public health cost to society at large. Treating the complications of unsafe abortions places a heavy burden on already strained healthcare systems. Hospital admissions for hemorrhages, infections, infertility, and other consequences of botched abortions consume medical resources that could otherwise be used for preventative care. In contrast, countries that provide safe and legal abortion services often see improved maternal health outcomes and reduced long-term healthcare costs.

Socially, restrictive abortion environments reinforce gender inequality by denying women agency over their bodies and life choices. When states dictate reproductive decisions, women's roles are confined to motherhood and family service, excluding them from broader participation in society, education, and the workforce. This perpetuates cycles of poverty, dependency, and social disempowerment, particularly in contexts where women already face legal and cultural discrimination.

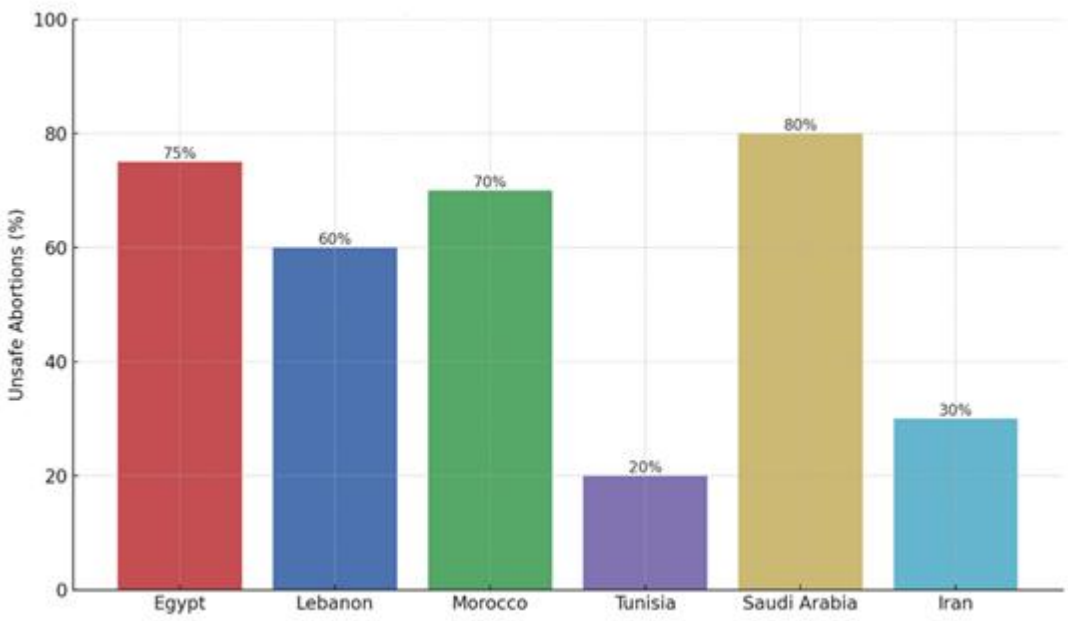
Furthermore, the legal threat posed by criminalized abortion contributes to a culture of silence, misinformation, and fear. Women who have undergone abortions are often unwilling to share their experiences, even anonymously, and healthcare providers may avoid offering necessary services for fear of prosecution. This atmosphere prevents open public debate, hinders the collection of accurate health data, and undermines the ability of states to design informed reproductive health policies.

In conclusion, the public health and social implications of restrictive abortion laws in the MENA region are severe, widespread, and deeply gendered. Unsafe abortion practices, inequitable access to care, psychological trauma, and systemic healthcare burdens all point to a crisis that extends far beyond individual moral or religious beliefs. Addressing these challenges requires not only legal reform but also comprehensive investments in education, health infrastructure, and women's empowerment, ensuring that reproductive rights are seen not as a taboo, but as a vital component of public health and human dignity.

A bar chart showing the estimated percentage of unsafe abortions in selected MENA countries is shown in Figure 1.

Figure 1

Unsafe Abortions (%) in Selected MENA Countries



https://doi.org/10.5281/zenodo.15854596

While the numbers are illustrative (based on public health trends and reports), they highlight the stark disparities:

- **Tunisia** has the lowest rate due to legal and accessible abortion services.
- **Saudi Arabia**, **Egypt**, and **Morocco** show significantly higher rates, reflecting restrictive laws and limited access.
- **Iran** and **Lebanon** fall in between, with some legal exceptions or access for the wealthy but persistent barriers for most women.

5. POLITICAL DYNAMICS AND WOMEN'S RIGHTS MOVEMENTS

The political landscape in the MENA region plays a critical role in shaping abortion laws and access. Most governments in the region maintain centralized, authoritarian control and often use social issues—particularly those related to women's rights—as tools for reinforcing national identity and public morality. Abortion, as one of the most sensitive and polarizing topics, is rarely debated openly in political spheres. Instead, it is tightly regulated under the guise of protecting religious values and traditional family structures, which in turn suppresses reformist agendas.

Many regimes in the MENA region rely on a strategy of religious-nationalist alliance, where maintaining the status quo on issues like abortion helps them appease conservative religious establishments. In Egypt, for example, successive governments have been reluctant to amend abortion laws for fear of backlash from Al-Azhar, the Sunni world's most influential Islamic institution. In Saudi Arabia, the monarchy governs through a strict interpretation of Wahhabi Islam, where political liberalization on reproductive rights would threaten its theological foundations and risk alienating key religious constituencies.

