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Maternal and child healthcare-seeking among victims of violence in armed conflict: a quasi-experimental study in Northeast Nigeria

Max Schaub ,[1,2] Gbadebo Collins Adeyanju ,[3] Aisha Aliyu Abulfathi,[4,5] Musa Muhammad Bello,[6,7] Lennart Kasserra,[1,8] Aminatu Ayaba Kwaku,[6,7] Muhammad Ibrahim Jalo,[9] Ahmad Mahmud ,[10,11] Pia Schrage,[3] Rabiu Ibrahim Jalo,[6,7] Liliana Abreu [8]

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For numbered affiliations see end of article.

Correspondence to
Professor Max Schaub;
max.schaub@uni-hamburg.de

ABSTRACT

Introduction Armed conflict severely impacts health, with indirect deaths often exceeding direct casualties two to four times, disproportionately affecting women and children. Although the magnitude of these effects is well-documented, the mechanisms driving them remain insufficiently understood. This study shifts the focus from supply-side factors, such as the destruction of infrastructure, to demand-side processes, particularly healthcare-seeking behaviour and from broader conflict exposure to individual-level violent victimisation.

Methods Data come from a representative survey (n=3006) of caregivers of young children in northeastern Nigeria, a region heavily affected by armed insurgency. Unlike previous studies, our survey included dedicated measures of victimisation, health-seeking outcomes and potential mediating factors within a single instrument, enabling precise measurement and analysis. To compare maternal and child healthcare-seeking behaviour between victimised and non-victimised caregivers, we employed a quasi-experimental observational design using propensity-score matching on demographic and contextual characteristics. Causal mediation analysis was then used to identify the mechanisms linking victimisation to health behaviours.

Results Victimisation was widespread, with 21% of respondents (n=651) having experienced a severe form of violence in the past 3 years. While maternal healthcare-seeking behaviour appeared unaffected, victimisation significantly reduced healthcare-seeking for child health. Children of victimised caregivers were markedly less likely to be fully immunised (OR 0.43, p<0.001) and to receive care at government health facilities (OR 0.23, p<0.001). This decline was primarily driven by increased distrust in the health system (proportion mediated: 0.42–0.70, p<0.05), stemming from negative experiences during the conflict, particularly health worker absenteeism and victimisation by state security forces.

Conclusion Addressing fear and mistrust is key to improving healthcare-seeking in conflict-affected populations. Efforts should focus on providing security for government-run health facilities, reducing violence against civilians by state security forces and restoring trust in healthcare and state institutions. Future research should explore effective strategies for achieving these objectives.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Armed conflict has severe negative consequences for maternal and child health, yet the underlying mechanisms remain understudied.

⇒ Recent research has called for a greater focus on how exposure to violence shapes the demand for health services and healthcare-seeking behaviour—a gap this study addresses with a representative survey (n=3006) in northeastern Nigeria.

WHAT THIS STUDY ADDS

⇒ Rather than approximating exposure through proximity to conflict, this study directly measures individual-level victimisation and examines potential mediating mechanisms with high precision.

⇒ 21% of respondents reported severe victimisation; these individuals showed markedly lower child immunisation rates (OR 0.43, p<0.001) and were less likely to use government health facilities (OR 0.23, p<0.001).

⇒ These differences are driven by mistrust of healthcare workers, predicated on absenteeism and prior victimisation by state security forces.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Preventing further erosion of trust likely requires reliable health service delivery and restraint by security forces.

⇒ To improve child health outcomes, trust-building in healthcare and state institutions should be integrated into recovery programmes.

INTRODUCTION

Studies of armed conflict and health have documented the devastating negative health

effects of exposure to violence. Estimates suggest that indirect deaths from conflict (eg, due to malnutrition and diseases) often exceed direct casualties by a factor of two to four,[1–3] with women and children disproportionately affected.[3–5] While these broad patterns are well documented, gaps remain in our understanding of why violence has such detrimental health consequences. The best-documented explanations focus on supply-side factors: armed conflict is accompanied by the large-scale destruction of critical infrastructure, leaving affected populations without essential services and vulnerable to the spread of infectious diseases.[6–9] In addition, health workers frequently flee conflict-affected areas, further limiting the availability of medical services.[7 10–13] Looking beyond such supply-side dynamics, recent research has shifted the focus to demand-side factors, particularly how exposure to violence affects healthcare-seeking behaviour, defined as utilisation of health services in armed conflict settings.[12 14–18] Exposure to violence can induce fear, scholars have argued, leading individuals to reduce their movement and limit their pursuit of maternal and child healthcare.[17–19] Moreover, individuals living in conflict-affected regions often report lower trust in government institutions, a key predictor of healthcare utilisation.[17 20–22]

Nigeria represents a particularly relevant case for testing the effect of violence exposure on healthcare-seeking. The country faces multiple forms of armed conflict, including the Boko Haram insurgency in the Northeast, recurrent clashes between farmers and herders in the Middle Belt, separatist agitation in the Southeast and criminal banditry in the Northwest.[23 24] These conflicts have had profound repercussions for the health system, ranging from the destruction of facilities and the displacement of health workers to interruptions in immunisation programmes and disease surveillance.[25 26] In the Northeast, where our study is situated, healthcare capacity has been particularly strained, with many communities reliant on humanitarian organisations whose reach remains inconsistent due to insecurity.[27 28] Existing research on Nigeria underscores the severity of these challenges: attacks on health services have contributed to elevated maternal and child mortality, malnutrition and outbreaks of preventable diseases such as cholera and measles.[29 30] Studies also document the psychological toll of conflict, including high levels of post-traumatic stress and depression among displaced populations.[31 32]

