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Child Morbidity and Camp Decongestion in Post-war Uganda

Carlos Bozzoli[1] and Tilman Brück[2]

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Abstract: Conflict related displacement affects millions of families throughout the world. Very little is known about the determinants of health outcomes in the period immediately after a cease-fire is agreed, in which currently displaced people living in camps consider returning to their place of origin. In this paper, we study the effects of war and displacement on the health of children, using morbidity data collected as part of a large household survey from post-war northern Uganda in 2007. We combine this dataset with geo-coded conflict event data at the individual level to overcome the challenges of selection bias and endogeneity arising from households choosing their location in part based on their health status. This methodological concern is confirmed in our analysis. We then estimate the determinants of child morbidity (proxied by various health indicators) in an instrumental variables multivariate model, where conflict intensity at place of birth of the head of household is used as an instrument. We find that while children in IDP camps and in returnee locations exhibit the same mean morbidity rates, IDP camp residency almost doubles morbidity while poor access to safe drinking water in return locations counteracts the positive health effects of camp decongestion. Our results point to the importance of overcrowding and poor cooking technologies in IDP camps for worsening morbidity in children and the need to provide better sanitation and drinking water access in return locations to further improve the health status of conflict-affected children. Better data and analysis in early post-war periods can help to balance public health interventions, thereby strengthening the peace process.

Keywords: Violent conflict, health, displacement, Uganda
JEL codes: I19, R23

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1. Introduction

At the end of 2007, conflict was responsible for an estimated number of 26 million internally displaced people in at least 52 countries (Jennings et al. 2007). Displacement and living in internally displaced persons´ (IDP) camps are associated with high morbidity and mortality rates (Depoortere et al. 2004, Guha-Sapir and van Panhuis 2002, Guha-Sapir and van Panhuis 2003, Salama et al. 2001). The medical literature discussing the health implications of IDP camps typically identifies associations between different health access indicators and health outcomes (Spiegel et al. 2002). There is little evidence allowing us to differentiate between different drivers of higher morbidity and mortality. Such drivers may include the lack of clean water, sanitation, appropriate shelter or sub-optimal medical facilities (Connolly et al. 2004, Toole and Waldman 1997). Furthermore, very little is known about the determinants of health outcomes in the period immediately after a cease-fire is agreed, in which currently displaced people living in camps consider returning to their place of origin. These knowledge gaps have methodological and data-related causes: It is hard to design studies on IDP camps with valid control groups and sample sizes in humanitarian emergencies are often small. These gaps also have strong implications for health practitioners on the ground involved in allocation of scarce resources during and after conflict, aiming to identify and to decide how best to assist the most vulnerable population groups.

In this paper, we utilise a unique dataset from the early post-war period in northern Uganda, which captures the process of IDP camp decongestion, with IDPs returning to their place of origin or to smaller camps. This region has been affected by mass violent conflict for almost two decades, peaking in the "iron fist" operation displacing almost all residents of three districts in northern Uganda by the government into IDP camps by 2005 (Van Acker 2004) and creating a complex humanitarian emergency in the process (Checchi 2006, WHO, 2005).

Methodologically and topically, this case represents a unique setup given the magnitude and speed of the population displacement and subsequent voluntary camp decongestion as well as the scale and the timing of the data collection, surveying 3962 households, including 4795 children under the age of five years, only a few months after the end of the fighting.

We combine this evidence with geo-coded conflict event data at the individual level, which allows us to identify the role of IDP camp status for various health indicators of these children with instrumental variable statistical techniques. Using this novel approach, we thereby show that IDP camp residency almost doubles morbidity for children in the period immediately after the end of the conflict. This is in strong contrast to both descriptive statistics and an inferior methodological multivariate statistical approach suggesting no effect of IDP camp residency on the health status of children versus those in returnee villages. Furthermore, we show that the positive health effects of IDP camp decongestion for children are, at least in part, counteracted by the negative effects of missing sanitation infrastructure in the return locations. Combining two data sources and applying these statistical techniques enables us to suggest better targeting of preventive health policies for IDPs by reducing overcrowding in IDP camps and accelerating the provision of sanitation facilities in returnee villages.