The politicization of abortion is also evident in how it is tied to issues of population control and state interest. In countries like Iran, abortion policy has shifted with political needs. During the 1980s and 1990s, the Iranian government promoted family planning and allowed some abortion exceptions to curb population growth. More recently, however, as the regime pushes pro-natalist policies to boost the birth rate, it has sought to tighten abortion access, demonstrating how women's bodies can be treated as instruments of state demographic goals rather than autonomous individuals.

In contrast, Tunisia stands out as an exceptional case where abortion was legalized early on, not due to a grassroots movement but as part of a top-down modernization policy by President Habib Bourguiba. His regime sought to secularize the country and promote women's rights as symbols of progress and state legitimacy. Although Tunisia remains an anomaly in the region, its experience illustrates that political will, when aligned with progressive values, can result in significant reproductive rights reforms even in predominantly Muslim societies.

Despite restrictive governments, women's rights movements across the MENA region have been persistent and increasingly vocal. From Morocco to Lebanon, feminist organizations, civil society activists, lawyers, and journalists have challenged abortion laws by exposing their human cost. These movements often frame abortion not solely as a matter of choice, but as a public health issue, a human rights concern, and a question of social justice—strategies designed to navigate the political and religious sensitivities of their societies.

https://doi.org/10.5281/zenodo.15854596

In Morocco, the advocacy efforts of civil society organizations were instrumental in pushing the monarchy to propose reforms in 2015. Led by activists, legal scholars, and medical professionals, the movement highlighted the dangers of unsafe abortions and called for exceptions in cases of rape, incest, and fetal deformity. Though the reforms have not been fully implemented, they represent a significant shift in public discourse and political acknowledgment of the issue. This shows that sustained advocacy can influence even monarchic regimes when backed by public concern and expert testimony.

Lebanon, with its more pluralistic and open society, has also seen a growing number of women's rights groups raise the issue of abortion. These organizations often operate in a complex political environment marked by sectarianism, patriarchy, and economic collapse. While legislative reform remains unlikely in the near term, feminist voices in Lebanon have succeeded in bringing abortion into public debate, challenging religious taboos, and offering informal support networks for women in need. The presence of media, academia, and civil society gives Lebanese activists tools that are less accessible in more repressive states.

At the regional level, transnational feminist networks and international NGOs have played a supporting role in amplifying local voices and pressuring governments through international human rights mechanisms. Reports from groups like Amnesty International and Human Rights Watch have brought global attention to the dangers of criminalized abortion, while UN agencies continue to advocate for sexual and reproductive health rights as fundamental to development and gender equality.

Nonetheless, women's rights movements in the MENA region face considerable challenges and risks. Activists often face legal harassment, social backlash, and limited funding. In many countries, NGOs are subject to heavy surveillance and must operate within strict parameters to avoid being labeled as threats to national security or religious values. The criminalization of abortion also limits their ability to provide direct services or support without risking legal repercussions, further complicating efforts to organize or mobilize.

In summary, the political dynamics surrounding abortion in the MENA region reflect broader patterns of authoritarianism, religious influence, and gender control. Yet within these constraints, women's rights movements continue to resist, adapt, and advocate for reform. Their efforts—though incremental—are reshaping the public narrative, challenging silence and stigma, and laying the groundwork for future legal and cultural change. True progress will require not only changes in law but shifts in political will, public discourse, and the empowerment of women as equal citizens across the region.

6. COMPARATIVE AND REGIONAL PERSPECTIVES

Abortion laws and practices across the MENA region vary considerably, shaped by a complex blend of religion, colonial legal legacies, political ideologies, and socioeconomic factors. Despite some shared cultural and religious foundations, countries within the region have adopted markedly different approaches to abortion, making regional comparison essential for understanding the full picture. While most MENA countries heavily restrict or criminalize abortion, exceptions like Tunisia illustrate that liberal abortion policy is possible even in predominantly Muslim societies.

North Africa shows greater diversity and relative openness compared to the Gulf region. Tunisia leads with one of the most liberal abortion laws in the Global South, legalizing abortion on request during the first trimester since 1973. Algeria and Morocco, on the other hand, retain colonial-era penal codes that criminalize abortion, though Morocco has proposed reforms in recent years to allow limited exceptions.

https://doi.org/10.5281/zenodo.15854596

The presence of post-colonial secular legal traditions and stronger civil society engagement in North Africa contributes to these internal differences.

In contrast, the Gulf countries, such as Saudi Arabia, the United Arab Emirates, and Qatar, maintain some of the most restrictive abortion laws in the region. These nations derive their legal systems predominantly from Islamic jurisprudence, particularly Hanbali or Maliki schools of thought, which allow abortion only when the mother's life is at risk, and occasionally for severe fetal anomalies before 120 days of gestation. The strong presence of religious institutions in governance makes legal reform in these countries particularly difficult.

