

Impact Assessment of Gas Flaring on Human Health and Housing in Eastern Obolo Local Government Area, Akwa Ibom State, Nigeria

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Abstract

Gas flaring remains a persistent environmental challenge in Nigeria's Niger Delta, with profound implications for human health and housing infrastructure. This study assessed the impacts of gas flaring on health and housing in Eastern Obolo Local Government Area (LGA), Akwa Ibom State. The study was guided by three key objectives: to examine perceived health impacts, to assess housing degradation, and to analyse community perceptions and socio-economic consequences. A descriptive survey research design was adopted, using a mixed-methods approach. Data were collected from 382 respondents across five communities (Iko, Okorombokho, Okoroiti, Okoroete, and Kampa) using structured questionnaires, semi-structured interviews, and field observations. Quantitative data were analysed using descriptive statistics and chi-square tests, while qualitative data were analysed thematically. The findings revealed that respiratory conditions (coughing, mean=3.61; difficulty breathing, mean=3.54) and eye irritation (mean=3.77) were the most prevalent health impacts, with 64.7% of respondents identifying gas flaring as the primary cause of health problems. Chi-square analysis confirmed a statistically significant association between proximity to flare sites and coughing prevalence ($\chi^2 = 28.72$, $df = 4$, $p < 0.001$), with residents within 500m reporting the highest rates (83.7%). Housing impacts were severe, with 69.9% reporting rusting/corrosion of roofing sheets, 58.4% reporting soot deposits, and 67.6% requiring roof repairs annually or every 2-3 years. A statistically significant association was also found between community location and roof corrosion ($\chi^2 = 12.18$, $df = 4$, $p = 0.016$), with Iko recording the highest prevalence (80.2%). The "two-year roof" phenomenon emerged as a stark indicator of accelerated material degradation. Healthcare expenditure was substantial, with 68% spending above ₦5,000 monthly, while 84.8% spent above ₦10,000 annually on housing maintenance. Community perceptions revealed strong consensus on the seriousness of flaring (mean=4.34), accountability demands (mean=4.40), and rejection of the claim that oil benefits outweigh harms (mean=2.24). Coping strategies adopted by households included staying indoors (46.6%), avoiding rainwater collection (40.8%), and saving for repairs (38.0%). The study concludes that gas flaring in Eastern Obolo constitutes a multidimensional crisis affecting health, housing, and socio-economic well-being, with households facing impossible trade-offs between healthcare, housing repairs, and basic needs. Recommendations include strengthening enforcement of anti-flaring regulations, investing in gas capture infrastructure, establishing healthcare and housing support programmes, and empowering communities through participation and access to information.

1.0 Introduction

Gas flaring, the burning of associated natural gas during crude oil extraction, remains a persistent environmental problem in Nigeria's Niger Delta. Nigeria still ranks among the world's highest gas-flaring nations, with most flare sites located in the Niger Delta (World Bank, 2022; Aigbe et al., 2023). Eastern Obolo Local Government Area (LGA) in Akwa Ibom State is directly exposed to these operations, and residents face continuous emissions of greenhouse gases and toxic pollutants (Morakinyo et al., 2023).

The health effects of flaring are well documented. Pollutants such as carbon dioxide, methane, nitrogen oxides, and volatile organic compounds contribute to respiratory illness, eye irritation, and chronic disease. Early studies in Rivers State communities such as Igwuruta and Umuechem found elevated respiratory and skin symptoms among residents living near flare stacks (Gobo et al., 2010). Recent Niger Delta studies report worsening respiratory conditions, irregular breathing among infants, and greater vulnerability to air-quality-related illness (Obi et al., 2021; Sofiullahi, 2024). Rural populations with limited healthcare access carry much of this burden. Housing is also affected. Acidic deposition and soot corrode roofing sheets, weaken walls, and damage paint coatings. Over time, this raises maintenance costs and can make structures unstable for households near flare sites. Gas flaring has been linked to material degradation and economic loss in Niger Delta communities (Ezinna et al., 2024; Ukhurebor et al., 2024; Kalu et al., 2025). In Eastern Obolo, where many homes use locally sourced materials, housing is particularly exposed.

