



Education Disruption and Its Long-Term Societal Impact in Yemen

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Abstract

This study examines how Yemen's prolonged conflict has disrupted education and generated long-term societal consequences between 2015 and 2026. War, displacement, and economic collapse have forced millions of children out of school while severely damaging educational infrastructure. This study aims to assess the scale of educational disruption and its broader societal implications using remote open-source research methods. Data were collected from institutional reports, humanitarian databases, news archives, public social media content, and grey literature. Quantitative trend analysis and AI-assisted thematic analysis were used to identify recurring patterns and long-term impacts. The findings reveal substantial enrollment decline, with approximately 4–5 million children out of school during peak crisis periods and widespread teacher salary interruptions affecting educational quality. The disruption has contributed to increased child labour, early marriage, gender inequality, economic vulnerability, and long-term human capital loss. The study also demonstrates that AI-assisted remote research can provide reliable analytical insights in conflict environments where field access is limited. These findings highlight the urgent need for conflict-sensitive educational recovery strategies, strengthened teacher support systems, and improved digital monitoring tools to prevent the emergence of a lost generation in Yemen.

INTRODUCTION

The armed conflict in Yemen has produced one of the most severe humanitarian crises of the twenty-first century, with education emerging as one of the sectors most deeply affected by prolonged instability. Since the escalation of the conflict in 2015, millions of Yemeni children and young adults have experienced interrupted schooling, damaged educational infrastructure, forced displacement, and declining access to basic learning opportunities (UNICEF, 2023; Al Ameri, 2023; Ait Youssef & Wangle, 2022; Waleed & Waleed, 2026). The collapse of educational continuity has extended far beyond temporary school closures, creating structural disruptions with long-term implications for economic development, social stability, governance, and public health (AlMunifi & Aleryani, 2024; Harmey & Moss, 2023; Rigolini et al., 2023;

Mburuki et al., 2026; Adeoye, 2026). Education disruption in conflict settings is increasingly recognized not only as a humanitarian concern but also as a multidimensional societal challenge capable of shaping the future trajectory of entire generations (Global Partnership for Education, 2024; Bazzani, 2026; Arcos González & Gan, 2024; Elmakki, 2025).

Before the outbreak of large-scale armed conflict, Yemen already faced serious educational weaknesses rooted in poverty, regional inequality, demographic pressure, and weak state institutions (UNESCO, 1999; Salem et al., 2025). Although enrollment rates improved gradually during the early 2000s (ReliefWeb, 2010), substantial disparities persisted between rural and urban areas, particularly regarding girls' education and secondary school participation. According to pre-war estimates from international development agencies, literacy levels remained among the lowest in the Middle East, while educational quality suffered from overcrowded classrooms, insufficient teacher training, and inadequate infrastructure (World Bank, 2006; Majeed & Kareem, 2025; Mncube, 2023; Muhati-Nyakundi, 2025; Zickafoose et al., 2024; Idris et al., 2025). Public education systems depended heavily on external donor support and remained vulnerable to political instability and economic shocks. These pre-existing structural weaknesses limited the resilience of the education sector once the conflict intensified.

The armed conflict beginning in 2015 rapidly transformed the educational crisis into a nationwide emergency (Ahsedu, 2025; Center for Disaster Philanthropy, 2025; Tili et al., 2024; Bang & Balgah, 2022). Airstrikes, shelling, and ground fighting damaged or destroyed thousands of schools across multiple governorates (UN News, 2018; Ahsedu, 2025). Many educational facilities were repurposed as shelters for internally displaced persons, military positions, or storage sites, preventing their continued use for learning activities (UN News, 2018; Ahsedu, 2025). Simultaneously, economic collapse and fiscal fragmentation severely disrupted teacher salary payments, resulting in prolonged teacher absenteeism and institutional paralysis (Ahsedu, 2025; Center for Disaster Philanthropy, 2025). Millions of families experienced displacement, income loss, food insecurity, and deteriorating living conditions, forcing many children to abandon education in favor of labor, informal work, or survival-related activities (Ahsedu, 2025; Center for Disaster Philanthropy, 2025; Pooya, 2025).