The Levant region, including countries like Lebanon, Jordan, and Syria, offers a mixed picture. Lebanon has a relatively open society, yet abortion remains illegal except to save a woman's life. Enforcement, however, is often inconsistent, and access through private medical networks is common among the elite. Jordan has made minor reforms, allowing abortion in cases of rape or incest for unmarried women in limited circumstances, particularly in refugee settings. The region's sectarian political structures and social conservatism slow progress despite active feminist advocacy.

Iran provides an interesting Shia-majority counterpoint to its Sunni neighbors. While abortion is restricted, Iran has a more formalized process for legal abortions in cases of fetal impairment and risk to the mother's life. A medical board must approve the procedure, and it must be done before 19 weeks of gestation. These policies emerged during Iran's family planning era and reflect how reproductive policy can shift based on political strategy. However, recent pro-natalist shifts under conservative leadership threaten to reverse some of these provisions.

When compared globally, MENA countries generally fall behind in terms of reproductive freedom. According to the Guttmacher Institute and other global monitoring bodies, regions like Latin America and parts of Africa—despite strong religious influences—have recently made strides toward liberalizing abortion laws, often following constitutional court rulings or widespread feminist mobilizations. In contrast, most MENA countries remain resistant to change, reflecting the region's authoritarian governance, limited judicial independence, and religious entrenchment in lawmaking.

That said, not all religious-majority countries are uniformly restrictive. For instance, Turkey—a Muslim-majority country outside the Arab world—permits abortion up to ten weeks of gestation and has integrated family planning into its public healthcare system. This underscores the point that religious identity alone does not determine abortion policy; rather, state ideology, legal history, and civic engagement play crucial roles. Tunisia's liberal abortion law, passed before Roe v. Wade in the U.S., is another reminder of how context and political will can transcend religious assumptions.

Across the MENA region, the legal inconsistency of abortion laws mirrors a deeper socioeconomic divide. Urban centers may provide clandestine or even semi-legal abortion services, especially for wealthier women, while rural areas and marginalized communities suffer from lack of access. Refugees, internally displaced women, and undocumented migrants face the most severe barriers, as they navigate not only restrictive laws but also xenophobia, poverty, and violence. These disparities are further widened by uneven healthcare systems and lack of sexual education.

Despite these challenges, a growing regional discourse is beginning to emerge, propelled by feminist scholars, medical professionals, and youth activists who are networking across borders. Conferences, joint research projects, and online campaigns are helping to build solidarity and share strategies among MENA countries. This transnational awareness allows reformists to learn from Tunisia's model,

https://doi.org/10.5281/zenodo.15854596

Morocco's advocacy tactics, or even Iran's bureaucratic procedures, adapting them to their own national contexts.

In conclusion, comparative and regional perspectives reveal that abortion in the MENA region is not governed by a single religious or cultural logic but by a complex web of historical, political, and socioeconomic variables. The variation across countries demonstrates that change is possible, especially where civil society is active and governments are willing to prioritize public health and gender equity. For real progress, however, regional collaboration and localized reform must go hand in hand with global solidarity and pressure to ensure reproductive justice across the Arab and Islamic world.

A comparative table summarizing the abortion policy status across the MENA region is shown in Table 2.

Table 2

Abortion Policy Status Across the MENA Region

Country	Policy Status	Legality	Notable Notes
Tunisia	Liberal	Legal on request up to 12 weeks	Progressive law since 1973; publicly funded procedures
Turkey	Liberal	Legal up to 10 weeks	Secular legacy; accessible in urban areas
Iran	Conditional	Permitted for fetal anomalies, life risk	Requires approval from medical board
Morocco	Reforming	Restricted, reforms proposed	Exceptions proposed for rape, incest, fetal deformities
Lebanon	Restricted	Illegal except to save the mother's life	Private access possible for wealthy; civil society active
Egypt	Restricted	Illegal except for life-threatening cases	Strong religious influence; unsafe abortions common
Jordan	Restricted	Illegal with narrow exceptions	Exceptions allowed for rape/incest in rare refugee contexts
Saudi Arabia	Highly Restricted	Life risk or serious fetal issues before 4 mo	Religious oversight; tightly controlled and rare access
UAE, Qatar, Kuwait	Highly Restricted	Life risk only	Bureaucratic procedures; access extremely limited
Algeria, Libya, Syria, Iraq, Yemen, Sudan	Restricted	Life risk only	Colonial penal codes remain in place; access extremely limited
Israel	Liberal	Legal with committee approval	Unique among regional countries; abortion widely accessible

7. ETHICAL AND PHILOSOPHICAL CONSIDERATIONS

The ethics of abortion remain deeply contested across cultures, and the MENA region is no exception. At the heart of the debate lies a fundamental moral question: when does human life begin, and what rights does it entail? The answer varies widely depending on religious belief, philosophical reasoning, and cultural context. While secular ethics often emphasize individual autonomy, bodily integrity, and the minimization of suffering, religious and traditional perspectives in the MENA region tend to prioritize the sanctity of life from conception—or at least early fetal development—leading to profound ethical tensions.

https://doi.org/10.5281/zenodo.15854596

Islamic ethics, which influence many MENA legal systems, offer a nuanced but ultimately conservative view. Most Islamic scholars agree that the fetus becomes fully human at the point of *ensoulment*, traditionally believed to occur at 120 days of gestation. Before this point, some interpretations permit abortion under specific circumstances, such as rape or fetal abnormality. However, in practice, these more flexible interpretations are often disregarded in favor of rigid, absolutist applications that treat abortion as ethically equivalent to murder. This selective application illustrates the politicization of religious ethics and the marginalization of interpretive pluralism.