Despite these known effects, local evidence for Eastern Obolo is limited. Most studies cover the Niger Delta broadly, so health and housing impacts in this LGA are not well quantified. This gap makes it difficult for policymakers, regulators, and community stakeholders to design mitigation and environmental justice measures. This study therefore assesses gas flaring impacts on human health and housing in Eastern Obolo LGA. Its objectives are to examine perceived health impacts, assess housing impacts, analyse community perceptions and assess socio-economic consequences.

2.0 Materials and Methods

2.1 Study Area

Eastern Obolo Local Government Area (LGA) is situated in the southeastern part of Akwa Ibom State, Nigeria, within the Niger Delta region. The administrative headquarters of the LGA is located at Okoroete, and the area is bounded by the neighbouring Ikot Abasi LGA to the west and Ibeno LGA to the east (Eastern Obolo, 2022; Udoudou et al., 2020). Geographically, Eastern Obolo covers an estimated land area of 156.5 km² and consists of 16 villages, grouped into two major clans: Okoroete and Iko. These villages are further divided into ten political wards, all inhabited by the Obolo ethnic group, who share a common Ijaw ancestral heritage (Eastern Obolo, 2022). The terrain is predominantly low-lying and coastal, making it highly vulnerable to flooding, erosion, and other environmental hazards associated with sea-level rise and oil exploration activities (Udoudou et al., 2020).

2.2 Research Design

The study adopted a descriptive survey research design. Structured questionnaires were administered to generate quantitative data on health conditions and housing degradation, while interviews were conducted to provide qualitative insights into community perceptions and socio-economic consequences. This mixed approach ensured that the study captured not only measurable impacts but also the lived experiences of residents, thereby offering a holistic understanding of the problem. The design was cross-sectional, which meant that data were collected at a single point in time from a representative sample of residents.

2.3 Population and Sample

The population of this study comprises residents of Eastern Obolo Local Government Area (LGA), Akwa Ibom State, who are directly or indirectly affected by gas flaring activities. Given the focus of the research on health and housing, the study targets household heads, community leaders, and health workers as key respondents. Applying Taro Yamane's (1967) formula at a 95% confidence level and an estimated population of 80,000 (National Bureau of Statistics, 2022), a sample of 398 was obtained. Thus, a sample size of 400 respondents was adopted to ensure adequate representation and account for possible non-responses. Of these, 382 were properly completed and returned, representing a response rate of 95.5%.

2.4 Sampling Techniques

For the sampling technique, the study employed a multi-stage sampling approach. First, communities within Eastern Obolo LGA were stratified into two major clans, which were Okoroete and Iko. Within each clan, villages were randomly selected to ensure geographic spread. Finally, households within the selected villages were chosen using systematic random sampling, with every *n*th household included until the required sample size was achieved. This approach ensures that the sample is representative of the diverse socio-economic and environmental conditions across the LGA. In addition, purposive sampling was used to select key informants such as community leaders, health workers, and farmers who can provide in-depth insights into the impacts of gas flaring. Combining random and purposive techniques enhances the reliability of the data while ensuring that critical perspectives are not overlooked.

2.5 Data Collection Procedure

Data were collected using three instruments, which include a structured questionnaire (to measure health conditions, housing degradation, and socio-economic consequences), a semi-structured interview guide (to capture open-ended accounts of experiences, coping strategies, and expectations) and an observation checklist (to document visible impacts such as soot deposition, corroded roofs, and weakened walls). The three instruments complemented one another by combining quantitative, qualitative, and direct observational evidence. Data collection in this study was carried out in a systematic manner to ensure accuracy and ethical compliance. Throughout the data collection process, ethical considerations were strictly observed. Respondents were informed about the purpose of the study, assured of confidentiality, and given the option to withdraw at any stage. Informed consent was obtained before administering questionnaires and conducting interviews.

2.6 Data Analysis Techniques

The data collected in this study were analysed using both quantitative and qualitative techniques, reflecting the mixed-methods approach adopted in the research design. Responses from the structured questionnaires were coded and entered into Microsoft Excel. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise responses related to health and housing impacts. Data from interviews were transcribed and analysed thematically. Thematic coding was applied to identify recurring patterns, perceptions, and narratives about gas flaring impacts. Findings were triangulated with secondary data sources such as published articles. This ensures that community-level evidence is cross-checked against scientific data, thereby enhancing the credibility of conclusions. Inferential statistics were conducted using chi-square tests of independence to examine statistically significant associations between key categorical variables. All analyses were conducted at a 95% confidence level ($\alpha = 0.05$).