Against this backdrop, the present study contributes to this literature, but shifts the focus from broader exposure to violence—typically measured as proximity to attacks—to individual-level violent victimisation. Even though victimisation is one of the most direct consequences of exposure to armed conflict, its impact on healthcare-seeking has not been explicitly assessed. In conflict settings, large numbers of individuals suffer from attacks themselves or observe family members being killed or otherwise harmed. Our study systematically measures such instances of victimisation and assesses their relationship with healthcare-seeking behaviour. Additionally, we advance existing research by explicitly identifying and modelling potential pathways through which victimisation translates into reduced healthcare-seeking, focusing on trauma, fear and mistrust. It is well established that victimisation can lead to persistent trauma, with survivors exhibiting significantly higher rates of post-traumatic stress symptoms, even decades after exposure.[33–35] As a consequence of trauma, victims may underuse healthcare services.[36 37] It is also plausible that violent victimisation may increase fear of further victimisation, discouraging individuals from leaving their homes to seek healthcare for themselves, their partner or their children.[19 37 38] Similarly, victimisation can erode trust in healthcare institutions. This may be because of negative experiences with healthcare services during the conflict or a generalisation of mistrust from one state institution (eg, the security forces that failed them) to other state institutions, such as government-provided healthcare. Distrustful individuals will stop using health services, for example, by refusing to vaccinate their children,[39 40] or they will seek non-government-run alternatives.[41 42] In order to consistently track these potential mediation effects, our study included measures for all of these dimensions in the same survey instrument.

METHODS

Data

Data come from a representative household survey (n=3006) conducted in August and September 2024 in the three northeastern Nigerian states of Adamawa, Borno and Yobe (see online supplemental figure S1 in the Supplementary information (SI) for a graphical overview). The region has been severely affected by an armed insurgency for the last 15 years.[43 44] And while the security situation has stabilised somewhat in recent years, sporadic attacks on government and civilian targets persist, including raids by armed extremists on villages and attacks on hospitals.[45] In each state, two local government areas (LGAs, comparable to counties) were randomly selected, weighting by population size. Within each LGA, three political wards (out of 10–15) were chosen using the same weighting approach. Due to security constraints, three wards had to be replaced during data collection with random replacements. The primary sampling units (PSUs) were determined by a population-weighted draw of 500×500 m grid cells, which generated interviewer starting points proportional to population size. Household recruitment followed a random walk with a 2:1 skip pattern. Sampling weights were generated to adjust for any over-representation or under-representation of PSUs in the final sample, ensuring unbiased summary statistics. Additional information about the survey, in line with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines,[46] is provided in online

supplemental tables S1–S3 in the SI and replication data and code are available on OSF.[47]

The target population for our survey was parents (men and women) of young children. In each household, a single person was chosen for interview. To be eligible for the interview, a person had to be the primary caregiver of a child 5 years of age or younger. Interviews were conducted by trained interviewers in the local language (Hausa) using a pretested questionnaire. Participants were informed in advance of the sensitive nature of some of the questions included in the survey and were informed that they could end the survey or skip individual questions at any time. Only individuals who gave their explicit informed consent were interviewed. Participants provided demographic information, answered questions about maternal and child health and reported on experiences of violence and attitudes toward government and healthcare institutions. For child health, we focused on the youngest child in the family, aged at least 1 year. For maternal health, we asked female respondents to report on their own experiences and male respondents to report on their partners' experiences. The survey and data collection protocol were approved by the respective authorities in both Nigeria and Germany.

Patient and public involvement

The research project built on knowledge gained from qualitative fieldwork with focus group participants and key informants (community leaders and healthcare workers). These interviews provided important input for defining the final set of questions included in the survey. The data and findings were disseminated through a workshop held in Kano, Nigeria, in January 2025, which was open to specialists from Nigerian ministries, non-governmental organisations (NGOs) and journalists.

Study design and statistical approach

For the analysis, we adopted a quasi-experimental propensity score matching approach. We matched individuals who reported being victimised in the past 3 years with non-victimised individuals using a 1:1 matching algorithm. For statistical modelling, we considered both conditional and unconditional logistic regression. Conditional logit relies only on within-pair variation, offering a rigorous approach to causal inference, but it discards a substantial portion of the data and limits flexibility for mediation analysis. The causal mediation framework we employ[48] requires an outcome model that can accommodate continuous and multiple mediators. Because conditional logit removes stratum-specific intercepts, it complicates estimation of mediated effects and precludes the inclusion of mediators that do not vary within pairs. By contrast, unconditional logistic regression allows us to estimate the outcome model required for mediation analysis.[49] We therefore opted for unconditional models as our default specification, applied to matched data with adjustment for the matching variables and clustering of SEs at the matched-pair level.[50 51] Robustness checks using conditional logistic regression are reported in Section H of the SI; substantively, both approaches yield very similar estimates.