From a secular moral perspective, especially within human rights discourse, bodily autonomy is a cornerstone principle. Ethical arguments in favor of legal abortion assert that a woman has the right to make decisions about her own body without state interference. This includes the right to terminate a pregnancy, especially when continuation would cause physical, psychological, or social harm. In the MENA context, where women's autonomy is frequently constrained by patriarchal systems, this ethical perspective challenges not only abortion laws but also broader structures of gender inequality.

Another important ethical lens is the utilitarian approach, which evaluates the morality of abortion based on its consequences. From this perspective, the suffering caused by forced pregnancies—particularly in cases of rape, incest, or fetal deformities—far outweighs the moral cost of terminating an early-stage pregnancy. Moreover, unsafe abortions resulting from legal bans pose grave public health risks, leading to preventable deaths and injuries. Thus, restricting abortion can be seen as ethically indefensible because it increases human suffering rather than reducing it.

In contrast, deontological ethics, which emphasize adherence to moral rules regardless of consequences, often underlie conservative arguments against abortion. Many opponents of abortion argue that life is sacred from the moment of conception and that terminating a fetus violates an absolute moral duty to protect the innocent. These views are often rooted in religious or metaphysical beliefs about the soul and divine will. In the MENA region, where religious frameworks hold strong societal sway, deontological thinking often dominates public discourse on abortion.

The tension between communitarian ethics and individual rights also plays out in the abortion debate. In many MENA societies, community values, family honor, and collective morality often take precedence over individual choice. A woman seeking an abortion is not seen as an autonomous actor making a personal health decision, but as someone threatening communal order or family reputation. This ethical framework often justifies coercion, secrecy, and even violence against women who defy social expectations.

Feminist ethics, on the other hand, center the lived experiences of women, especially those marginalized by poverty, violence, or systemic oppression. Feminist philosophers argue that ethical debates on abortion must account for the context of women's lives—the social pressures, economic burdens, and emotional trauma that often accompany unintended pregnancies. In the MENA region, where women may lack legal protections or access to healthcare, denying abortion is not just unethical but a form of structural violence that targets the most vulnerable.

There is also an ethical discussion surrounding the fetus itself: what moral status should it have, and how should its potential life be balanced against the rights and well-being of the mother? Philosophers differ on whether a fetus is a "person" with moral rights or a potential life whose value increases with gestational development. In many MENA abortion laws, the fetus is granted nearly full moral status from conception, often at the expense of the woman’s health and rights—a position increasingly challenged by global bioethics.

https://doi.org/10.5281/zenodo.15854596

Moreover, ethical relativism poses an ongoing dilemma: should abortion laws and ethics be judged by universal standards or cultural specificity? While international human rights frameworks advocate for reproductive freedom as a universal right, many MENA states resist such claims, arguing that abortion contradicts their moral and religious values. The challenge, then, is to promote ethical reflection that respects cultural contexts while still upholding core principles of justice, autonomy, and dignity.

In conclusion, the ethical and philosophical debates surrounding abortion in the MENA region reflect a clash of values—between tradition and modernity, religion and secularism, community and individual, duty and compassion. These tensions are not easily resolved, but they must be openly addressed if the region is to move toward more humane and equitable reproductive policies. Ethical discourse, informed by lived realities and guided by empathy and justice, has the potential to bridge divides and shape a more inclusive future for women's health and rights in the Arab and Islamic world.

8. RECOMMENDATIONS AND POLICY DIRECTIONS

To address the multifaceted crisis of abortion rights in the MENA region, it is essential to adopt a set of comprehensive, evidence-based policy recommendations. These must balance public health priorities, human rights principles, religious sensitivities, and social realities. The first and most urgent recommendation is the decriminalization of abortion, at least in cases involving rape, incest, threats to the woman’s life or health, and severe fetal anomalies. This legal reform would significantly reduce unsafe abortions and prevent thousands of avoidable deaths and complications each year.

Secondly, governments must establish clear medical guidelines and protocols for legal abortions where they are already permitted. In many MENA countries, legal ambiguities discourage doctors from performing even allowed procedures due to fear of legal repercussions. Creating standardized, confidential, and transparent medical pathways—especially for cases involving fetal deformity or mental health risks—would protect both patients and providers and ensure ethical and safe care.

Another critical step is the integration of reproductive health into national healthcare systems. This includes ensuring access to family planning services, contraception, safe abortion where permitted, and post-abortion care. Public hospitals, especially in rural or marginalized areas, should be equipped with trained personnel and medical infrastructure. Governments should also subsidize reproductive services to prevent economic inequality from determining access to care.

In parallel, comprehensive sexuality education must be implemented in schools and community centers. Misinformation and stigma surrounding abortion are often rooted in ignorance. Educating young people about reproductive health, consent, contraception, and responsible sexual behavior not only prevents unintended pregnancies but also fosters a more informed and empathetic society. Educational programs should be culturally sensitive but also grounded in scientific fact and human rights standards.