3.0 Results and Discussion

3.1 Perceived Health Impacts of Gas Flaring

Respondents were asked to indicate how often they or members of their household had experienced various health conditions in the past 12 months. The findings (in Table 1) reveal that the most frequently experienced health conditions were eye irritation (mean = 3.77), coughing (mean = 3.61), and difficulty breathing (mean = 3.54). These conditions were reported as occurring "often" by the majority of respondents, indicating that eye and respiratory symptoms are the most prevalent manifestations of exposure to gas flaring emissions. Respiratory conditions such as coughing (38.0% often, 21.7% always) and difficulty breathing (35.1% often, 22.5% always) were also highly prevalent, reflecting the impact of fine particulate matter and combustion-related pollutants on the airways. The relatively lower frequency of asthma attacks (mean = 2.69) may reflect that asthma is a chronic condition with specific triggers, rather than an acute response to pollution exposure, though the 30.9% of respondents reporting "often" or "always" asthma attacks remains concerning. Skin rashes and itching (mean = 3.32) and headaches/dizziness (mean = 3.22) were reported with moderate frequency, consistent with the systemic effects of air pollution exposure. Similarly, sore throat (mean = 3.05) and nosebleeds/nasal irritation (mean = 2.87) were reported with moderate frequency, likely reflecting the irritant effects of pollutants on mucosal surfaces.

Table 1: Frequency of Health Conditions Experienced in the Past 12 Months

Health Condition	Never	Rarely	Sometimes	Often	Always	Mean
Coughing (dry or persistent)	18 (4.7%)	42 (11.0%)	94 (24.6%)	145 (38.0%)	83 (21.7%)	3.61
Difficulty breathing/Shortness of breath	24 (6.3%)	51 (13.4%)	87 (22.8%)	134 (35.1%)	86 (22.5%)	3.54
Wheezing or chest tightness	31 (8.1%)	63 (16.5%)	92 (24.1%)	121 (31.7%)	75 (19.6%)	3.38
Asthma attacks	97 (25.4%)	89 (23.3%)	78 (20.4%)	71 (18.6%)	47 (12.3%)	2.69
Catarrh/Excess phlegm	28 (7.3%)	56 (14.7%)	103 (27.0%)	118 (30.9%)	77 (20.2%)	3.42
Eye irritation (redness, itching, tearing)	16 (4.2%)	34 (8.9%)	81 (21.2%)	142 (37.2%)	109 (28.5%)	3.77
Skin rashes or itching	34 (8.9%)	62 (16.2%)	104 (27.2%)	112 (29.3%)	70 (18.3%)	3.32
Headaches or dizziness	41 (10.7%)	73 (19.1%)	98 (25.7%)	103 (27.0%)	67 (17.5%)	3.22
Nosebleeds or nasal irritation	68 (17.8%)	87 (22.8%)	101 (26.4%)	79 (20.7%)	47 (12.3%)	2.87
Sore throat or hoarseness	52 (13.6%)	76 (19.9%)	112 (29.3%)	86 (22.5%)	56 (14.7%)	3.05

Source: Field Survey, 2025 (Mean interpretation: 1.00–1.80 = Never; 1.81–2.60 = Rarely; 2.61–3.40 = Sometimes; 3.41–4.20 = Often; 4.21–5.00 = Always)

As shown in Table 2, respondents were also asked whether they or any member of their household had been diagnosed by a health worker with specific illnesses in the past 3 years. The most commonly diagnosed illness was eye infections (40.8%), followed by bronchitis

(29.3%), skin infections/dermatitis (25.7%), and asthma (22.8%). These findings corroborate the self-reported symptom data and show the clinical burden of flaring-related health conditions in the community. A substantial majority of respondents (64.7%) identified gas flaring emissions as the main cause of health problems in their community. This perception reinforces the findings from the symptom and diagnosis data, demonstrating that community members attribute their health challenges to the ongoing flaring activities. Other perceived causes included oil spills/water pollution (17.5%), poor sanitation (8.1%), and lack of healthcare facilities (6.0%).