We matched on the demographic characteristics of the respondent (sex, age, education, number of children) and of the child in question (sex, age) to shield against potential confounding along these dimensions. For example, age and sex may be related to both the likelihood of victimisation and healthcare-seeking patterns. Second, to isolate the *demand* for healthcare, we also accounted for determinants of healthcare supply. Specifically, we included the self-reported walking distance (in minutes) to the nearest clinic and the remotely measured geographical distance between the interview locations and georeferenced clinic and hospital locations.[52] We further included several health indicators in our matching function to capture the relative quality of services, namely diphtheria-tetanus-pertussis and measles vaccination coverage, malaria and malnutrition prevalence, and the under-five mortality rate.[53–57] A full description of the included contextual covariates can be found in online supplemental table S4 in the SI. These indicators were recorded at the 500×500 m grid cell level, the same scale used for sampling. Finally, we included covariates that are known determinants of armed violence, notably population density, accessibility (measured as the distance to the nearest major road) and state reach (measured as the distance to the regional capital).[58] All time-varying context-level covariates were measured pretreatment, between 2015 and 2019, that is, before the start of the recording period for victimisation. Matching was performed on the propensity score, estimated by means of a probit model regressing the victimisation indicator on the full set of controls and a calliper set to 0.2.[59] This procedure matched the full set of victimised individuals (n=651) to the same number of non-victimised control-group individuals, for an effective sample of n=1302 used in most of the analyses.

Our models relate violent victimisation to indicators of healthcare-seeking for maternal and child health. Violent victimisation was assessed using a survey question asking whether the respondent or a household member had been 'directly affected by organized violence' in the past 3 years. Organised violence was defined as violence perpetrated by 'members of an organized group, such as an extremist group or armed bandits'. Respondents were further instructed that being 'affected' meant being 'either the target or witness of violence'. Following this question, we asked whether respondents would mind sharing what had happened to them or their household member. We coded individuals as violently victimised if they reported that they or their household members were physically assaulted, had a household member killed, were kidnapped/abducted, were threatened with violence or experienced sexual violence.

As the core outcomes, our study focused on four key indicators of maternal and child healthcare-seeking. These were (1) utilisation of antenatal care and (2)

facility-based childbirth (delivery in a healthcare facility) for maternal healthcare-seeking, and (3) adherence to the recommended child immunisation schedule and (4) use of government health facilities for child healthcare-seeking. Antenatal care use was operationalised as respondents reporting that they received four or more antenatal care visits, the number recommended by the Nigerian Ministry of Health. Facility-based birth is measured as respondents reporting that the child in focus was born in a health clinic or hospital. To measure immunisation coverage, interviewers checked the child's official immunisation card to verify whether they had received the full schedule of vaccinations recommended by the Nigerian Ministry of Health. To operationalise the use of government health facilities, we recorded whether individuals used a health facility for any of their children in the past 6 months, and the type of health facility they visited. We then coded reported use of government clinics or hospitals as one, and use of private clinics, traditional healers and clinics run by religious institutions or other NGOs as zero.

A slight uncertainty arises from temporal ordering. In principle, it is possible that some instances of victimisation occurred after the health-seeking behaviour they are linked to, particularly for maternal indicators, which may refer to events some time before the interview. Although none of the respondents reported such a sequence, we cannot entirely rule out this possibility. Interpretations should therefore be made with greater caution for outcomes that occurred further in the past. This concern does not apply to vaccination status, which was assessed at the time of the interview. Moreover, the usual caveats regarding self-reported behaviours apply, notably that these measures may be affected by imperfect recall or imprecise reporting. As long as such biases affect victimised and non-victimised respondents equally, they would not systematically bias our estimates. However, bias could arise if recall accuracy were directly correlated with victimisation status—an effect that cannot be entirely ruled out, though we consider it unlikely. By contrast, measurement of child immunisation status is not subject to this concern, as vaccination information was verified from the child's official immunisation card.

Mediators

In addition to these outcomes, we examined three potential mediating mechanisms: trauma, fear and mistrust. The hypothesised causal framework is shown in figure 1. Following prior research in conflict settings, trauma is most often assessed in terms of post-traumatic stress disorder (PTSD) and related symptomatology, typically using standardised instruments such as the Harvard Trauma Questionnaire or the PTSD Checklist (PCL).[60 61] PTSD reflects the psychological sequelae of past traumatic events,[62] and in our study, it was measured using the validated eight-item PCL (PCL-8).[63] Fear, by contrast, captures a forward-looking perception of continued threat, closely linked to the anticipation of future violence rather than past exposure.[64] In previous work, fear has been operationalised through self-reports of avoidance behaviours or through predicted local violence risk in conflict-affected settings.[17 19 65] We followed the self-report approach by asking respondents directly about their perceived likelihood to become victims of violence again in the future. The third mediator, institutional mistrust, refers to the erosion of confidence in the state's ability or willingness to fulfil its protective and service-providing roles.[66 67] Victimisation implies that the state has failed in its role as protector, which may undermine confidence not only in security institutions but also in other state services such as healthcare. This spillover matters for health outcomes: mistrustful individuals are less likely to seek care, follow medical advice or vaccinate their children.[17 21 42 68] To capture this dimension, our survey included a question on whether respondents' trust in healthcare workers had increased, decreased or remained unchanged over the past 3 years. The full wording of all survey questions can be found in online supplemental table S14 in the SI.