Efforts should also be made to engage religious and community leaders in open, constructive dialogue. Rather than confronting religious norms head-on, reformers should draw upon more flexible interpretations within Islamic jurisprudence that allow abortion under certain conditions. Fatwas and religious guidance can play a powerful role in shifting public opinion and legitimizing reform in religiously conservative societies. Building alliances with moderate clerics can help reduce the perception of abortion reform as a Western imposition.

https://doi.org/10.5281/zenodo.15854596

Civil society must be empowered and protected as a key driver of change. NGOs, women's organizations, legal advocates, and health workers have played critical roles in raising awareness, supporting women, and pressuring governments. States should ease restrictions on civil society and allow reproductive rights organizations to operate freely, conduct research, provide services, and advocate for reform without fear of legal harassment or shutdown.

From a global perspective, international institutions and donor agencies must continue to support abortion rights advocacy in the MENA region—but with cultural sensitivity and local leadership. Rather than imposing external models, international actors should partner with grassroots organizations, fund research and public health initiatives, and pressure governments diplomatically to meet their human rights obligations. The role of the United Nations, particularly UNFPA and WHO, remains vital in this regard.

Another key policy direction is the collection of reliable reproductive health data. Many MENA countries lack accurate statistics on abortion prevalence, maternal mortality, and reproductive health access. Governments and NGOs should prioritize data-driven policymaking to better understand the scope of the problem and evaluate the effectiveness of interventions. Transparency and research are essential to dispelling myths and informing public debate.

In addition, there should be legal and medical protections for healthcare providers. Doctors, nurses, and counselors who assist women with legal abortions or post-abortion care must not face criminal prosecution or professional censure. Clear legal protections and professional training would create a safer environment for providing essential reproductive services and ensure that care is delivered based on medical ethics rather than fear.

Finally, reform should be framed not just as a health issue, but as a matter of justice, dignity, and gender equality. Women in the MENA region deserve the right to make informed choices about their bodies and futures. Policy makers must recognize that denying safe abortion not only violates human rights, but also undermines public health, social development, and the moral integrity of governance itself. Sustainable reform will depend on a long-term commitment to empowering women, reforming institutions, and building societies that place compassion, science, and equality at the center of their reproductive laws.

9. CONCLUSION

The issue of abortion in the MENA region lies at the intersection of law, religion, culture, politics, public health, and gender justice. As this research has shown, abortion is widely restricted across the region, often permitted only in cases where the mother's life is in danger. This legal rigidity is deeply rooted in conservative religious interpretations, colonial legal legacies, and patriarchal societal norms that collectively deny women control over their reproductive choices and bodies. Despite some exceptions—such as Tunisia and, to a lesser extent, Iran—the broader trend in the region remains one of criminalization and social stigma.

These restrictions have profound consequences. They drive women to seek unsafe abortions, heightening maternal mortality rates and putting enormous pressure on public health systems. Women from lower socioeconomic backgrounds are disproportionately affected, facing not only physical risks but also psychological trauma, social isolation, and legal persecution. The lack of access to safe abortion is thus not only a medical issue but a social and moral crisis that reflects broader inequalities in health, gender rights, and access to justice.

https://doi.org/10.5281/zenodo.15854596

At the same time, the region is not static. Women's rights movements, civil society organizations, and feminist scholars are increasingly challenging the silence and taboos surrounding abortion. They are reframing the issue not simply as a moral debate, but as a public health imperative and a human rights concern. These advocates are working to break the political and religious monopoly on reproductive discourse, and they are finding ways to engage with religious frameworks in more compassionate and progressive interpretations that can support reform from within cultural and spiritual traditions.

The path forward must involve multi-level strategies: legal reform to permit abortion in broader circumstances; public health investment in reproductive care and education; protection and empowerment of healthcare workers; and cultural change to reduce stigma and shame. Governments must listen to women, protect their rights, and embrace policies based on evidence and empathy, not fear and control. International cooperation and solidarity also have an important role in supporting change, especially in societies where open advocacy can be dangerous.

In conclusion, abortion rights in the MENA region remain one of the most urgent yet neglected dimensions of women's autonomy and public health. Change is possible, but it will require courage, dialogue, and persistent advocacy. By centering the voices and experiences of women themselves—and by building alliances across faiths, sectors, and borders—the region can move toward a more just and humane future where reproductive freedom is not a privilege for the few, but a right for all. The time has come for policymakers, healthcare professionals, religious leaders, educators, and civil society in the MENA region to confront the reality of unsafe abortion and its devastating impact on women's lives. Reproductive rights are not a threat to cultural values—they are a cornerstone of human dignity and public health. Let us break the silence, challenge unjust laws, and create systems that trust women to make decisions about their own bodies. Legal reform, compassionate care, and open dialogue are not only possible—they are urgently necessary. Change starts with listening, continues with courage, and ends with justice.

BIBLIOGRAPHY

Abdelbaqy, M. A. (2019). Reproductive Health in Arab Countries. Handbook of Healthcare in the Arab World, 1-39.

Abdelwahed, I. (2024). An Overview of Sexual and Reproductive Health. Sexuality in the Middle East and North Africa: Contemporary Issues and Challenges, 197.