2. Data and Methods

2.1 Household health survey

We use a large household survey collected in northern Uganda in April and May 2007 by the Ugandan Bureau of Statistics (UBoS) and the Norwegian Fafo Institute for Applied International Studies (UNDP 2008). The survey of 3962 households is representative for the population who has ever resided in an IDP camp in the six districts of Amuru, Gulu, Kitgum, Pader, Lira and Oyam. The sampling procedure followed a two-stage cluster design (UNDP 2008).The first stage followed a probability proportional to size design to select camps or return areas (Fafo unpublished, UNDP 2008).The survey includes indicators of morbidity based on reported symptoms sudden illness, mostly malaria/fever, diarrhoea and severe cough present in children aged five years or below (subsequently referred to as ‘children’) in the previous two weeks, with an acute illness module similar to standard survey studies (DHS Surveys, 2009).

2.2 Geo-coded conflict event data

We also use detailed geo-coded data on conflict events (e.g. fighting) between the central government and rebel groups in northern Uganda, based on ACLED (Armed Conflict Location and Events Dataset) and provided by the Peace Research Institute Oslo (PRIO), Norway (Raleigh and Hegre, 2005). This dataset provides specific information on 1276 individual battle events and rebel activity in Uganda from 1962 through 2006 by location (in geographic coordinates) and by date. 546 of these events occurred in northern Uganda from 1987 till the ceasefire in 2006. We use this dataset to construct a conflict intensity index for any geographic location and year in northern Uganda. For example, events happening 0/15/30/50km away are weighted using the factors 1/0.63/0.16/0.006, respectively. Yearly indices are smoothed by adding one index value each from the previous and the subsequent year, each multiplied by 0.37. (Full details available in an online appendix).

2.3 Statistical methods

We first use descriptive statistics to compare the survey mean of two population sub-groups of children: current versus former IDP camp residents. However, these two groups are not comparable in that they differ in characteristics such as access to safe sources of water. To make a valid comparison, we need to overcome selection bias and endogeneity. The selection bias results from observable and unobservable differences that operate on both IDP camp status and health outcomes. For example, a child’s health status and need to access health services may be an important driver of the relocation decision of a household. This creates an endogeneity between location (IDP camp vs. return areas) and health status and hence the need to model jointly IDP camp status and health status. Empirically, we use a subset of our conflict intensity indices to explain (i.e. to instrument) for current location and then estimate the effects of IDP camp status (and exogenous covariates, including further conflict intensity indices) on the health status of children. The inclusion of the conflict intensity index helps, first, to control for the direct effect of conflict exposure on child health and, second, to control for an exogenous driver of IDP camp residence (not related to unobservable individual characteristics). We use conflict intensity at the place of birth of the head of household as an instrument, since it should only affect child morbidity through its effect on IDP camp status conditional on district fixed effects and exposure of the household to conflict in 2002 and 2006 (created using a retrospective migration history of the household combined with geocoded conflict event data).

We implement three multivariate statistical models which account to varying degrees for selection bias and endogeneity. Specifically, Model 1 shows a naïve probit model controlling neither for the selection bias nor for endogeneity. Model 2 is a probit model that attempts to control for the selection bias by including the conflict event histories. Model 3 (our preferred model) includes a 'first stage' equation, where IDP camp status is modelled and controlled for, and the conflict event exposure of the household to control for selection bias and endogeneity. Since IDP camp status and child morbidity are each dichotomous variables, we use a bivariate probit (Maddala 1983, Wilde 2000). In all models we also control for additional drivers of outcomes (e.g. access to health facilities, to markets, number of years that the head of the household lived in an IDP camp, etc) and for factors that may influence recall bias (Manesh et al. 2008).

3. Results

3.1 Descriptive statistics

To understand the effects of IDP camp residency on the health status of children we first analyse unconditional household survey data from Northern Uganda in mid-2007. We group the data to illustrate the mean morbidity rates of children in IDP camps and in returnee locations (Figure 1). Some households divided their time and activities between IDP camps and their homestead (that is 'commuted'). We grouped these households with IDP camp residents as they shared the services offered by the camps. There are 4795 children in our sample, of which 3527 are either living in an IDP camp (3205 cases) or commuting to it (322 cases), and 1268 live in households who have moved away from the camps.