Table 2: Diagnosed Illnesses in the Past 3 Years

Illness	Frequency (n)	Percentage (%)
Asthma	87	22.8
Bronchitis	112	29.3
Pneumonia	68	17.8
Chronic Obstructive Pulmonary Disease (COPD)	43	11.3
Eye infections (e.g., conjunctivitis)	156	40.8
Skin infections/dermatitis	98	25.7
None of the above	72	18.8

Source: Field Survey, 2025 (Note: Respondents could select multiple conditions, so percentages do not sum to 100%)

3.2 Healthcare Utilisation and Expenditure

Respondents were asked about their usual actions when experiencing flare-related health issues. The most common healthcare-seeking behaviour was self-medication (37.2%), followed by visiting a local health centre/clinic (30.9%). A notable minority visited traditional healers (11.3%) or took no action (9.4%). Further inquiry, as shown in Table 4, reveals a high prevalence of self-medication, suggesting limited access to formal healthcare facilities, financial constraints, and possibly the perception that pollution-related symptoms are manageable with over-the-counter drugs. Nearly 68% of respondents reported spending above ₦5,000 per month on healthcare, with 25.1% spending between ₦10,001 and ₦20,000, and 13.6% spending above ₦20,000. Only 7.3% reported no expenditure. These figures represent a substantial financial burden for households in a rural fishing community where average incomes are modest.

Table 3: Monthly Household Healthcare Expenditure

Amount (₦)	Frequency (n)	Percentage (%)
No expenditure	28	7.3
₦1,000 – ₦5,000	94	24.6
₦5,001 – ₦10,000	112	29.3
₦10,001 – ₦20,000	96	25.1
Above ₦20,000	52	13.6
Total	382	100

Source: Field Survey, 2025

An overwhelming majority (72.3%) reported that healthcare expenditure had increased (34.3% greatly, 38.0% slightly) compared to five years ago. This upward trend likely reflects the

cumulative health effects of prolonged exposure to flaring emissions, as well as the rising cost of healthcare services in Nigeria. A substantial majority of respondents (74.3%) reported that the cost of treating flare-related illnesses affected their ability to meet basic needs, with 33.5% indicating a very significant impact and 40.8% indicating an impact to some extent. This finding shows the trade-offs households must make between healthcare spending and other essentials such as food, children's education, and housing maintenance.

Table 4: Impact of Healthcare Costs on Ability to Meet Basic Needs

Impact	Frequency (n)	Percentage (%)
Yes, very significantly	128	33.5
Yes, to some extent	156	40.8
No, not at all	64	16.8
Not applicable	34	8.9
Total	382	100

Source: Field Survey, 2025

3.3 Perceived Housing Impacts of Gas Flaring

The survey shows that the majority of households (72.8%) used galvanised zinc or iron sheets as their primary roofing material, followed by aluminium sheets (16.8%). The limited use of aluminium (16.8%) suggests that while some households have adopted more durable materials, the majority remain vulnerable to flare-induced degradation. Respondents were asked to identify visible changes to their roofing sheets since living near the flare site. The most commonly observed change was rusting/corrosion (69.9%), followed by blackening/soot deposits (58.4%), leakages during rainfall (51.8%), and loosening of nails/screws (37.4%). The high prevalence of rusting and soot deposits reflects the dual mechanisms of chemical corrosion from acid rain and particulate deposition from flare emissions. The significant proportion reporting leakages (51.8%) indicates that structural integrity has been compromised, posing safety risks and increasing household vulnerability.