Badahdah, A. M. (2016). Attitudes toward restricting the sexual and reproductive rights of women living with HIV infection in Yemen. Journal of the Association of Nurses in AIDS Care, 27(2), 180-187.

Bearak, J. M., Popinchalk, A., Ganatra, B., Moller, A. B., Tunçalp, Ö., Beavin, C., ... & Alkema, L. (2020). Global estimation of unintended pregnancy and abortion using a Bayesian hierarchical random walk model. arXiv preprint arXiv:2007.09246.

Bohsas, H., Alibrahim, H., Swed, S., Rais, M. A., Aljabali, A., Jawish, N., ... & Cherrez-Ojeda, I. (2023). Evaluation of Women's Abortion Knowledge and Attitudes in Syria: An Online Cross-Sectional Study.

Dabash, R., & Roudi-Fahimi, F. (2008). Abortion in the middle east and north africa. Washington, DC: Population Reference Bureau, 268-267.

DeJong, J., Shepard, B., Roudi-Fahimi, F., & Ashford, L. (2007). Young people's sexual and reproductive health in the Middle East and North Africa. Reprod Health, 14(78), 8.

East, G. M., & Jassim, G. (2023). Women's Health. In. Healthcare in The Arabian Gulf and Greater Middle East: A Guide for Healthcare Professionals-E-Book, 64.

El Ansari, W., El-Ansari, K., & Arafa, M. (2025). Breaking the silence–systematic review of the socio-cultural underpinnings of men's sexual and reproductive health in Middle East and North Africa (MENA): A handful of taboos?. Arab Journal of Urology, 23(1), 16-32.

Ellis-Kahana, J. (2013). Sailing for safe abortion access: The emergence of a conscious social nonmovement in Morocco. The Moroccan Family Code (Moudawana) of February, 5, 2004.

Feather, G. (2020). Proactive versus Reactive Sexual and Reproductive Health Rights: A Comparative Case Study Analysis of Morocco and Tunisia. Femina Politica–Zeitschrift für feministische Politikwissenschaft, 29(2), 76-89.

Gomez, J. (2022). North Africa and the Middle East. Women and Sexuality: Global Lives in Focus, 93.

Haghighat, E. (2014). Establishing the connection between demographic and economic factors, and gender status in the Middle East: Debunking the perception of Islam's undue influence. International Journal of Sociology and Social Policy, 34(7/8), 455-484.

Haghighat-Sordellini, E. (2010). Women's Status and Fertility Patterns. In Women in the Middle East and North Africa: Change and Continuity (pp. 61-71). New York: Palgrave Macmillan US.

Hessini, L. (2007). Abortion and Islam: policies and practice in the Middle East and North Africa. Reproductive health matters, 15(29), 75-84.

Islam, N., Mahmood, S., Kabir, H., Chowdhury, S. R., Elshaikh, U., Alhussaini, N., ... & Chivese, T. (2025). Prevalence of unintended pregnancy in the MENA region: a systematic review and meta-analysis. BMJ open, 15(4), e084016.

Jamaleddine, Z. (2012). Feminism, gender equity and sexual/reproductive health in the Middle East and North Africa (MENA) region. The University of Texas School of Public Health.

Jerak, N. (2018). Upcoming spring for reproductive rights and health in Tunisia and Egypt?: a comparative analysis of reproductive rights and health before and after the 2011 Arab Spring (Master's thesis, ISCTE-Instituto Universitario de Lisboa (Portugal)).

Kareem, Q. N., Hussein, A. A., & Khalaf, S. K. (2022). Human cytomegalovirus and relationship with abortion among Iraqi females: a systematic review. Journal of Ideas in Health, 5(3), 739-747.

Maffi, I., & Tønnessen, L. (2023). Abortion, law, and health in the Arab world. In Research Handbook on International Abortion Law (pp. 303-320). Edward Elgar Publishing.

Maffi, I. (2020). Abortion in post-revolutionary Tunisia: Politics, medicine and morality (Vol. 46). Berghahn Books.

Moghadam, V. M. (2019). Social Transformation in a digital age: women's participation in civil and political domains in the MENA region. IEMed. Mediterranean Yearbook, 2019, 140-145.

Moradinazar, M., Rostami, R., Armaghan, N., Shakiba, M., Rai, A., Azizi, S. A., & Shakiba, E. (2022). Epidemiological features of spontaneous abortion in the North Africa and the Middle East from 1990 to 2019: results from the global burden of Disease Study 2019. Journal of family & reproductive health, 16(3), 183.

Moujahid, C., Turman, J. E., & Amahdar, L. (2024). A scoping review of the social determinants of maternal health in the MENA region. The Pan African Medical Journal, 47, 205.

Newman, J., & Inhorn, M. C. (2015). Medical Anthropology in the Middle East and North Africa. A Companion to the Anthropology of the Middle East, 205-232.

Oraby, D. (2024). Sexuality education for youth and adolescents in the Middle East and North Africa region: A window of opportunity. Global Health: Science and Practice, 12(1).

Roudi-Fahimi, F. (2003). Women's reproductive health in the Middle East and North Africa. Washington, DC: Population Reference Bureau.