To conduct the mediation analysis, we adopt the causal mediation framework proposed by Imai *et al*.[48] In practice, we use the unconditional logistic regression outcome model as the basis for the mediation analysis. We estimate separate regression models for each mediator conditional on victimisation and covariates, and then decompose the total effect into the natural indirect effect (mediation pathway), the direct effect and the proportion mediated (PM). To account for the hypothesised

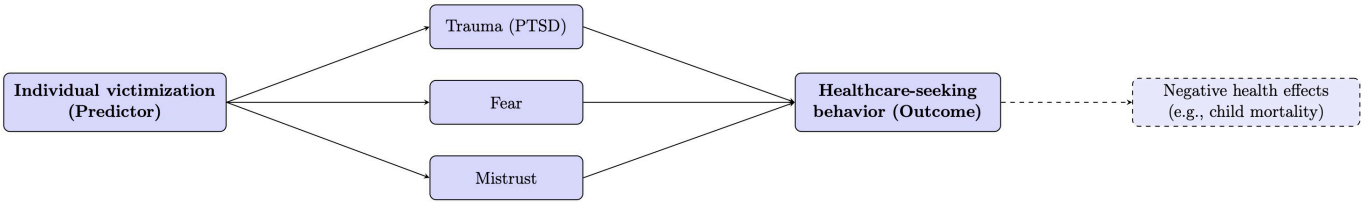

Figure 1 Hypothesised causal framework. The figure shows the hypothesised causal relations explored in this paper. Individual victimisation is assumed to affect healthcare-seeking behaviour through trauma (post-traumatic stress disorder, PTSD), fear and mistrust. Arrows reflect temporal/causal ordering. The dashed arrow from healthcare-seeking behaviour to health outcomes (eg, child mortality) indicates the next logical link in the chain but is not estimated here. For an analysis testing the full causal chain with aggregate data, see the study by Schaub.[17]

presence of multiple mediators, we include the respective other mediators as controls in each model.[69] A core identifying assumption of this approach is sequential unconfoundedness, meaning that there are no unmeasured confounders of the treatment–outcome or mediator–outcome relationships. In practice, this assumption is difficult to fully satisfy, even when controlling for a rich set of covariates as in the present analysis. Therefore, the mediation results should be interpreted with appropriate caution.

Finally, we conducted a complementary regression analysis to identify predictors of declining trust in healthcare workers. The outcome was a binary indicator of whether respondents reported that their trust in healthcare workers had decreased over the past 3 years. We estimated our standard matched logistic regression models with predictors including reported absenteeism of healthcare workers, exposure to violence by security forces, fear for security at health facilities, worry about undue political influence on the health system and the provision of free healthcare provided by NGOs. All models adjust for the same sociodemographic covariates used in the main models. All predictors were measured through self-report survey items (full wording in online supplemental table S14, SI). This analysis allows us to examine more directly the contextual factors underlying loss of trust, which emerged as the key mediator in our main models.

RESULTS

Sample demographics and matching

Table 1 provides summary statistics for our sample, victimisation rates, healthcare-seeking behaviours and other variables reported in this study. The table reports averages after applying sample weights. The corresponding raw frequencies are reported in the text. Statistics for all variables, including covariates, can be found in online supplemental table S4 in the SI and balance statistics, which list values for victimised and non-victimised individuals separately in line with the STROBE[46] statement, are shown in online supplemental table S5, SI. As shown in table 1, of the 3006 respondents, 71% (n=2172) were female and 29% (n=834) were male, with an average age of 36 years. Caregivers provided information on 3006 children, of whom 48% (n=1448) were female and 52% (n=1558) male, with a mean age of 2.5 years. Propensity score matching achieved excellent balance, with none of the mean differences statistically significant and all standardised mean differences below 7% (see online supplemental table S5 and figure S4 in the SI). Applying a much stricter calliper (0.025) results in a similar number of matched pairs (647 vs 651), indicating that most pairs are very closely matched.

Victimisation prevalence

Table 1 (and online supplemental figure S2 in the SI) also shows the prevalence of different types of victimisation in our sample. Common forms of victimisation include physical assault, experienced by 11.1% (n=338) of respondents and the killing or kidnapping of a household member, experienced by 4.9% (n=155) and 4.5% (n=129) of respondents, respectively. Most importantly, overall no fewer than 21% of respondents (n=651) reported being victimised by some form of severe violence, underscoring the importance of considering the impact of individual-level victimisation on healthcare-seeking behaviour, rather than examining only broader exposure to conflict.

Healthcare-seeking

As for the prevalence of healthcare-seeking for child and maternal health, full childhood immunisation coverage was 61% (n=1563), significantly below the global average of over 80%.[70] Antenatal care was relatively high compared with other Nigerian states, with 77% (n=2129) of women attending at least four recommended visits during pregnancy.[71] Children were born in a health clinic or hospital in 61% (n=1559) of cases, slightly below the 70% estimated for births in low- and middle-income countries.[72]

Use of government facilities for child healthcare was reported by 80% (n=1805) of respondents, reflecting the dominance of the public health sector in the country. Other measures included in the table are discussed below.

Statistical results

Figure 2 shows the results of the matched case-control logistic regression model, which examines the relationship between healthcare-seeking behaviour and violent victimisation. Descriptive statistics are shown in online supplemental figure S3, conditional logistic regression results are shown in online supplemental figure S5 and full regression outputs are included in online supplemental tables S5–S8. As shown in figure 2, victimisation was not significantly associated with whether respondents attended the recommended number of prenatal care visits (OR 1.25, 95% CI 0.93 to 1.69). Contrary to expectations, the likelihood that a child born to victimised caregivers was delivered in a health clinic or hospital was slightly *higher* than among matched non-victimised individuals (OR 1.30, 95% CI 1.01 to 1.66). However, this result lacks full robustness across alternative model specifications (see online supplemental tables S9–S11 in the SI).

Thus, healthcare-seeking for maternal health does not differ significantly between victimised and non-victimised individuals. In contrast, there are strong differences in healthcare-seeking for children's health. Children of victimised caregivers were significantly less likely to be fully vaccinated (OR 0.43, 95% CI 0.32 to 0.57). A striking difference emerged in healthcare-seeking *patterns*: children of victimised caregivers were far less likely to be taken to government-run clinics compared with private facilities (OR 0.23, 95% CI 0.14 to 0.39).