Table 5: Observed Changes to Roofing Sheets

Change	Frequency (n)	Percentage (%)
Rusting / Corrosion (brown/reddish stains)	267	69.9
Blackening / Soot deposits	223	58.4
Perforations / Holes	119	31.2
Loosening of nails/screws	143	37.4
Leakages during rainfall	198	51.8
No visible changes	34	8.9
Others	16	4.2

Source: Field Survey, 2025 (Note: Respondents could select multiple options, so percentages do not sum to 100%)

The most common wall effects were discolouration/staining (51.8%), peeling of paint/plaster (49.0%), and cracking/weakening (40.8%). Dampness/moisture retention was reported by 35.1% of respondents. These findings reflect the combined effects of acid deposition, soot accumulation, and moisture intrusion from damaged roofs. Additionally, 70.2% of respondents reported damage to other parts of their house or property, including gutters, window frames,

doors, and fencing. This finding indicates that the impact of gas flaring extends beyond roofing materials to encompass the entire housing structure.

3.4 Perceived Housing Impacts of Gas Flaring

A combined 67.6% of respondents reported needing to repair or replace their roofing sheets every year (35.1%) or every 2-3 years (32.5%), indicating a rapid cycle of degradation driven by flaring emissions. Only 10.7% reported repairs less often than every 5 years, suggesting that households located farther from flare sites or using more durable materials experience slower deterioration.

Table 6: Frequency of Roof Repair or Replacement

Frequency	Frequency (n)	Percentage (%)
Every year	134	35.1
Every 2–3 years	124	32.5
Every 4–5 years	57	14.9
Less often than every 5 years	41	10.7
Not sure / Not applicable	26	6.8
Total	382	100

Source: Field Survey, 2025

Nearly 85% of respondents reported spending above ₦10,000 annually on housing maintenance, with 20.2% spending above ₦100,000. This represents a substantial financial burden for households with modest incomes, diverting resources from other essential needs.

Table 4.7: Annual Household Expenditure on Housing Maintenance

Amount (₦)	Frequency (n)	Percentage (%)
₦0 – ₦10,000	58	15.2
₦10,001 – ₦50,000	134	35.1
₦50,001 – ₦100,000	113	29.6
Above ₦100,000	77	20.2
Total	382	100

Source: Field Survey, 2025

Based on the photographic evidence provided, a distinct correlation is observed between the gas flaring activity and the accelerated degradation of zinc roofing materials on nearby buildings.



Plate 1: Rusty Open Shelter



Plate 2: Corroded Mud House



Plate 3: Perforated Zinc Roof



Plate 4: Active Gas Flare

The most prominent observation is the widespread and severe rusting of the corrugated zinc roofs. The metal surfaces exhibit extensive reddish-brown and dark brown oxidation, replacing the original silver-grey sheen of galvanised steel. The roofs in Plates 4.1, 4.2 and 4.3 all display significant rust coverage. This is consistent with the thick, black smoke plume emitted by the flare stack (Plate 4.4), which likely deposits carbon particulates and chemical residues onto the surrounding surfaces.

3.5 Community Perceptions and Socio-Economic Consequences

Respondents were asked to indicate their level of agreement with various statements regarding gas flaring and its consequences. The perception data reveal strong community consensus regarding the seriousness of gas flaring and its impacts.

Table 4.8: Community Perceptions of Gas Flaring

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean
F1. Gas flaring is a serious environmental problem in my community.	198 (51.8%)	142 (37.2%)	24 (6.3%)	11 (2.9%)	7 (1.8%)	4.34
F2. Gas flaring is the primary cause of health issues in my household.	167 (43.7%)	145 (38.0%)	38 (9.9%)	18 (4.7%)	14 (3.7%)	4.13
F3. The government and oil companies should be held accountable for the damage caused by gas flaring.	212 (55.5%)	134 (35.1%)	19 (5.0%)	11 (2.9%)	6 (1.6%)	4.40
F4. The health impacts of gas flaring have reduced my ability to work or earn income.	143 (37.4%)	156 (40.8%)	37 (9.7%)	28 (7.3%)	18 (4.7%)	3.99
F5. My family spends a significant portion of our income on healthcare due to pollution from the flare.	156 (40.8%)	148 (38.7%)	34 (8.9%)	26 (6.8%)	18 (4.7%)	4.04
F6. The corrosion of my roof and house structure is directly due to the gas flare.	167 (43.7%)	142 (37.2%)	31 (8.1%)	24 (6.3%)	18 (4.7%)	4.09
F7. I have considered relocating from this community because of the gas flaring.	112 (29.3%)	134 (35.1%)	57 (14.9%)	45 (11.8%)	34 (8.9%)	3.64
F8. The benefits of oil production outweigh the harm caused by gas flaring.	21 (5.5%)	38 (9.9%)	67 (17.5%)	142 (37.2%)	114 (29.8%)	2.24

