Kyle Beardsley and Jessica Beardsley, "Can Peace Operations Mitigate the Effect of Armed Conflict on Malnutrition? Evidence from Côte d'Ivoire," *Environment and Security* (2023)

Online Appendix

Replication data and syntax can be accessed on the corresponding author's website: https://sites.duke.edu/kcbeardsley/

Table A1: Logistic Regression

	(1)	(2)
VARIABLES	Underweight	Underweight
ln(battle deaths)	0.325***	0.331***
	(0.104)	(0.106)
ln(troops)	-0.00646	-0.0130
	(0.0424)	(0.0438)
ln(battle deaths)*ln(troops)	-0.0272**	-0.0272**
	(0.0110)	(0.0113)
ln(neighbor battle deaths)	-0.135**	-0.149**
	(0.0558)	(0.0585)
ln(neighbor troops)	-0.0376	-0.0379
	(0.0522)	(0.0517)
Night lights	30.88*	31.29*
	(17.78)	(18.09)
Drought	-2.958*	-3.096*
	(1.751)	(1.812)
2011-12 wave	-0.937	-0.863
	(1.026)	(1.049)
Pregnant/recent birth		-0.664***
		(0.152)

Age		-0.0336***
		(0.00731)
Time to water		-0.00225
		(0.00244)
Education		-0.00658
		(0.0146)
Visitor		0.0490
		(0.313)
Constant	-3.395***	-2.338***
	(0.395)	(0.466)
Observations	7,984	7,865

Models include Grid dummies not shown
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2: Comparing underweight in 1994 and 1998/1999 DHS waves, by PKO exposure

VARIABLES	(1) Underweight
No PKO exposure, 1994 wave	Reference
No PKO exposure, 1998/1999 wave	0.0124
	(0.0144)
PKO exposure, 1994 wave	-0.000799
	(0.0117)
PKO exposure, 1998/1999 wave	-0.00274
	(0.0119)
Constant	0.0790***
	(0.00968)
Observations	8,203

OLS regression
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3: Different waves of violence

VARIABLES	(1) Underweight
ln(battle deaths, 89-09)	0.0145*
	(0.00820)
ln(troops, 04-09)	0.00419
	(0.00374)
ln(battle deaths, 89-09)*ln(troops, 04-09)	-0.00169
	(0.00128)
ln(battle deaths, 10-12)	0.0114
	(0.00745)
ln(troops, 10-12)	-0.00393
	(0.00408)
ln(battle deaths, 10-12)*ln(troops, 10-12)	-0.00139
	(0.00128)
ln(neighbor battle deaths, 89-09)	-0.00756**
	(0.00379)
ln(neighbor troops, 04-09)	-0.000510
	(0.00402)
ln(neighbor battle deaths, 10-12)	0.00120
	(0.00505)
ln(neighbor troops, 10-12)	-0.00521
	(0.00634)
Night lights	1.883
	(1.248)
Drought	-0.221
	(0.151)
2011-12 wave	-0.0452

	(0.0631)
Constant	0.0277
	(0.0460)
Observations	8,203

Models include Grid dummies not shown
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A4: Controlling for UNPOL deployment

	(2)
VARIABLES	Underweight
ln(battle deaths)	0.0197***
	(0.00632)
ln(troops)	-0.00309
	(0.00362)
ln(battle deaths)*ln(troops)	-0.00194***
	(0.000723)
UNPOL deployment	0.0486*
	(0.0256)
ln(neighbor battle deaths)	-0.00827**
	(0.00383)
ln(neighbor troops)	-0.00141
	(0.00383)
Night lights	2.164**
	(0.991)
Drought	-0.159
	(0.119)
2011-12 wave	-0.0815
	(0.0659)
Constant	0.0394
	(0.0301)
Observations	8,203

Models include Grid dummies not shown
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Examination of Mechanisms

The arguments in the main text proposed mechanisms by which exposure to armed conflict could contribute to malnutrition. We focus here on the mechanisms related to disruptions to household economies through use of auxiliary analyses. Data on local interruptions to food production and distribution are not available.

Related to disruptions to household economies, we model as an intermediate variable whether the respondent receives income as compensation for work. We also use as intermediate variables the respondent's status as head of the household, whether the household has a woman as the head of the household, the number of children under five-years of age that the respondent has, and the size of the household. We also consider if a respondent is a "visitor" in the household, which is a potential indicator of whether the respondent was displaced in the conflict. We thus substitute dichotomous variables of these intermediate variables, from the DHS data, for the underweight outcome variable in separate regressions. If any of these variables have similar relationships with conflict and peace-operation exposure, we would also include them as additional explanatory variables to the base model in order to see if they can explain the associations between violence (and peacekeeping) and underweight.