The households of IDP camp residents and their children exhibit different characteristics concerning their sanitation access and conflict histories compared to returnee households.12 Our initial results suggest that IDP camp residents have better access to safe sources of water. Furthermore, the typical head of household in IDP camps has been exposed to significantly higher levels of conflict in 2006. In addition, their place of birth (an indicator of alternative residence opportunity) has also experienced substantially higher levels of conflict intensity during 2006. Nevertheless, using this descriptive statistics approach and looking just at the main sub-group morbidity rates (symptoms of fever/malaria/diarrhoea/cough/TB in the previous 2 weeks), children living in IDP camps do not appear to differ significantly from returnee children (with 18.5 % and 18.1 % morbidity rates, respectively).

3.2 Multivariate statistics

This finding raises the question of whether IDP camp residency does after all have any impact on the health status of children. To answer this question correctly requires a multivariate statistical approach controlling for selection bias and endogeneity. We therefore calculate three regression models to estimate the impact of IDP camp status on child morbidity (Table 1). Model 3 (our preferred model) controls for both selection bias and endogeneity. Models 2 and 2, being more naïve models, do not but are included as controls. For comparability and simplicity, we report only the results for the second stage for Model 3, we display incremental effects rather than regression coefficients, and we report only the incremental effect of being an IDP camp resident and having access to safe water (full results for all three models and for both stages of model 3 are available in an online appendix).

We demonstrate in Model 3 that IDP camp status has as a significant negative effect on child health with an incremental effect of 0.163 units representing an almost doubling of the morbidity rate. Furthermore, Model 3 indicates that IDP camp status doubles the reduction in morbidity associated with access to safe water. The significance of the test of exogeneity clearly indicates that ignoring the endogeneity of IDP camp status (controlled for with our approach in Model 3) would lead to incorrect inference, biasing the estimate of camp residence on child health. Not surprisingly, the impact of camp residency is not significant in either Model 1 or 2. All three key components of morbidity (fever/malaria, diarrhoea and cough) contribute significantly to the negative health effect of IDP camp residency (shown in appendix).

4. Discussion

4.1 Discussion of data

Our use of the data entails three interesting features. The study site is unique in that the conflict in northern Uganda resulted in one of the largest relative population displacements induced by war in recent years (WHO 2005), only surpassed by recent figures from Sudan and Colombia (Jennings et al. 2008). Hence there was no element of choice in becoming displaced, unlike the decision to return, which is voluntary. The survey is unique in that it was collected about ten months after the end of the conflict, a period of massive displacement of individuals from camps to their place of origin (UN OCHA, 2007). The combination of household survey data and geo-coded conflict event data to overcome the selection bias is novel and a role model for future studies of the effects of conflict.

4.2 Discussion of descriptive statistics

The apparent similarity of the health status of children in the camps and in the returnee locations may be the result of different mechanisms that cannot be identified by comparing mean morbidity incidence across groups. This justifies the need to adopt multivariate techniques to isolate the pure effect of being an IDP camp resident on child health.

4.3 Discussion of key regression result

Our preferred specification (Model 3) explains why morbidity incidence is similar in IDP camp and in returnee populations, even when IDP camps seem better provided in terms of access to water. We are able to isolate the negative and significant 'IDP camp effect' for children's morbidity of Model 3 by first explaining the location of households and then modelling the drivers of children's morbidity. Although this is speculative, overcrowding in the camps (and within the shelter provided) and inferior cooking fuels or stoves may explain this finding. These results would not obtain with standard multivariate analysis ignoring the twin challenge of selection bias and endogeneity (as in Model 1) or with an analysis only accounting for the conflict event history of households but not simultaneously explaining the household location (Model 2). Hence the combination of calculating a conflict intensity index from geo-coded conflict event data and using it to model household location in a first step helps to reveal the true negative effect of IDP camp residency on children's morbidity in the second step. Our control models indicate that not controlling for these issues, which is hard to achieve in the context of conflict and displacement, significantly biases the findings.