Table 1 Summary statistics for sample demographics, predictors, outcomes and mediators

	Mean	SD	Min	Max	Count
Sample demographics					
Respondent female	0.71	0.45	0.00	1.00	3006
Respondent age	36.19	10.52	15.00	82.00	3006
Child female	0.48	0.50	0.00	1.00	3006
Child age	2.49	1.30	1.00	5.00	3006
Victimisation prevalence					
Was/were physically assaulted	0.11	0.31	0.00	1.00	3006
Had a household member killed	0.05	0.22	0.00	1.00	3006
Was/were kidnapped/abducted	0.05	0.21	0.00	1.00	3006
Witnessed someone else being killed	0.04	0.18	0.00	1.00	3006
Was/were threatened with violence	0.03	0.16	0.00	1.00	3006
Experienced sexual violence	0.01	0.10	0.00	1.00	3006
Victimised during armed violence (any)	0.21	0.41	0.00	1.00	3006
Healthcare-seeking behaviour					
Child fully vaccinated	0.62	0.48	0.00	1.00	3006
Recommended antenatal care	0.77	0.42	0.00	1.00	3006
Birth at medical facility	0.61	0.49	0.00	1.00	3006
Used government clinic for child	0.80	0.40	0.00	1.00	2196
Child health outcomes					
Child had health issue when born	0.03	0.16	0.00	1.00	3006
Child had health issue during last year	0.24	0.43	0.00	1.00	3006
Mediators					
Fear of victimisation	0.47	0.50	0.00	1.00	3006
Post-traumatic stress disorder	0.24	0.43	0.00	1.00	3006
Loss of trust in healthcare workers	0.19	0.39	0.00	1.00	3006
Predictors of loss of trust					
State security perpetrator	0.08	0.27	0.00	1.00	3006
Feared for security at health facility	0.03	0.18	0.00	1.00	3006
Worried about undue influence	0.11	0.31	0.00	1.00	3006
Free healthcare provided by NGO	0.08	0.27	0.00	1.00	3006
Absenteeism of healthcare workers	0.19	0.40	0.00	1.00	3006

Summary statistics for the main outcome and treatment variables used in the study. Reduced number of observations in variable 'Used government clinic for child' due to question only asked of individuals reporting use of healthcare.
NGO, non-governmental organisation.

Figure 2 also shows that victimisation was associated with poorer child health. Children of caregivers who experienced violence were less likely to be fully healthy at birth (OR 5.47, 95% CI 2.64 to 11.34) and more likely to have recently suffered from health issues such as respiratory, digestion or coordination problems; or hearing and vision problems (OR 1.48, 95% CI 1.10 to 1.99).

To confirm the validity of our findings, we conducted a number of robustness checks. First, conditional logistic regression yields very similar estimates to our main unconditional models: antenatal care (OR 1.14, 95% CI 0.89 to 1.45 vs OR 1.08), skilled birth attendance (OR 1.26, 95% CI 1.01 to 1.59 vs OR 1.18), full child vaccination (OR 0.50, 95% CI 0.40 to 0.63 vs OR 0.43) and use of government facilities for child care (OR 0.17, 95% CI 0.10 to 0.28 vs OR 0.23). Second, we restricted the analysis to female respondents and found that the results remained largely unchanged compared with using the full sample (online supplemental table S9). Third, applying small-area (500×500 m) fixed effects likewise yielded very similar estimates (online supplemental table S10, SI). This suggests that our findings are robust even when comparing closely matched individuals living in the same local area, where healthcare supply factors should be constant, making it highly unlikely that the observed differences in healthcare-seeking behaviour are

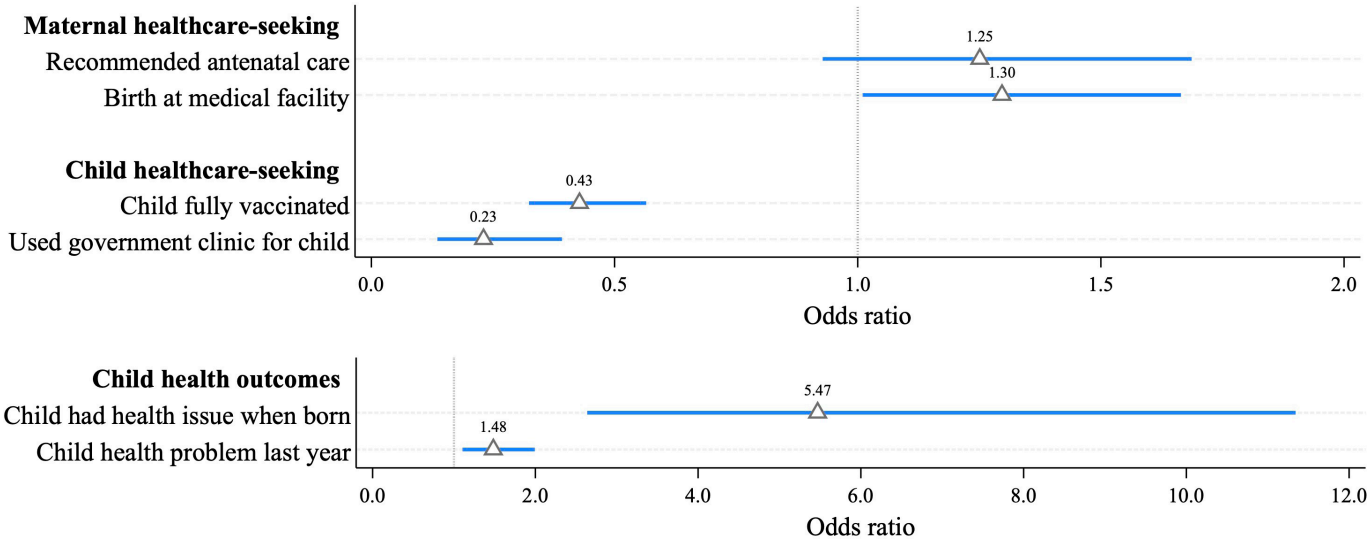

Figure 2 Effect of violent victimisation on healthcare-seeking behaviour and child health. Coefficient plots from a regression of indicators of healthcare-seeking for maternal and child health, and of child health outcomes, on violent victimisation. Reported coefficients are ORs after unconditional logistic regression using the matched sample. Markers are point estimates, lines 95% CIs. SEs clustered at the level of the matched pair.