Source: Field Survey, 2025 (Mean interpretation: 1.00-1.80 = Strongly Disagree; 1.81-2.60 = Disagree; 2.61-3.40 = Neutral; 3.41-4.20 = Agree; 4.21-5.00 = Strongly Agree)

The highest mean scores were recorded for F3 (Accountability: mean = 4.40), F1 (Serious environmental problem: mean = 4.34), and F6 (Roof corrosion directly due to flare: mean = 4.09). These findings indicate that community members are not only aware of the environmental and housing impacts of flaring but also hold strong views about the accountability of government and oil companies. The statement that the benefits of oil production outweigh the harm (F8: mean = 2.24) was strongly rejected by a large majority (67.0% disagreed or strongly disagreed), reflecting the community's perception that the costs of oil production far exceed the benefits. The most common coping strategies adopted by households were staying indoors/keeping windows closed (46.6%), avoiding rainwater collection for drinking (40.8%), and saving money specifically for repairs (38.0%). These strategies reflect both immediate health-protective behaviours and medium-term economic

adaptations. The high occurrence of avoiding rainwater collection (40.8%) is particularly concerning, as it indicates that households perceive rain as contaminated and are forced to rely on alternative, possibly more expensive, water sources.

Table 4.9: Coping Strategies Adopted to Mitigate Impacts of Gas Flaring

Coping Strategy	Frequency (n)	Percentage (%)
Use of face masks or protective clothing during flare events	89	23.3
Applying protective coatings/paint on roofs	134	35.1
Sleeping with windows closed or staying indoors	178	46.6
Avoiding rainwater collection for drinking	156	40.8
Relocating sleeping areas away from the flare side of the house	98	25.7
Replacing zinc roofs with more durable materials	67	17.5
Saving money specifically for frequent repairs	145	38.0
Protesting or joining community advocacy groups	56	14.7
Others	23	6.0

Source: Field Survey, 2025 (Note: Respondents could select multiple options, so percentages do not sum to 100%)

Respondents were asked to suggest measures to mitigate the negative impacts of gas flaring in their community. The most frequently cited mitigation measure was enforcement of stricter anti-flaring laws (67.0%), reflecting community dissatisfaction with the current regulatory environment. The second most cited measure was investment in gas capture/recycling technology (62.3%), indicating that communities are aware of technological solutions and expect oil companies to adopt them. Compensation for housing and health damages (58.4%) was also highly cited, reflecting the community's desire for redress and accountability.

3.6 Qualitative Findings: Insights from Interviews and Field Observations

To complement the quantitative data presented in the preceding sections, interviews were conducted with 25 key informants purposively selected from the five communities, including village heads (5), health workers (5), community elders (8), and farmers/fishers (7).

Theme 1: Lived Experiences of Respiratory and Ocular Distress

Across all interview sessions, respondents consistently described a daily struggle with respiratory and eye-related health challenges that they directly attributed to gas flaring emissions. A 62-year-old community elder from Okoroete articulated this with poignant clarity: "We have bad diseases which our old people do not have. Even our roofs, we have coloured zinc here because of gas flaring." This sentiment was echoed by a health worker at a local clinic in Iko, who observed: "Every morning, especially during the dry season, we see patients, children and adults, with coughing, difficulty breathing, and red, itchy eyes. The pattern is so consistent that we don't even ask what caused it anymore. It's the flare. We know it's the flare." These narratives corroborate the quantitative findings, where eye irritation and coughing were the most frequently reported health conditions. The interviews add depth by revealing the daily rhythm of exposure, night-time flaring intensity leading to morning symptoms, and the intergenerational burden, with children and the elderly described as particularly vulnerable.