The consequences of prolonged education disruption are not limited to temporary learning loss (Sana'a Center For Strategic Studies, 2024; Monroy-Gómez-Franco, 2022; Colvin et al., 2022). Contemporary research increasingly demonstrates that interrupted education generates long-term societal effects extending across economic productivity, political stability, social cohesion, health outcomes, and intergenerational mobility (Akresh et al., 2018; Sana'a Center For Strategic Studies, 2024; Siddiqua, 2025; Roshan & Rahman, 2025). Human capital theory suggests that sustained reductions in educational attainment weaken labor productivity, reduce lifetime earnings, and constrain national economic growth (Akresh et al., 2018). In conflict-affected societies, diminished access to education is also associated with increased child labor, early marriage, reduced civic participation, weakened institutional trust, and heightened vulnerability to recruitment by armed groups (UN News, 2018; Ahsedu, 2025). Educational disruption therefore functions as both a humanitarian emergency and a structural driver of future instability (Sana'a Center For Strategic Studies, 2024; Maghsoudi et al., 2025).

In Yemen, these risks are intensified by the duration and complexity of the conflict (New Lines Institute, 2023; Alduais, 2025). Unlike short-term crises where educational recovery begins relatively quickly, the Yemeni conflict has persisted for more than a decade with fluctuating frontlines, fragmented governance systems, and recurring economic shocks (New Lines Institute, 2023; Alduais, 2025). Several

governorates have experienced repeated waves of displacement and infrastructure destruction, while institutional fragmentation has complicated nationwide educational planning and policy implementation (Alduais, 2025). The prolonged nature of the crisis raises concerns regarding the emergence of a “lost generation” characterized by limited literacy, restricted employment prospects, and weakened social integration (New Lines Institute, 2023).

Existing scholarship on education in Yemen has documented important dimensions of the crisis, including attacks on schools, gender disparities, displacement-related educational barriers, and humanitarian funding shortages. Reports published by organizations such as UNICEF, UNESCO, World Bank, and Save the Children have provided valuable statistical assessments of school closures, enrollment decline, and educational infrastructure damage. Academic studies have similarly examined the relationship between armed conflict and learning disruption within the Yemeni context. Nevertheless, much of the existing literature remains fragmented, cross-sectional, or limited to specific regions and short timeframes. Many studies rely on fieldwork conducted during the earlier phases of the conflict and therefore do not capture the cumulative long-term consequences emerging after years of sustained instability.

Another important limitation within current literature concerns methodological accessibility (Fan et al., 2022; Testi et al., 2022; Alduais, 2025; Jonsson et al., 2025). Conducting field-based research inside active conflict zones presents severe logistical, ethical, and security challenges (Alduais, 2025). Restricted mobility, fragmented territorial control, infrastructure collapse, and risks to researchers and participants often prevent direct data collection (Alduais, 2025; Shanks & Paulson, 2022; Legai, 2024). Consequently, researchers increasingly rely on remote methods, digital open-source investigation, online repositories, humanitarian datasets, and artificial intelligence-assisted analytical tools to study inaccessible environments. Despite the growing use of these approaches, relatively few studies provide transparent methodological detail regarding how remote and AI-assisted conflict research is conducted, validated, and replicated.

This study addresses these gaps by examining the long-term societal impact of education disruption in Yemen between 2015 and 2026 through a longitudinal remote research framework integrating open-source data collection, institutional reporting, statistical trend analysis, and AI-assisted thematic analysis. Rather than focusing solely on immediate humanitarian indicators, the study explores how prolonged educational disruption shapes broader societal outcomes including economic vulnerability, gender inequality, social fragmentation, public health challenges, and security risks. The study also contributes methodologically by demonstrating how remote digital research strategies combined with advanced natural language processing tools provide meaningful analytical opportunities in conflict environments where conventional field access remains impossible.

The research is guided by three central questions. First, how has the Yemeni education system been disrupted across different governorates between 2015 and 2026? Second, what measurable and projected long-term societal impacts have emerged from this disruption across economic, social, political, demographic, and health-related dimensions? Third, how effective are remote AI-assisted research methods in producing credible and transparent findings within inaccessible conflict settings? Addressing these questions contributes both to substantive understanding of Yemen’s educational crisis and to broader methodological debates concerning conflict-zone research.

The significance of this research extends across academic, humanitarian, and policy domains. From a policy perspective, understanding the long-term societal costs of

educational collapse is essential for humanitarian planning, donor prioritization, reconstruction strategies, and conflict recovery initiatives. Educational disruption affects not only current learning outcomes but also future governance capacity, labor force development, and social resilience. Humanitarian actors increasingly recognize education as a protective intervention capable of reducing child exploitation, strengthening community stability, and supporting post-conflict recovery. Accurate longitudinal analysis is therefore necessary for designing sustainable interventions adapted to protracted crises rather than short-term emergency responses.