driven by variation in service availability rather than the effects of victimisation. Finally, probing for differential effects within our main independent variable, we found that the observed negative association between victimisation and healthcare-seeking appears to be driven by direct forms of victimisation (physical assault, abduction or sexual violence), whereas indirect victimisation (seeing someone killed or losing a household member) did not consistently reduce healthcare-seeking behaviour (online supplemental table S12, SI).

Mediation analysis

What explains the lower healthcare-seeking for child health and the shift away from government healthcare among victimised respondents? To investigate this, we examined three key factors discussed in the literature: (1) fear of future victimisation, which may lead to avoidance behaviour; (2) poor mental health, which may impair individuals' ability to engage in healthcare-seeking behaviour; and (3) loss of trust in healthcare personnel,

Table 2 Mediation analyses

Dependent variable:	Child fully vaccinated			Used government clinic for child		
	(1)	(2)	(3)	(4)	(5)	(6)
Mediator:	FearVict	PTSD	DistrustMed	FearVict	PTSD	DistrustMed
Nat. indirect effect	−0.001	−0.001	−0.041**	−0.030***	0.003	−0.089***
	(−0.011 to 0.009)	(−0.010 to 0.009)	(−0.073 to −0.009)	(−0.050 to −0.010)	(−0.002 to 0.008)	(−0.137 to −0.041)
Total effect	−0.096***	−0.082***	−0.128***	−0.073**	−0.052*	−0.127***
	(−0.150 to −0.042)	(−0.138 to −0.026)	(−0.174 to −0.082)	(−0.138 to −0.008)	(−0.110 to 0.006)	(−0.173 to −0.080)
Proportion mediated	0.01	0.01	0.32**	0.41*	−0.06	0.70***
	(−0.09 to 0.12)	(−0.11 to 0.13)	(0.03 to 0.61)	(−0.04 to 0.86)	(−0.17 to 0.06)	(0.25 to 1.16)
N	1302	1302	1302	979	979	979

Mediation analysis for the effect of violent victimisation on child healthcare-seeking. Models 1–3 show mediation analyses for our indicator as to whether a child is fully vaccinated, Models 4–6 show mediation analyses for the effect of victimisation on child healthcare-seeking at government health clinics or hospitals. Nat. indirect effect stands for natural indirect (mediated) effect. FearVict records respondents reporting fear of future violence, PTSD measures respondents suffering from PTSD and DistrustMed records whether respondents report a loss of trust in healthcare workers. Reported coefficients are marginal effects after logistic regression. Matched sample of victimised and non-victimised respondents. Proportions mediated do not sum to 100 since baseline values vary (the total effect is estimated conditional on the other mediators). SEs clustered at the level of the matched pair, 95% CIs in parentheses, *p<0.1, **p<0.05, ***p<0.01.
PTSD, post-traumatic stress disorder.

which may prevent victimised individuals from engaging with government institutions.

Table 2 indicates the extent to which the effect of violent victimisation on child health is mediated by these three factors, keeping in mind the methodological limitations of this kind of analysis. For childhood vaccination rates, neither fear of future victimisation (PM 0.01, 95% CI −0.09 to 0.12) nor PTSD (PM 0.01, 95% CI −0.11 to 0.13) seems to mediate the effect of victimisation, despite prior work documenting or suggesting a mediating role for trauma.[73–78] This divergence may reflect characteristics of our setting and measurement: PTSD symptoms were captured with the PCL-8, which may underrepresent avoidance and numbing domains most relevant to preventive care, while contextual constraints such as staff absenteeism, politicisation of services and indeed fear and distrust may act more proximally on care-seeking behaviour than trauma.[17 19] The non-detection of a mediating relationship does not imply that victimisation has no effect on PTSD, however. On the contrary, all three mediators—including fear and PTSD—are strongly predicted by violent victimisation, as shown in online supplemental table S13 in the SI.

Supporting this idea, loss of trust in healthcare workers emerges as a strong and statistically significant mediator, explaining approximately one-third (PM: 0.32, 95% CI 0.03 to 0.61) of the effect of victimisation. The mediation pattern is more complex for children's healthcare-seeking in government facilities. Here, 41% of the effect of victimisation (controlling for other mediators) could be attributed to perceived insecurity, a result that approaches conventional statistical significance (PM: 0.41, 95% CI −0.04 to 0.86). PTSD, once again, does not mediate the effect of victimisation (PM: −0.06, 95% CI −0.17 to 0.06). However, mistrust in healthcare providers appears to have an extraordinarily strong mediating effect, accounting for no less than 70% of the conditional effect of victimisation (PM: 0.70, 95% CI 0.25 to 1.16). Our analysis thus strongly suggests that fear and especially distrust play important mediating roles. While these results align with previous research, they provide more direct empirical evidence linking both factors to victimisation rather than to general exposure to armed violence. In contrast, despite its theoretical plausibility and prior empirical support, in our setting, poor mental health (PTSD) does not appear to explain the observed association between victimisation and healthcare-seeking for children.