4.4 Implications

The first year of the post-conflict period is a very fluid and little understood period of human development. Our results demonstrate the need for very detailed data and careful analysis as otherwise misunderstandings about the patterns of behaviour and health outcomes may create unbalanced aid interventions. In particular, we find that sanitary conditions in returnee locations (here captured by poor access to safe sources of water) indicate that the hardships posed by conflict-induced displacement may not end with the end of confrontations or indeed IDP camp decongestion. Comparisons of morbidity outcomes in conflict-affected children are relevant to establish priorities in the provision of adequate healthcare during the decongestion process, by adequately balancing resources between IDP camps and returnee locations (Salama et al. 2004, UNICEF 2009). Misalignments in the provision of resources between these two populations may set the stage for a difficult transition to peace or indeed the return of violence.

5. References

Checchi, F. (2006). Humanitarian interventions in Northern Uganda: based on what evidence? *Humanitarian Exchange Magazine*, 36. http://www.odihpn.org/report.asp?id=2856 (accessed August 7, 2009).

Connolly, M., Gayer, M., Ryan, M., Salama, P., Spiegel, P., & Heymann, D. (2004). Communicable diseases in complex emergencies: impact and challenges. *Lancet*, 364, 1974–1983.

Depoortere, E., Checchi, F., Broillet, F., Gerstl, S., Minetti, A., Gayraud, O., *et al*. (2004). Violence and mortality in West Darfur, Sudan (2003–04): epidemiological evidence from four surveys. *Lancet***,** 364, 1315–1320.

DHS Surveys. Macro International. Demographic and Health Surveys, Overview. http://www.measuredhs.com/aboutsurveys/dhs/start.cfm (accessed August 7, 2009).

Fafo Institute for Applied International Studies. Methods and sampling in Northern Uganda Livelihood Survey: draft document. Fafo AIS, unpublished.

Guha-Sapir, D. & van Panhuis, W. (2002). Armed conflict and public health: a report on knowledge and knowledge gaps. Brussels: Center for Research on the Epidemiology of Disasters.

Guha-Sapir, D. & van Panhuis, W. (2003). The importance of conflict-related mortality in civilian populations. *Lancet***,** 361, 2126–2128.

Jennings, E., Birkenes, A., Eschenbacher, J.H., Foaleng, M., & Khalil, K. (2008). Internal displacement: global overview of trends and developments in 2007. Geneva: Norwegian Refugee Council, Internal Displacement Monitoring Centre.

Maddala, G. (1983). Limited dependent and qualitative variables in econometrics. Cambridge: Cambridge University Press.

Manesh, A., Sheldon, T., Pickett, K., & Carr-Hill, R. (2008). Accuracy of child morbidity data in demographic health surveys. *Int J Epidemiol*, 37, 194–200.

Raleigh, C. & Hegre, H. (2005) Introducing ACLED: An armed conflict location and event dataset. http://www.prio.no/sptrans/2050901786/UCSD_paper_final.pdf (accessed August 2, 2009).

Salama, P., Spiegel, P., & Brennan, R. (2001). No less vulnerable: the internally displaced in humanitarian emergencies. *Lancet*, 357, 1430–1431.

Salama, P., Spiegel, P., Talley, L., & Waldman, R. (2004). Lessons learned from complex emergencies over past decade. *Lancet*, 364, 1801–1813.

Spiegel, P., Sheik, M., Gothway-Crawford, C., Salama, P. (2002). Health programmes and policies associated with decreased mortality in displaced people in postemergency phase camps: a retrospective study. *Lancet*, 360, 1927–1934

Toole, M. & Waldman, R. (1997). The public health aspects of complex emergencies and refugee situations. *Annual Review of Public Health*, 18, 283–312.

UNICEF (2009). Uganda in 2008. In: UNICEF. Humanitarian Action Report 2009. http://www.unicef.org/har08/files/har08_Uganda_countrychapter.pdf (accessed August 4, 2009).

United Nations Development Programme, Office of the Prime Minister of Uganda (2008) Returning to uncertainty? Addressing vulnerabilities in Northern Uganda. Kampala: UNDP, Uganda.

United Nations Office for the Coordination of Humanitarian Affairs. (2007). Consolidated appeal for Uganda 2007: mid-year review. http://ochaonline.un.org/humanitarianappeal/webpage.asp?Page=1583 (accessed August 1, 2009).

Van Acker, F. (2004). Uganda and the Lord's Resistance Army: the new order no one ordered. *African Affairs*, 103, 335–357.