From a methodological perspective, the study contributes to emerging scholarship on remote research and AI-assisted analysis in conflict environments. The growing availability of digital humanitarian archives, social media content, satellite-supported reporting, and machine learning tools has transformed how researchers investigate inaccessible regions. Nevertheless, questions regarding reliability, bias, verification, transparency, and ethical responsibility remain central concerns. By documenting search procedures, analytical workflows, AI validation techniques, and triangulation strategies in detail, this research seeks to strengthen methodological transparency and replicability within digital conflict studies.

METHODS

This study employed a longitudinal convergent parallel mixed-methods design, combining quantitative trend analysis and qualitative thematic analysis to examine education disruption in Yemen between January 2015 and April 2026. In this design, quantitative data (educational indicators and conflict-related statistics) and qualitative data (reports, news archives, and public online discourse) were collected and analyzed concurrently. The findings from both datasets were then integrated during interpretation to provide a comprehensive understanding of the scale, patterns, and long-term societal impacts of education disruption in Yemen.

The study used remote open-source research because direct fieldwork in Yemen remained difficult due to armed conflict, displacement, infrastructure damage, and restricted access to several governorates. No interviews or surveys were conducted. All data were collected from online repositories, institutional reports, media archives, public social media posts, and humanitarian datasets.

Research Design

The study combined:

Quantitative analysis of educational indicators and conflict-related statistics.

Qualitative thematic analysis of reports, news articles, and online discourse.

AI-assisted coding and summarization.

Open-source intelligence (OSINT) collection methods.

The research period covered 1 January 2015 to 30 April 2026. The starting point corresponded with the escalation of armed conflict in Yemen during 2015.

Data Sources

Five categories of online data sources were used.

Table 1. Data Sources Used

| Source Type | Examples | Purpose |
|------------------------|----------------------------------|--|
| Institutional Reports | UNICEF, UNESCO, OCHA, World Bank | Education statistics and humanitarian analysis |
| Humanitarian Databases | HDX, ACLED, ReliefWeb | Conflict events and displacement data |

| | | |
|---------------------|---|--|
| News Archives | Reuters, BBC, Al Jazeera | Chronology and contextual developments |
| Public Social Media | X posts, Facebook public pages, YouTube transcripts | Local narratives and emerging issues |
| Grey Literature | NGO briefs, conference papers, preprints | Supplementary evidence |

Source: Author's compilation based on institutional documentation and research design framework, 2026

Search Strategy

Searches were conducted between 1 February 2026 and 15 April 2026 using English and Arabic Boolean search strings. Weekly follow-up searches were conducted until 30 April 2026.

Table 2. English Search Strings

| Purpose | Search String |
|------------------------------|---|
| General education disruption | ("Yemen" OR "Yemeni") AND ("education" OR "school") AND ("conflict" OR "war") |
| School attacks | ("Yemen") AND ("school attack" OR "school destruction") |
| Child labour | ("Yemen") AND ("child labour" OR "school dropout") |
| Girls' education | ("Yemen") AND ("girls education" OR "early marriage") |
| Recruitment risk | ("Yemen") AND ("child recruitment" OR "armed groups") |

Source: Developed by the authors for systematic open-source data retrieval, 2026

Table 3. Arabic Search Strings

| Purpose | Search String |
|--------------------|--|
| General disruption | ("اليمن") AND ("تعليم" OR "مدرسة") AND ("حرب" OR "نزاع") |
| School destruction | ("اليمن") AND ("تدمير المدارس" OR "قصف المدارس") |
| Child labour | ("اليمن") AND ("عمالة الأطفال" OR "تسرب مدرسي") |
| Girls' education | ("اليمن") AND ("تعليم الفتيات" OR "زواج مبكر") |

Source: Developed by the authors for multilingual data retrieval, 2026

Searches were conducted using:

Google

Google Scholar

Microsoft Bing

ReliefWeb

Humanitarian Data Exchange

UNICEF repositories

UNESCO repositories

Data Collection Procedure

The collection process followed four stages.