Determinants of the loss of trust in healthcare workers

Given the important role of a loss of trust in mediating healthcare-seeking behaviour, we investigated its underlying determinants in the final step of our analysis. A key finding was that loss of trust in health workers was strongly correlated with loss of trust in other state institutions. Specifically, individuals who lose trust in the government (OR 35.76, 95% CI 23.72 to 53.91) and in the security forces (OR 23.76, 95% CI 17.43 to 32.38) were significantly more likely to lose trust in healthcare providers. These findings suggest that distrust in healthcare workers extends beyond the health sector, reflecting a broader erosion of trust in state institutions. This generalised distrust may result from a perceived failure of the government or security forces to protect individuals from violence, leading victims to associate the healthcare system with the same institutions they hold responsible for their victimisation. Second, we regress the indicator for loss of trust in healthcare workers on several conflict-related experiences reported in our survey. Specifically, we focus on whether distrust is linked to: (1) violent victimisation at the hands of state security forces, (2) healthcare worker absenteeism when respondents sought medical assistance, (3) fear for personal safety while at a health facility, (4) concerns that health facilities were unduly influenced by the government or (5) receiving free healthcare from NGOs.

Victimisation by state security forces is alarmingly common in our sample. Among those who experienced violence, more than one-third of victimised respondents (38%)—equivalent to 8% (n=212) of the full sample, see table 1—reported that state security forces were the perpetrators. Such experiences are likely to undermine trust in the government, which in turn may spill over to health workers.[66 79 80]

Similarly, health worker absenteeism, experienced by 17% (n=527) of respondents, has previously been found to correlate with lower levels of trust.[81] Concerns about the security of health facilities, cited by 4% (n=122) of respondents, and about undue political influence on health facilities, cited by 13% (n=396) of respondents, may also contribute to mistrust. In contrast, receiving free healthcare from NGOs, reported by 9% (n=272) of respondents, may have the opposite effect. Previous research suggests that humanitarian interventions providing free medical care can mitigate the negative effects of conflict exposure,[18] and it is plausible that access to such services helps to restore trust in healthcare workers.[68]

Figure 3 shows the results of the regression analysis. The dominant factors explaining the loss of trust in healthcare are victimisation by state security forces (OR 30.23, 95% CI 17.64 to 51.81) and absenteeism of healthcare workers (OR 13.43, 95% CI 9.58 to 18.85). Other significant, but less pronounced, predictors include: feeling unsafe when seeking healthcare (OR 2.01, 95% CI 1.10 to 3.70) and worrying about undue political influence on the healthcare system (OR 1.50, 95% CI 1.02 to 2.20). Meanwhile, receiving free healthcare is associated with a relative gain in trust, but not significantly so (OR 0.76, 95% CI 0.47 to 1.22). Overall, the results clearly show how failed attempts to access healthcare and negative experiences with other government institutions contribute to a decline in trust.

CONCLUSION

Our study advances the literature on the health effects of armed conflict in three key ways. First, we focus explicitly

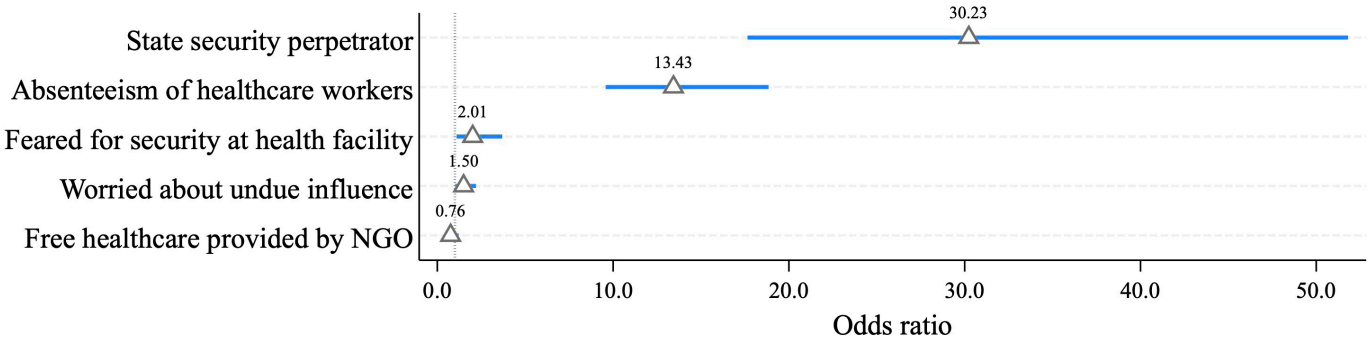

Figure 3 Determinants of loss of trust in healthcare workers. Coefficient plots from a regression of the indicator for loss of trust in healthcare workers on various potential explanatory variables. Reported coefficients are ORs after unconditional logistic regression using the matched sample. Markers are point estimates, lines 95% CIs. SEs clustered at the level of the matched pair.