Saadeh, R., Alfaqih, M., Odat, A., & Allouh, M. Z. (2021). Attitudes of medical and health sciences students towards abortion in Jordan. BioMed research international, 2021(1), 6624181.

Speake, B. (2012). Islam and Women's Reproductive and Sexual Rights in the MENA Region. E-International Relations Students.

Tabahi, S. (2020). The construction and reconstruction of sexuality in the Arab world: An examination of sexual discourse, women's writing and reproductive justice. Sexuality & Culture, 24(6), 1720-1737.

Tirado, V., Ekström, A. M., Orsini, N., Hanson, C., & Strömdahl, S. (2023). Knowledge of the abortion law and key legal issues of sexual and reproductive health and rights among recently arrived migrants in Sweden: a cross-sectional survey. BMC public health, 23(1), 551.

Tønnessen, L., & Al-Nagar, S. (2019). The politicization of abortion and hippocratic disobedience in Islamist Sudan. Health and Human Rights, 21(2), 7.

Tønnessen, L. (2015). Women's right to abortion after rape in Sudan. CMI Insight.

van der Kop, M. L., Båge, K., Tirado, V., Kågesten, A., Puranen, B., Sorcher, R., ... & Larsson, E. C. (2025). Reproductive agency and the acceptability of divorce, abortion, and homosexuality among migrants from the Middle East and Africa living in Sweden–a cross-sectional analysis. International Journal for Equity in Health, 24(1), 53.

Zaki, S. A., Naous, J., Ghanem, A., Abou Abbas, D., Tomb, R., Ghosn, J., & Assi, A. (2021). Prevalence of STIs, sexual practices and substance use among 2083 sexually active unmarried women in Lebanon. Scientific reports, 11(1), 9855.

Zaręba, K., Herman, K., Kołb-Sielecka, E., & Jakiel, G. (2021, November). Abortion in countries with restrictive abortion laws—possible directions and solutions from the perspective of Poland. In Healthcare (Vol. 9, No. 11, p. 1594). MDPI.

Zuhur, S. (2006). Women's crimes and the criminalization of sex. Al-Raida, 23(113), 28-37.

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.

CITATION:

Choueiri, E.M. (2025). *Abortion Rights in The MENA Region (Middle East and North Africa)*. World Safety Journal, XXXIV(2), 51–67. https://doi.org/10.5281/zenodo.15854596

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.
Members have access to WSO Newsletters and other member- ship publications of the WSO on the WSO website, and may request hard copies by contacting the WSO World Management Center. Subscription fees apply to certain publications.
Members are entitled to reduced fees at seminars, conferences, and classes given by the WSO. This includes local, regional, and international programs. When Continuing Education Units (CEUs) are applicable, an appropriate certificate is issued.
Members who attend conferences, seminars, and classes receive a Certificate of Attendance from the WSO. For individuals attending courses sponsored by the WSO, a Certificate of Completion is issued upon completion of each course.
Members receive special hotel rates when attending safety pro- grams, conferences, etc., sponsored by the WSO.

Membership

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.

Membership Categories

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 included on the following pages and is also available on the WSO website: https://worldsafety.org/quick- downloads/

WSO – Application for Membership

[✓]	Application Fee	$20.00 USD
[ ]	Associate Membership	$65.00 USD
[ ]	Affiliate Membership	$90.00 USD
[ ]	Institutional Membership*)	$195.00 USD
[ ]	Corporate Membership*)	$1000.00 USD

*) In case of institution, agency, corporation, etc., please indicate name, title, and mailing address of the authorized representative.

(Please print or type.)

NAME (Last, First, Middle) [ ] Mr. [ ] Ms. [ ] Mrs. [ ] Dr. [ ] Engr.

BIRTHDATE:

POSITION/TITLE:

COMPANY NAME AND ADDRESS: [ ] Preferred

HOME ADDRESS: [ ] Preferred

BUSINESS PHONE: | FAX:

CELL PHONE: | HOME PHONE:

E-MAIL ADDRESS(ES):

PROFESSIONAL MEMBERSHIP(S), DESIGNATION(S), LICENSE(S):

EDUCATION (degree(s) held):

REFERRAL

If you were referred by someone, please list his/her name(s), chapter, division, etc.:

WSO Member: _____

WSO Chapter: _____

WSO Division/Committee: _____

Other: _____

PLEASE specify your area of professional expertise. This information will be entered into the WSO "Bank of Professional Skills," which serves as a pool of information when a request for a consultant/information/expertise in a specific area of the profession is requested.

- [ ] Occupational Safety and Health (OS&H)
- [ ] Environmental Safety and Health (EH&S)
- [ ] Fire Safety/Science (FS&S)
- [ ] Safety/Loss Control Science (S&LC)
- [ ] Public Safety/Health (PS&H)
- [ ] Construction Safety (CS)
- [ ] Transportation Safety (TS)
- [ ] Industrial Hygiene (IH)
- [ ] Product Safety (PRO)
- [ ] Risk Management (RM)
- [ ] Hazardous (Toxic) Materials Management (HAZ)
- [ ] Nuclear Safety (NS)
- [ ] Aviation Safety (AS)
- [ ] Ergonomics (ERG)
- [ ] Petroleum (PS)
- [ ] Oil Wells (OW)
- [ ] Other: _____

PAYMENT OPTIONS

For secure Credit Card Payment, please visit the SHOP on WSO's website (https://worldsafety.org/shop) and select "WSO Membership Application Fee" to make your payment. You will receive an emailed invoice for the Membership Fee upon approval.