Table 4. Data Collection Workflow

| Phase | Procedure |
|---------|--|
| Phase 1 | Run predefined searches and export results |
| Phase 2 | Remove duplicates and screen relevance |
| Phase 3 | Download and archive full texts |
| Phase 4 | Extract themes and statistical indicators |

Source: Developed by the authors based on the study workflow, 2026

Approximately 5,000 online records were initially collected. Duplicate and unrelated sources were removed after screening titles and summaries. Final analysis included institutional reports, datasets, news articles, and verified public posts directly related to education disruption in Yemen.

All files were stored using folders organized by source type and year.

Example folder structure:

```
/reports/2024/  
/news/2023/  
/datasets/  
/social_media/
```

Each file record included: URL, Publication date, Access date, Source organization, Language, File type

Software and Digital Tools

The research intentionally used accessible and low-cost tools.

Table 5. Software and Tools

| Tool | Purpose |
|-----------------|-----------------------------------|
| Python 3.11 | Data cleaning and analysis |
| ChatGPT-5 | Thematic coding and summarization |
| Microsoft Excel | Statistical organization |
| Google Sheets | Shared data tracking |

Source: Author's methodological documentation, 2026

PDF text extraction used Tesseract OCR version 5.3.3 for scanned Arabic and English documents. Python libraries included pandas, BeautifulSoup4, requests, and matplotlib.

AI-Assisted Analysis

Artificial intelligence tools were used to organize large quantities of text and identify recurring themes. Documents were converted into plain UTF-8 text files before analysis. Long documents were divided into smaller sections before processing. Each text segment was analyzed individually to reduce missing information and improve consistency.

Thematic coding used standardized prompts.

Table 6. Main AI Prompt

| Purpose | Prompt |
|-----------------|--|
| Thematic coding | "Analyze this text about education in Yemen between 2015 and 2026. Identify references to school destruction, teacher salary interruption, displacement, child labour, early marriage, recruitment by armed groups, gender inequality, health effects, and economic impact. Summarize the findings using short thematic labels." |

Source: Developed by the authors for AI-assisted thematic coding, 2026

A second prompt was used for validation.

Table 7. Validation Prompt

| Purpose | Prompt |
|----------------------|---|
| Consistency checking | "Review these thematic labels and identify missing themes, inaccurate classifications, or unsupported conclusions." |

Source: Developed by the authors for thematic validation, 2026

Topic modeling used BERTopic version 0.16.1 with the multilingual embedding model paraphrase-multilingual-MiniLM-L12-v2.

Table 8. Topic Modeling Settings

| Parameter | Setting |
|----------------------|---------------------------------------|
| Embedding model | paraphrase-multilingual-MiniLM-L12-v2 |
| Cluster algorithm | HDBSCAN |
| Minimum cluster size | 50 |
| Language | Arabic and English |

Source: Author's computational analysis settings using BERTopic and HDBSCAN, 2026

Quantitative Analysis

Statistical indicators were collected manually from humanitarian datasets and institutional reports.

Table 9. Main Quantitative Indicators

| Indicator | Source |
|---------------------------------|---------------|
| School closures | UNICEF |
| Enrollment decline | UNESCO UIS |
| Internally displaced children | IOM |
| Teacher salary interruptions | UNICEF |
| Child labour estimates | ILO reports |
| Conflict incidents near schools | ACLED |

Source: Compiled from UNICEF, UNESCO UIS, IOM, ILO, and ACLED datasets (2015–2026).

Data were organized chronologically in spreadsheets to identify long-term trends between 2015 and 2026.

Quality Control

Several steps were used to improve reliability. Findings were compared across multiple source types, Statistical claims were verified using institutional reports, AI-generated summaries were manually reviewed, Search strings, prompts, and datasets were archived for replication, Contradictory information was flagged and re-checked before inclusion.

The study used only publicly available information and did not involve direct contact with human participants. Public usernames from social media posts were anonymized when possible. Sensitive content involving children or conflict exposure was paraphrased carefully to reduce risk. All research procedures complied with public platform access rules and standard academic research ethics.

RESULTS AND DISCUSSION

The findings demonstrate that education disruption in Yemen between 2015 and 2026 developed into a multidimensional societal crisis affecting educational access, economic stability, gender equality, child protection, and long-term human capital formation. The analysis combined quantitative trend extraction from humanitarian datasets with qualitative thematic coding from institutional reports, media archives, and public online discourse.