Table A5: Women's Work as Intermediate Variable

VARIABLES	(1) Work	(2) Underweight
Work		-0.0343***
		(0.00844)
ln(battle deaths)	0.0217	0.0205***
	(0.0138)	(0.00634)
ln(troops)	0.00398	-1.94e-05
	(0.00528)	(0.00316)
ln(battle deaths)*ln(troops)	-0.00281*	-0.00168**
	(0.00158)	(0.000707)
ln(neighbor battle deaths)	0.00534	-0.00880**
	(0.00742)	(0.00388)
ln(neighbor troops)	-0.00706	-0.00241
	(0.00657)	(0.00378)
Night lights	0.210	1.718*
	(2.566)	(0.985)
Drought	0.450**	-0.165
	(0.223)	(0.119)
2011-12 wave	-0.0597	-0.0538
	(0.143)	(0.0647)
Constant	0.515***	0.0281
	(0.0481)	(0.0246)
Observations	8,185	8,185

Models include Grid dummies not shown
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A5 presents the estimated coefficients for the models with women's work as an intermediate variable. While we observe, as expected in Model 2, that employment is negatively associated with underweight, the results from Model 1 are not consistent with what should be expected if women's work status is a pathway connecting conflict and peacekeeping exposures to underweight. In Model 1, we observe, unexpectedly, that higher levels of armed conflict exposure is associated with a *higher* propensity for employment, although the relationship is not statistically significant. Also unexpected is the finding that peacekeeping exposure mitigates any positive relationship that exists.

Turning to other mechanisms related to household disruptions, Table A6 presents models which consider as potential intermediate variables the respondent's head-of-household status, whether there is a female head of household, the number of children under five years of age in the household, the total household size, and whether the respondent is a visitor to the household. Models 1, 2, 3 and 5 do not indicate much of an impact of armed conflict or peacekeeping exposure on whether the respondent is the head of the household, whether there is any woman who is the head of the household, the number of children under five in the household, or whether the respondent is a visitor.

Table A6: Household attributes as intermediate variables

VARIABLES	(1) Head of HH	(2) Female Head of HH	(3) Children in HH under 5	(4) HH size	(5) Visitor
ln(battle deaths)	-0.00777	-0.0152	0.110	0.695***	0.00852
	(0.00684)	(0.0138)	(0.0731)	(0.259)	(0.00644)
ln(troops)	-0.00228	0.00519	0.0267	0.0648	-0.000986
	(0.00326)	(0.00576)	(0.0389)	(0.168)	(0.00202)
ln(battle deaths)*ln(troops)	0.000534	0.000695	-0.00452	-0.0268	-1.72e-06
	(0.000861)	(0.00171)	(0.00912)	(0.0375)	(0.000780)
ln(neighbor battle deaths)	-0.00253	-0.0112	0.114***	0.496***	-0.00769**
	(0.00434)	(0.00784)	(0.0385)	(0.149)	(0.00298)
ln(neighbor troops)	0.000196	-0.00102	-0.0347	-0.147	-0.000621
	(0.00406)	(0.00621)	(0.0313)	(0.113)	(0.00276)
Night lights	1.001	1.828	-39.65***	-99.42*	0.164
	(1.280)	(2.166)	(12.81)	(52.08)	(0.661)
Drought	-0.0319	-0.0302	-1.829	0.609	-0.0977
	(0.133)	(0.230)	(1.423)	(5.162)	(0.0982)
2011-12 wave	0.0162	0.0427	0.0768	-0.925	-0.0368
	(0.0808)	(0.119)	(0.687)	(2.625)	(0.0476)
Constant	-0.0292	0.191***		10.46***	0.0593***
	(0.0267)	(0.0441)		(0.816)	(0.0195)
Observations	8,203	8,203	8,203	8,203	8,203

Models include Grid dummies not shown
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In Model 4, we observe that exposure to battle deaths, without peacekeeping, increases the overall household size. We also observe, however, that peacekeeping does not significantly mitigate that relationship. In models not shown, we do not observe that the increase in the size of the household significantly increases the potential for underweight. In total, we do not observe much evidence that the types of household disruptions measured across these variables are intermediate mechanisms by which conflict and peacekeeping exposure influence malnutrition.

Trauma as a Potential Mechanism

We also considered the potential for stress-induced trauma to operate as another mechanism by which conflict affects malnutrition. To measure trauma, we consider loss of close family members as intermediate variables. We use data on sibling mortality to code the number of siblings that have died in the last ten years, with the expectation that a loss of siblings relates to the level of trauma that a person has experienced. We also consider if the respondents are widows. Another variable counts the number of each respondent's children who have died. Finally, we code an aggregate dummy variable of whether the respondent has lost a sibling in the last ten years, is widowed or has lost a child.

Table A7 shows the results of the auxiliary analyses probing whether the trauma-related variables constitute intermediate variables related to underweight. We do not observe that exposure to battle deaths -- with or without peacekeeping -- significantly increases the expected likelihood of any of the types of family deaths considered here. We do not find evidence that trauma, so measured, is a key mechanism connecting exposure to armed conflict or peacekeeping to malnutrition.