Check or Money Order payable to WSO may be mailed with application packet to: WSO-WMC, Attn: Membership Coordinator, PO Box 518, Warrensburg MO 64093 USA. International postal money orders or bank drafts with a U.S. routing number are acceptable for applicants outside the United States. For alternate payment arrangements, please contact WSO-WMC.

Annual dues hereafter will be billed and payable on the anniversary date of your membership. **U.S. funds only.**

By submitting this application, you are accepting that WSO will use the information provided to perform an independent verification of employer, credentials, etc.

Mail or email completed form, along with current résumé/CV:

WSO World Management Center
PO Box 518 | Warrensburg, Missouri 64093 USA
Phone 660-747-3132 | FAX 660-747-2647 | membership@worldsafety.org

Student Membership Application

WORLD SAFETY ORGANIZATION

Instructions | Complete all applicable fields and mail to **WSO World Management Center, PO Box 518, Warrensburg, MO 64093 USA**, email to **membership@worldsafety.org**, or fax to **1-660-747-2647**. For assistance completing this application, please call **1-660-747-3132**, or email questions to **membership@worldsafety.org**.

Membership Level | Choose One

❑ **College/University Student Membership – FREE**

*You will receive all member benefits including subscriptions to **WSO World Safety Journal** and **WSO NewsLetter**, as well as access to **WSO's Mentor Program**.*

❑ **Middle/High School Student Membership – FREE**

*You will receive all member benefits including subscription to **WSO World Safety Journal** and **WSO NewsLetter**, excluding access to **WSO's Mentor Program**.*

Last Name/Family Name

First Name/Given Name | Initial | ❑ M ❑ F (Gender)

Birthdate MM / DD / YYYY *(Application must include exact birthdate with year to be processed.)*

Current Street Address ❑ On Campus ❑ Off Campus *(Attach separate sheet if you need more room for your address.)*

City | State/Province | Country

Zip/Postal Code | Telephone Number (including area code) | ❑ Landline ❑ Mobile (Type)

Permanent Street Address

City | State/Province | Country

Zip/Postal Code | Telephone Number (including area code) | ❑ Landline ❑ Mobile (Type)

Send mail to: ❑ Current Address ❑ Permanent Address

Email Address(es)

COLLEGE/UNIVERSITY STUDENT

Category: ❑ Undergraduate ❑ Graduate/Post-Graduate

Degree(s) Sought/Obtained

Name of College/University | Campus

MIDDLE / HIGH SCHOOL STUDENT

❑ I am a Middle Schooler in: ❑ 6th Grade ❑ 7th Grade ❑ 8th Grade

❑ I am a High School: ❑ Freshman ❑ Sophomore ❑ Junior ❑ Senior

Name of School

Approximate Date of Graduation (MM / YYYY)
(For High School and College/University students, application must include approximate date of graduation to be processed.)

If you were referred by someone, please list name(s), chapter, division, etc.:

WSO Member: _____

WSO Chapter/National Office: _____

WSO Division/Committee: _____

Other: _____

What Interests You?

Please specify your area(s) of interest. These areas of interest will allow you to connect with others who share similar interests throughout the world.

[ ] Occupational Safety and Health (OS&H)
[ ] Environmental Safety and Health (EH&S)
[ ] Fire Safety/Science (FS&S)
[ ] Safety/Loss Control Science (S&LC)
[ ] Public Safety/Health (PS&H)
[ ] Construction Safety (CS)
[ ] Transportation Safety (TS)
[ ] Industrial Hygiene (IH)
[ ] Product Safety (PRO)
[ ] Risk Management (RM)
[ ] Hazardous (Toxic) Materials Management (HAZ)
[ ] Nuclear Safety (NS)
[ ] Aviation Safety (AS)
[ ] Ergonomics (ERG)
[ ] Petroleum (PS)
[ ] Oil Wells (OW)
[ ] Other: _____

Required Signatures & Permissions

I subscribe to the above record and when approved will be governed by the Constitution and By-Laws of WSO and its Code of Ethics as I continue as a member. I furthermore agree to promote the objectives of the WSO wherever and whenever possible.

X _____ Applicant Signature | Date

***FOR MID/HIGH SCHOOLERS ONY**: WSO subscribes to the Family Educational Rights and Privacy Act (FERPA) philosophy in protecting student privacy and information. WSO may disclose "directory" information such as a student's name, WSO Student Chapter affiliation, name of school, grade in school, etc., along with group or individual photos in WSO NewsLetters, NewsFlashes, eNews, on WSO website, and on WSO's social media accounts.*

❑ My student has permission to participate as outlined above.

❑ My student has permission to participate with exclusions: _____

X _____ Parent/Guardian Signature (Mid/High Student) | Date

X _____ WSO Student Chapter Mentor Signature **[IF APPLICABALE]** | Date

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 professional interest, reputation, and
good name of any deserving WSO member
or member of other professional organization involved in
safety or associate disciplines.

Members must be dedicated to 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 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