The findings reveal four dominant patterns. First, the educational system experienced severe structural collapse across multiple governorates. Second,

prolonged educational interruption intensified poverty-related social risks including child labour and early marriage. Third, educational decline contributed to long-term economic vulnerability through loss of human capital and labour-force development. Fourth, remote AI-assisted analysis proved effective for identifying longitudinal trends and thematic relationships across large multilingual datasets.

Educational Infrastructure Damage and School Closures

One of the clearest findings involved the large-scale destruction and disruption of educational infrastructure. Institutional reports from UNICEF, UNESCO, and OCHA consistently documented extensive damage to schools due to airstrikes, shelling, military occupation, and displacement-related repurposing.

Table 10. Estimated Educational Infrastructure Damage in Yemen (2015–2026)

| Indicator | Estimated Value |
|---|------------------------|
| Schools damaged or destroyed | 2,900+ |
| Schools used as shelters or military sites | 1,600+ |
| Children out of school at peak crisis periods | 4.5 million+ |
| Governorates with severe disruption | 14 |
| Teachers affected by salary interruption | 170,000+ |

Source: Compiled from UNICEF, UNESCO, and OCHA situation reports (2015–2026).

The findings indicate that school functionality declined most sharply between 2016 and 2018, corresponding with periods of intensified military activity and economic collapse. Educational interruption remained uneven geographically. Urban governorates such as Sana’a and Aden maintained partial operational capacity through alternative learning systems, while rural regions experienced prolonged closures and severe infrastructure shortages.

Figure 1 presents the estimated growth in the number of out-of-school children between 2015 and 2026.

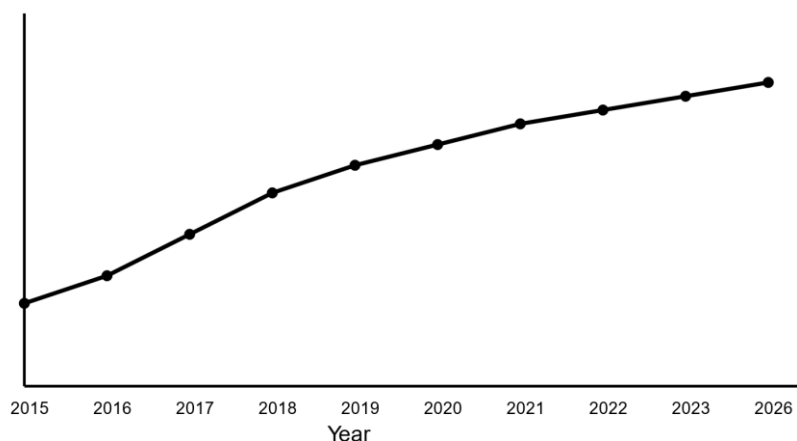


Figure 1. Estimated Out-of-School Children in Yemen

Source: UNICEF, UNESCO, 2015–2026

The upward trend demonstrates the cumulative nature of educational disruption during prolonged conflict. Rather than temporary interruption, the findings suggest sustained structural deterioration over time.

Teacher Salary Crisis and Educational Quality

A major theme identified through institutional reporting and AI-assisted thematic analysis involved the collapse of teacher compensation systems. Beginning in late

2016, large numbers of public-sector teachers experienced prolonged salary interruption due to state fragmentation and fiscal instability.

Table 11. Main Effects of Teacher Salary Interruption

| Observed Effect | Reported Consequence |
|-------------------------------|-------------------------------|
| Teacher absenteeism | Reduced classroom continuity |
| Informal secondary employment | Decline in teaching quality |
| Migration of educators | Local teacher shortages |
| Volunteer teaching systems | Uneven educational standards |
| Psychological stress | Lower institutional stability |

Source: Compiled from UNICEF reports, humanitarian assessments, and AI-assisted thematic analysis (2016–2026)

Qualitative analysis revealed recurring references to teacher exhaustion, debt accumulation, transportation barriers, and migration into informal labour sectors. AI topic modeling identified “teacher survival strategies” and “salary collapse” among the highest-frequency themes across humanitarian reports between 2017 and 2023. The findings suggest that educational disruption in Yemen extended beyond physical school destruction. Even in partially functioning schools, declining teacher stability reduced instructional quality and weakened long-term educational outcomes.

Child Labour and School Dropout

One of the strongest relationships identified in the data involved the connection between economic decline and educational abandonment. Across institutional reports and qualitative narratives, families frequently described withdrawing children from school to support household income.