Table A7: Trauma

VARIABLES	(1) Sibling deaths	(2) Widow	(3) Child deaths	(4) Family deaths
ln(battle deaths)	-0.0173	-0.00339	0.00845	-0.00198
	(0.0186)	(0.00390)	(0.0290)	(0.0161)
ln(troops)	-0.00765	-0.00148	-0.0121	-0.00585
	(0.00726)	(0.00143)	(0.00969)	(0.00528)
ln(battle deaths)*ln(troops)	0.00324	0.000597	-0.00129	0.000811
	(0.00237)	(0.000444)	(0.00333)	(0.00192)
ln(neighbor battle deaths)	-0.00387	0.00347*	-0.0354***	-0.0176**
	(0.00884)	(0.00190)	(0.0124)	(0.00734)
ln(neighbor troops)	0.00997	-0.00172	-0.00497	0.00285
	(0.00934)	(0.00179)	(0.0115)	(0.00712)
Night lights	1.875	-0.306	-2.728	-3.302
	(2.291)	(0.612)	(3.733)	(2.225)
Drought	0.214	-0.00594	0.0876	0.160
	(0.318)	(0.0571)	(0.418)	(0.240)
2011-12 wave	-0.0768	0.0356	0.170	0.142
	(0.152)	(0.0347)	(0.230)	(0.133)
Constant	0.0903	0.0662***	0.696***	0.381***
	(0.0632)	(0.0125)	(0.0847)	(0.0508)
Observations	7,949	6,377	8,203	8,203

Models include Grid dummies not shown
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

These analyses have explored whether mechanisms related to household economies explain the main findings, but the results are indeterminate. One challenge with the research

design relates to the substantial time gaps between the baseline survey in 1994, the first wave of violence in 2002-2004, the second wave of violence in 2010-2011, and the endline survey in 2011/2012, allowing ample opportunities for more noise to make it difficult to detect key relationships. The lack of statistical significance should not be interpreted as dispositive for a lack of mechanisms in play. Further studies that can narrow in on shorter time horizons for the observed effects may uncover a clearer picture of the relevant pathways.

Full Table 2

VARIABLES	(1) Underweight	(2) Underweight
ln(battle deaths)	0.0203***	0.0210***
	(0.00637)	(0.00639)
ln(troops)	-2.44e-05	-0.000646
	(0.00312)	(0.00318)
ln(battle deaths)*ln(troops)	-0.00166**	-0.00167**
	(0.000704)	(0.000713)
ln(neighbor battle deaths)	-0.00896**	-0.0100**
	(0.00388)	(0.00398)
ln(neighbor troops)	-0.00202	-0.00206
	(0.00379)	(0.00382)
Night lights	1.786*	1.748*
	(1.006)	(1.032)
Drought	-0.177	-0.193
	(0.118)	(0.123)
2011-12 wave	-0.0568	-0.0463
	(0.0654)	(0.0675)
Pregnant/recent birth		-0.0392***
		(0.00744)
Age		-0.00217***
		(0.000458)
Time to water		-0.000129
		(0.000140)
Education		-0.000345
		(0.000988)

Visitor		0.00268
		(0.0236)
Constant	0.00858	0.0845***
	(0.0243)	(0.0274)
Observations	8,203	8,083

Models include Grid dummies not shown
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Full Table 3

VARIABLES	(1) Underweight
ln(battle deaths, placebo)	0.00487
	(0.00807)
ln(troops, placebo)	0.00293
	(0.00385)
ln(battle deaths, placebo)*ln(troops, placebo)	-0.000916
	(0.000979)
ln(neighbor battle deaths, placebo)	-0.00361
	(0.00473)
ln(neighbor troops, placebo)	-0.000888
	(0.00447)
Night lights	0.696
	(1.209)
Drought	0.0610
	(0.157)
2011-12 wave	-0.0231
	(0.0884)
Constant	0.0635*
	(0.0371)
Observations	6,523

Models include Grid dummies not shown
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Full Table 4

VARIABLES	(1) Δ Energy adequacy	(2) Δ Cereal production	(3) Δ Meat production
ln(battle deaths)	-0.0567**	-57,118**	-4,130*
	(0.0242)	(24,920)	(2,204)
Peace operation	-0.530**	-136,764	-14,399
	(0.254)	(117,166)	(10,205)
ln(battle deaths)*ln(peace operation)	0.0544	39,775*	2,924*
	(0.0358)	(23,053)	(1,600)
GDP per capita (t-1)	-1.148***	375,293	-5,135
	(0.294)	(320,452)	(21,461)
Δ GDP per capita (t-1)	3.434***	944,450	30,323
	(1.142)	(905,645)	(25,962)
Urban population ratio (t-1)	3.663*	-358,910	-138,398
	(1.896)	(941,691)	(186,341)
Δ Urban population ratio (t-1)	-35.23*	1.48e+07	-205,546
	(21.07)	(1.18e+07)	(457,373)
Constant	8.944***	-2.87e+06	166,674
	(2.242)	(2.67e+06)	(282,362)
Observations	2,678	2,865	3,058

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1