on the effects of individual-level victimisation, a quantitatively significant yet often overlooked consequence of armed conflict. Unlike broad measures of exposure to conflict, which are often defined in terms of proximity to violent events, victimisation is a more direct and specific experience. In our sample, 21% of respondents reported experiencing severe forms of victimisation, such as being violently attacked or having a household member killed. These respondents exhibit markedly different healthcare-seeking behaviours compared with non-victimised (but still conflict-exposed) individuals living in close proximity, underscoring the importance of looking beyond general exposure. Second, echoing other recent research,[9 15–19 22] we focus on demand-side effects, that is, healthcare-seeking, rather than on supply-side factors such as the destruction of infrastructure. By adjusting for healthcare supply factors, such as proximity to health facilities or availability of health workers, and by using small-area fixed effects, we effectively isolated the effect of violence on the demand for healthcare. We found that while maternal health-seeking was resilient to victimisation, child health outcomes showed acute vulnerability, with children of victimised caregivers having significantly lower vaccination rates and much lower rates of presentation to government health facilities. This is consistent with other studies that have found that paediatric care tends to be neglected in conflict-affected areas.[18 82] Third, looking beyond top-level associations, we present evidence for a mechanism by which individual-level victimisation translates into lower healthcare-seeking for child health and a shift in healthcare-seeking away from government-run facilities: a loss of trust in healthcare workers. We found that the loss of trust was most strongly associated with absenteeism among healthcare workers and instances of violent victimisation by state security forces. Contrary to theoretical expectations,[36 37] victimisation-induced trauma did not mediate the relationship between victimisation and healthcare-seeking behaviour.

As always, this study is not without limitations. For one, the cross-sectional nature of the data limits our ability to definitively establish causality. Although the matched case-control design strengthens causal inference, we cannot completely rule out the possibility that unobserved confounders may have influenced the results. In addition, the study focuses on a specific region in Nigeria, which may limit the generalisability of the findings to other conflict-affected contexts. Future research should examine these relationships in different settings and strengthen causal inference by using longitudinal data to track causal pathways linking victimisation, trust and health-seeking behaviours over time.

While more research is needed to validate the results, our findings suggest several policy priorities. A first area of intervention is to prevent the loss of trust. Our findings suggest that to achieve this goal, at least basic emergency services should be provided throughout a violent conflict, and security forces should exercise the utmost discipline and care to avoid harming civilians. A second area of intervention is to mitigate the consequences where trust has already been lost and healthcare-seeking for children has been reduced. While other work has found that aid provided by NGOs can help counteract the negative effects of exposure to armed conflict on trust,[18 68] our evidence suggests that such aid may not be sufficient to rebuild trust among actual victims.

This calls for a deeper exploration of how trust might be rebuilt. One possible strategy is targeted child health interventions, for instance in the form of community engagement strategies,[83–85] which could help rebuild state-community relations. Political science research also suggests that legal accountability for perpetrators is important for rebuilding trust,[86] and that listening exercises that explicitly acknowledge suffering can be used to restore trust in the state after conflict.[87–89] Such exercises could take the form of outreach and communication campaigns by health authorities—for example, acknowledging hardships and encouraging families to return to government health services. Combining such symbolic acknowledgement with visible improvements in service quality may be particularly effective, as it couples recognition with tangible action and incentives.[90]

Evidence from other conflict-affected settings shows that interventions can be designed to both improve health outcomes and rebuild trust in service delivery.

Community health worker programmes, which relied on locally recruited workers and participatory planning, improved immunisation coverage and strengthened community confidence in the health system.[91–93] Similar approaches could be adapted in Nigeria, where trust has likewise proven central to sustained healthcare utilisation.[94] Experience from Northern Nigeria and elsewhere demonstrates that adaptive, multilevel engagement with governance, financing and community systems can strengthen health system resilience even under insecurity.[95 96] Building on such principles, displaced persons or youth volunteers could be trained as health promoters in camps for internally displaced persons (IDPs) and host communities, and mobile units staffed by female health workers could enhance access and trust among women in conservative or insecure areas.[97 98] Conflict-sensitive vaccination campaigns that engage local and religious leaders to counter misinformation, as successfully implemented elsewhere,[99 100] could likewise inform strategies to overcome vaccine hesitancy and insecurity. These approaches must, however, be carefully tailored to Nigeria's sociopolitical realities, including collaboration with religious institutions and strict avoidance of coercive associations with security actors.

Ultimately, our findings underscore that in contexts of protracted conflict, rebuilding trust is as central to improving health outcomes as restoring supply, and future interventions should be rigorously evaluated with this dual objective in mind.

Author affiliations
[1]University of Hamburg, Hamburg, Germany
[2]WZB, Berlin, Germany
[3]University of Erfurt, Erfurt, Thuringia, Germany
[4]University of Maiduguri, Maiduguri, Nigeria
[5]University of Maiduguri Teaching Hospital, Maiduguri, Nigeria
[6]Bayero University, Kano, Nigeria
[7]Aminu Kano Teaching Hospital, Kano, Nigeria
[8]University of Konstanz, Konstanz, Germany
[9]Women and Children Hospital Damaturu, Damaturu, Nigeria
[10]Modibbo Adama University, Yola, Nigeria
[11]Modibbo Adama University Teaching Hospital, Yola, Nigeria

Contributors MS, GCA and LA developed the research idea. All coauthors helped to develop the research design and survey instrument. RIJ and MS supervised the fieldwork, and AAA, AAK, MIJ and AM led the interview data collection. MS and LK performed statistical analyses and interpreted results. MS drafted the initial manuscript, with extensive input from LA. All members reviewed and provided critical feedback. MS serves as guarantor. DeepL.com was used for language editing.

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ORCID iDs
Max Schaub https://orcid.org/0000-0003-2057-7002
Gbadebo Collins Adeyanju https://orcid.org/0000-0002-5398-0183
Ahmad Mahmud https://orcid.org/0000-0002-6628-3918
Liliana Abreu https://orcid.org/0000-0003-1110-6508

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