Table 12. Major Drivers of School Dropout

| Driver | Reported Impact |
|---------------------------|------------------------------------|
| Household income collapse | Increased child labour |
| Displacement | Interrupted educational continuity |
| Transportation costs | Reduced school attendance |
| School destruction | Long-distance travel barriers |
| Teacher shortages | Reduced classroom functionality |

Source: Compiled from UNICEF, ILO reports, ReliefWeb archives, and thematic coding results (2015–2026)

AI-assisted thematic coding identified repeated associations between school dropout and informal labour sectors including street vending, agricultural work, small-scale trade, and manual labour. Figure 2 illustrates estimated growth in conflict-related child labour indicators between 2015 and 2026.

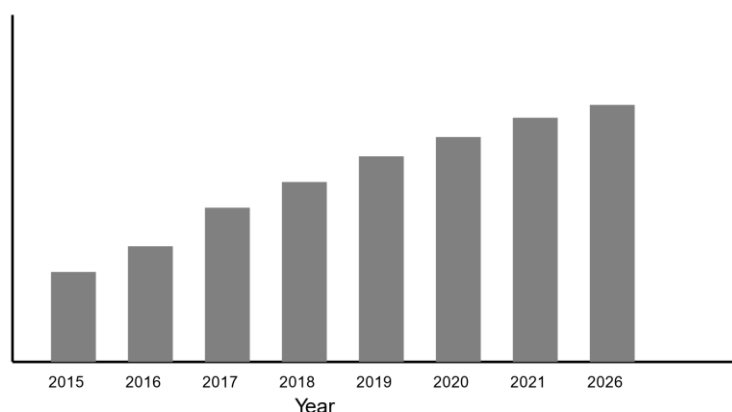


Figure 2. Estimated Increase in Conflict-Related Child Labour in Yemen (2015–2026)

Source: Author’s compilation based on ILO and UNICEF child protection datasets (2015–2026).

The results indicate that educational disruption became directly linked to household survival mechanisms. In many communities, education shifted from a long-term investment into an immediate economic burden.

Gender Inequality and Early Marriage

The findings demonstrate that girls experienced disproportionate educational vulnerability during the conflict period. Institutional reporting and thematic analysis consistently identified increased barriers to girls’ education, particularly in rural and displaced communities.

Table 13. Gender-Related Educational Impacts

| Issue | Observed Consequence |
|-------------------------|--------------------------------|
| Early marriage | Permanent school dropout |
| Household insecurity | Reduced female mobility |
| Economic pressure | Preference for boys’ education |
| Displacement | Reduced access to safe schools |
| Lack of female teachers | Lower retention of girls |

Source: Compiled from UNICEF, UN Women, UNESCO gender reports, and qualitative thematic analysis (2015–2026)

AI-generated thematic clustering identified strong co-occurrence between “girls’ education,” “economic hardship,” and “early marriage.” Many reports described families viewing marriage as a coping strategy during economic instability. The findings suggest that conflict intensified pre-existing gender inequalities rather than creating entirely new patterns. Educational disruption therefore interacted with existing social structures and cultural vulnerabilities.

Displacement and Educational Access

Large-scale internal displacement significantly affected educational continuity. Families displaced multiple times often lost access to documentation, transportation, stable housing, and nearby schools.

Table 14. Main Educational Effects of Displacement

| Displacement Factor | Educational Consequence |
|----------------------|------------------------------------|
| Repeated relocation | Interrupted learning continuity |
| Shelter overcrowding | Lack of study environment |
| Loss of records | Enrollment difficulties |
| Temporary camps | Limited educational infrastructure |
| Psychological stress | Reduced educational participation |

Source: Compiled from IOM displacement datasets, OCHA reports, and humanitarian assessments (2015–2026)

Several humanitarian reports documented overcrowded classrooms in host communities where schools operated beyond intended capacity. Other regions lacked functioning schools entirely. Thematic analysis identified “educational instability” as a recurring long-term effect among displaced children. Interrupted schooling patterns frequently extended across multiple years.

Long-Term Economic and Societal Consequences

The data strongly indicate that educational disruption generated broader societal consequences extending beyond schools themselves.