Theme 2: The "Black Rain" Phenomenon and Water Insecurity

A recurring narrative across all communities was the transformation of rainfall from a trusted water source into a perceived health hazard. Respondents consistently used the term "black rain" to describe the discoloured precipitation they observed, linking it directly to soot and particulate emissions from flare stacks. A 58-year-old farmer from Okoroiti stated: "When it rains now, the water is not clean. It leaves black stains on our clothes and on the ground. We used to collect rainwater for drinking; our fathers did it, our grandfathers did it. Now we cannot. The rain is poisoned by the gas flare."

Theme 3: Accelerated Roof Corrosion and the "Two-Year Roof"

Perhaps the most visceral and frequently discussed theme was the rapid deterioration of roofing materials, particularly galvanised zinc sheets. Multiple respondents independently used the phrase "two-year roof" to describe the lifespan of zinc roofing in their communities, a stark contrast to the 10+ years expected in non-flaring areas. A 50-year-old community leader from Okoroete explained: "Before, when we built our houses, the zinc roof would last for ten years or more. Now, within two years, the roof is already rusting, developing holes, and leaking. The rain that falls here is acidic; it eats the zinc like a disease. We are forced to repair every year, sometimes every few months." The "two-year roof" narrative also corresponds with the quantitative data, where 67.6% of respondents reported repairing or replacing their roofs every year or every 2-3 years.

Theme 4: Economic Precarity and Healthcare Trade-offs

Interviews consistently revealed the difficult economic choices households are forced to make as a result of flare-related health and housing costs. A 40-year-old mother of four from Kampa described the impossible trade-offs: "When my daughter has difficulty breathing, I must take her to the clinic. That is ₦2,000 for the consultation, ₦3,000 for the drugs. But if I spend that money, I cannot buy food for the week. Sometimes I choose between my child's medicine and feeding my other children. It is a choice no mother should have to make." This narrative supports the quantitative finding that 74.3% of respondents reported healthcare costs affecting their ability to meet basic needs. The interviews reveal the compounding nature of the burden: health problems reduce the capacity to work, which reduces income, which in turn limits access to healthcare and housing maintenance, creating a cycle of poverty and vulnerability.

Theme 5: Perceptions of Abandonment and Demands for Accountability

A strong and consistent theme across all interviews was the perception of abandonment by both the government and oil companies. Respondents expressed frustration with decades of unfulfilled promises and the continued operation of flare sites despite regulatory frameworks. A 72-year-old village head from Okoroiti stated: "We have been crying for years. We have written letters, we have held meetings, we have protested. But the flares continue burning. The government collects taxes from the oil companies, but we see nothing. The companies make billions, but we live in poverty with rusted roofs and sick children. Where is the justice?"

3.7 Inferential Analysis: Chi-Square Tests of Association

This section presents inferential analyses using chi-square tests of independence to examine statistically significant associations between key categorical variables in the study.

3.7.1 Association between Proximity to Flare Site and Respiratory Symptoms (Coughing)

Null Hypothesis (H_{01}): There is no significant association between proximity to the flare site and the prevalence of coughing among residents.

The chi-square test revealed a statistically significant association between proximity to gas flare sites and the prevalence of coughing among residents of Eastern Obolo LGA ($\chi^2 = 28.72$, $df = 4$, $p < 0.001$). Since the calculated chi-square value (28.72) exceeds the critical value (9.49), the null hypothesis is rejected.

3.7.2 Association between Community/Village Location and Housing Degradation

Null Hypothesis (H_0): There is no significant association between community/village location and the prevalence of roof rusting/corrosion.

The chi-square test revealed a statistically significant association between community/village location and the prevalence of roof rusting/corrosion among households in Eastern Obolo LGA ($\chi^2 = 12.18$, $df = 4$, $p = 0.016$). Since the calculated chi-square value (12.18) exceeds the critical value (9.49), the null hypothesis is rejected. The pattern observed in the data reveals substantial variation across communities. Iko reported the highest prevalence of roof corrosion (80.2%), followed by Okorombokho (75.3%), Okoroete (69.0%), Okoroiti (63.8%), and Kampa (56.5%). The variation likely reflects differential exposure to flaring emissions, influenced by proximity to flare sites and prevailing wind patterns.