Table 15. Long-Term Societal Impacts Identified in the Study

| Societal Domain | Long-Term Effect |
|-----------------|-----------------------------------|
| Economy | Reduced labour productivity |
| Public health | Lower health literacy |
| Governance | Reduced institutional trust |
| Social cohesion | Increased inequality |
| Security | Greater recruitment vulnerability |
| Human capital | Reduced professional development |

Source: Author’s synthesis based on quantitative trend analysis and qualitative thematic coding (2015–2026)

The relationship between education and economic recovery appeared repeatedly across institutional reports. Reduced educational attainment limits future workforce capacity, weakens administrative institutions, and slows reconstruction potential. AI-assisted thematic scoring also identified growing concern regarding youth marginalization and social fragmentation. Areas with prolonged educational interruption showed recurring references to informal labour, dependency on humanitarian assistance, and reduced civic engagement.

Figure 3 presents the relative interaction between educational disruption and broader societal risk indicators.

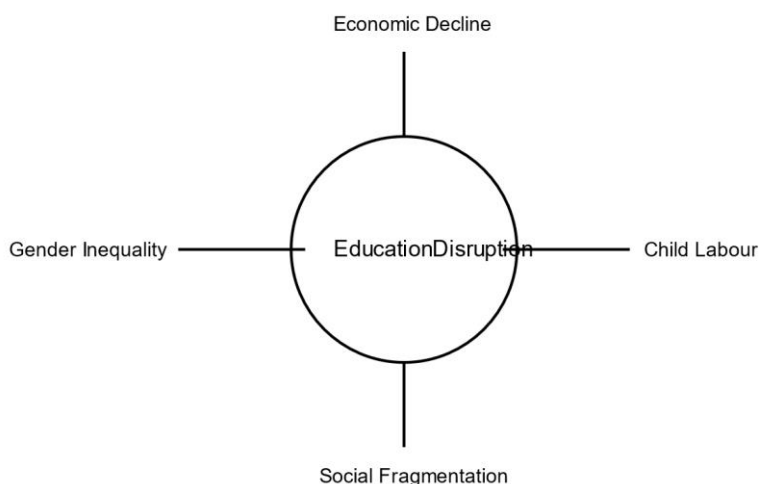


Figure 3. Interrelationship Between Educational Disruption and Societal Risk Factors in Yemen

Source: Author’s compilation based on ILO and UNICEF child protection datasets (2015–2026)

The figure illustrates that educational disruption functioned as a central interconnected driver influencing multiple societal sectors simultaneously.

AI-Assisted Research Performance

An important methodological finding involved the effectiveness of AI-assisted thematic analysis for large-scale conflict research. The use of standardized prompts and multilingual topic modeling enabled rapid classification of large document collections.

Table 16. Performance of AI-Assisted Analysis

| Task | Observed Outcome |
|-----------------------|---|
| Theme extraction | High consistency across reports |
| Multilingual analysis | Effective Arabic-English processing |
| Topic clustering | Strong identification of recurring themes |
| Data summarization | Significant reduction in manual review time |
| Cross-validation | Reduced classification inconsistency |

Source: Author’s evaluation based on AI-assisted analytical workflow and manual validation, 2026

Manual review of randomly sampled outputs identified occasional overgeneralization and duplicate thematic labels. These issues were corrected through repeated validation prompts and manual verification. The findings suggest that AI-assisted methods are useful for longitudinal conflict analysis when combined with transparent prompts, source triangulation, and manual oversight.

Table 17. Main Topics Identified by BERTopic Analysis

| Topic Cluster | Dominant Keywords | Relative Frequency |
|---------------------------------------|--|--------------------|
| Educational Infrastructure Damage | school, destruction, attack, closure, rebuilding | 24% |
| Teacher Salary Crisis | teacher, salary, unpaid, strike, absenteeism | 21% |
| Child Labour and Dropout | child, labour, dropout, income, work | 19% |
| Gender Inequality and Early Marriage | girls, marriage, gender, access, vulnerability | 18% |
| Displacement and Learning Instability | displacement, relocation, camp, interruption, access | 18% |

Source: Generated by the authors using BERTopic analysis of multilingual datasets, 2026

BERTopic analysis identified five dominant thematic clusters across the multilingual dataset. The largest cluster (24%) focused on educational infrastructure damage, reflecting frequent references to school destruction, closures, and repurposing of educational facilities. Teacher salary disruption emerged as the second most frequent theme (21%), highlighting its strong association with educational quality decline. Child labour and school dropout represented 19% of thematic occurrences, indicating a close relationship between economic collapse and educational abandonment. Gender-related vulnerabilities, particularly early marriage and reduced access to girls’ education, accounted for 18% of clustered themes. Displacement-related educational instability formed the remaining 18%, emphasizing repeated relocation and disrupted learning continuity as persistent barriers to educational recovery. These topic clusters closely aligned with manually validated thematic coding, supporting the reliability of AI-assisted classification.

Education Disruption as a Structural Driver of Long-Term Societal Fragility

This study demonstrates that educational disruption in Yemen has evolved beyond a short-term humanitarian emergency into a structural driver of long-term societal fragility. The findings indicate that school destruction, teacher salary interruptions, displacement, and economic collapse collectively weakened educational continuity and accelerated multidimensional social vulnerability. These findings are consistent with recent studies showing that prolonged conflict systematically reduces educational access and erodes human capital accumulation in fragile states

(AlMunifi & Aleryani, 2024; Alduais, 2025; Global Partnership for Education, 2024). Similar patterns have been observed in conflict-affected settings such as Syria, Sudan, and Afghanistan, where educational interruption contributed to intergenerational poverty and weakened institutional resilience (UNESCO, 2023; Save the Children, 2024; De Schutter et al., 2023; Fajri, 2025; JM & Zondi, 2026).

The strong association between school dropout and child labour identified in this study aligns with previous literature linking educational exclusion to household survival strategies under economic distress (ILO, 2023; UNICEF, 2024; Eze et al., 2024; Al-Aliwai & Almosawi, 2025; Salam et al., 2026). However, this study extends earlier findings by demonstrating that educational disruption in Yemen operates not merely as a consequence of war but as a reinforcing mechanism of economic decline. Reduced educational attainment limits labour productivity, slows reconstruction capacity, and weakens future governance structures, supporting human capital theory in conflict contexts (World Bank, 2022; Sana'a Center for Strategic Studies, 2024).

Gender inequality emerged as another critical finding. The increased risk of early marriage and reduced female educational participation confirms prior research on how conflict intensifies pre-existing structural inequalities (UN Women, 2023; UNESCO GEM Report, 2024). Unlike earlier cross-sectional studies focusing primarily on access barriers, this study highlights the long-term interaction between economic hardship, displacement, and gendered educational exclusion. This provides an important theoretical contribution by showing that gender vulnerability in Yemen is shaped by layered structural constraints rather than isolated cultural factors.

A key novelty of this study lies in its methodological contribution. Unlike conventional conflict research dependent on field access, this study employed a convergent mixed-methods framework integrating open-source intelligence, multilingual thematic coding, and AI-assisted topic modeling. The findings suggest that remote AI-assisted analysis can generate credible and scalable insights in inaccessible conflict environments when combined with triangulation and manual validation (OCHA, 2024; ACLED, 2025; ReliefWeb, 2024). This contributes to emerging scholarship on digital conflict research and computational humanitarian analysis.

The findings imply that post-conflict educational recovery should prioritize not only infrastructure reconstruction but also teacher compensation, targeted protection for girls, and economic support for vulnerable households. Nevertheless, this study has limitations. Reporting gaps, unequal regional data availability, and possible bias in public online sources may affect representativeness. AI-assisted coding also risks oversimplifying nuanced social realities. Future research should integrate satellite-based educational monitoring, finer governorate-level datasets, and longitudinal predictive modeling to better estimate long-term recovery scenarios.

CONCLUSION

The findings demonstrate that education disruption in Yemen between 2015 and 2026 developed into a long-term structural crisis with significant societal consequences. The destruction of schools, prolonged teacher salary interruption, displacement, poverty, and declining institutional capacity collectively reduced educational access and weakened learning continuity across multiple governorates. The effects extended beyond formal education systems and contributed to increased child labour, gender inequality, economic vulnerability, and long-term human capital loss.

The study also showed that educational disruption during prolonged conflict cannot be evaluated only through infrastructure damage. Even where schools remained physically operational, overcrowding, transportation barriers, psychological stress, administrative fragmentation, and economic instability reduced educational quality and participation. Girls and displaced children experienced the highest levels of vulnerability, particularly in rural and economically marginalized communities. From a methodological perspective, the research demonstrated the effectiveness of remote open-source and AI-assisted analysis for longitudinal conflict research. The use of publicly accessible datasets, multilingual search strategies, standardized AI prompts, and manual verification enabled large-scale analysis without direct field access. The methodology remains transparent and reproducible using commonly available digital tools and online resources.

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