4.0 Discussion of Findings

The findings of this study reveal that respiratory conditions are among the most prevalent health impacts reported by residents, with coughing, difficulty breathing, and wheezing/chest tightness being the most frequently experienced symptoms. These findings are consistent with the epidemiological evidence linking gas flaring emissions to respiratory morbidity. The pollutant profile from flare stacks, rich in sulfur dioxide (SO_2), nitrogen oxides (NO_x), particulate matter (PM), and volatile organic compounds (VOCs), is well-established to aggravate the airways, reduce lung function, and trigger inflammatory responses that manifest as asthma, bronchitis, and chronic obstructive pulmonary disease (COPD) (Kampa & Castanas, 2008; Schraufnagel et al., 2019; Ukhurebor et al., 2024).

The high prevalence of coughing and difficulty breathing in this study corroborates the findings of Obi et al. (2021) and Sofiullahi (2024), who documented worsening respiratory conditions and irregular breathing among infants in Niger Delta communities. The qualitative interviews in this study provided rich contextual detail, with residents describing a daily rhythm of exposure: night-time flaring intensity leading to morning symptoms, and children and the elderly being particularly vulnerable. Eye irritation was the most frequently reported health condition, with 65.7% of respondents reporting "often" or "always" experiencing redness, itching, or tearing. This finding is consistent with the irritant effects of SO_2 , NO_x , and PM on ocular surfaces, which are well-documented in the environmental health literature (Kampa & Castanas, 2008; Schraufnagel et al., 2019). The high prevalence of diagnosed eye infections further confirms the clinical significance of ocular impacts.

The finding that 72.8% of households used galvanised zinc or iron sheets as their primary roofing material is significant, as these materials are particularly vulnerable to corrosion from acid deposition and particulate matter. The high prevalence of rusting/corrosion, blackening/soot deposits, leakages during rainfall, and loosening of nails/screws confirms that gas flaring has a direct and destructive effect on housing materials. These findings align with the experimental work of Abali et al. (2018), who documented accelerated corrosion of galvanised roofing sheets near flare sites in Rivers State, and Ekpoh and Obia (2010), who demonstrated that zinc roofs in the Niger Delta corrode significantly faster due to acidic emissions. The perception data reveal strong community consensus regarding the seriousness of gas flaring and its impacts. The strong rejection of the statement that the benefits of oil production outweigh the harm caused by gas flaring reflects the community's perception that

the costs of oil production far exceed the benefits. This perception is consistent with the environmental justice framework, which emphasises that communities in the Niger Delta bear disproportionate environmental costs while receiving minimal economic benefits (Esavwede & Oyibodoro, 2025; Aigbe et al., 2023).

5.0 Conclusion

This study assessed gas flaring impacts on health and housing in Eastern Obolo LGA, Akwa Ibom State. Findings show a public health crisis: residents report high rates of respiratory illness, eye irritation, and skin conditions. Limited healthcare access and financial constraints lead many to self-medicate or delay care. Housing is also severely affected. Galvanised zinc roofs corrode rapidly, often needing replacement within two years. Frequent, costly repairs divert household money from food, education, and other needs. Families face difficult choices between healthcare, roof repairs, and basic necessities. Community members agree that flaring is a serious problem, causes health and housing damage, and that government and oil companies must be held accountable. Coping strategies are mostly reactive and insufficient, while perceived solutions point to both regulatory failures and available technologies.

6.0 Recommendations

Based on the findings of this study, the following recommendations are made:

1. **Strengthen enforcement of anti-flaring regulations:** The Nigerian Upstream Petroleum Regulatory Commission (NUPRC) should enforce stricter penalties for gas flaring, ensure fines are sufficiently high to deter flaring, and establish transparent monitoring and reporting systems that include community participation.
2. **Invest in gas capture and utilisation infrastructure:** The federal government and oil companies should prioritise investment in gas capture, recycling, and utilisation technologies, including gas-to-power projects and LNG infrastructure, to eliminate routine flaring.
3. **Establish healthcare and housing support programmes:** The Akwa Ibom State Government, in collaboration with oil companies, should establish targeted support programmes including free or subsidised healthcare services, housing repair subsidies, and compensation mechanisms for health and property damages.
4. **Promote research and monitoring:** Continuous air quality monitoring and health surveillance should be established in flaring-impacted communities to provide empirical data for policy interventions and track the effectiveness of mitigation measures.

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