WHO, The Republic of Uganda Ministry Of Health (2005) Health and mortality survey among internally displaced persons in Gulu, Kitgum, and Pader districts, northern Uganda. http://www.who.int/hac/crises/uga/sitreps/Ugandamortsurvey.pdf (accessed August 7, 2009).

Wilde J (2000) Identification of multiple equation probit models with endogenous dummy regressors. *Economics Letters*, 69, 309–312.

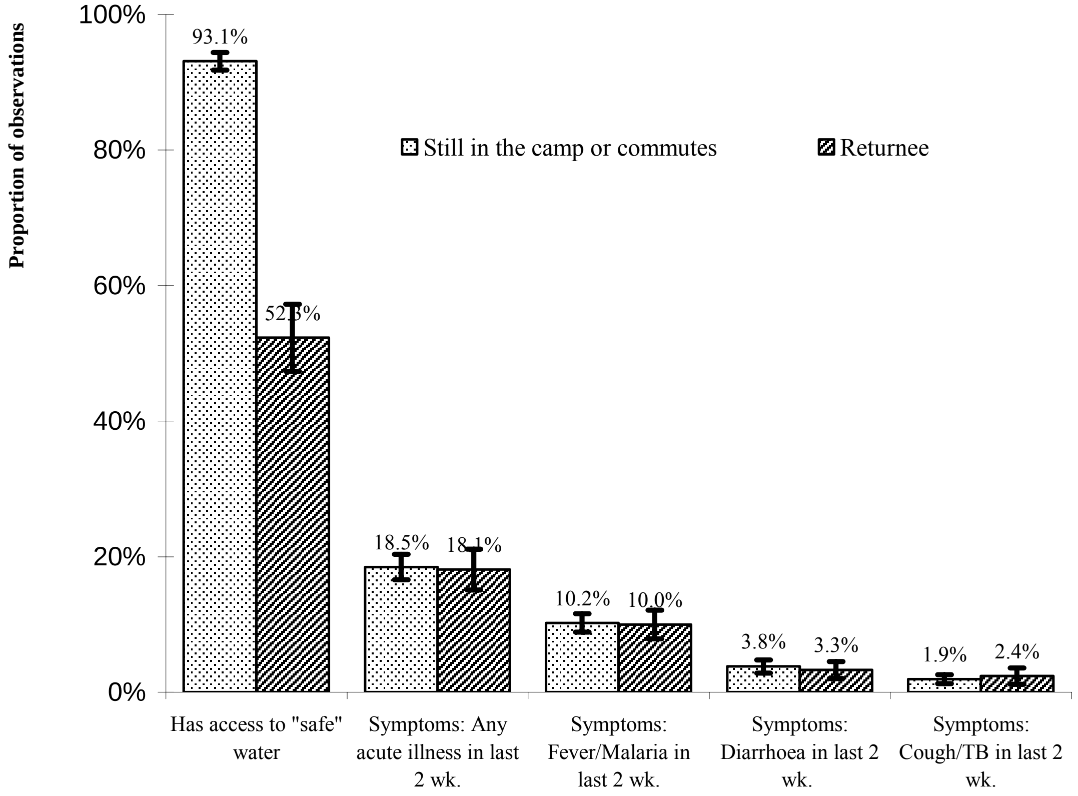
Tables and Figures

Table 1: Determinants of Morbidity in Children under the Age of 5.

	Model 1	**Model 2**	**Model 3 (preferred model)**
Effect of access to safe water	-0.148* (0.085)	-0.147* (0.085)	-0.079* (0.040)
IDP camp effect	0.374 (0.026)	0.0519 (0.027)	0.163* (0.022)
Controls for endogeneity of IDP camp residence?	NO	NO	YES
Controls for conflict intensity?	NO	YES	YES
Controls for household and camp characteristics?	YES	YES	YES
Test of exogeneity of IDP camp residence $\chi^2(1)$, (p-val)	-	-	12.473 (p<0.001)
Observations	2 905	2 905	2 905

Note: Coefficients report the change in the probability that the child had access to safe water (access vs. no access) and was ill in the last two weeks explained by IDP camp status (being in camp/commuting vs. returnee). Household characteristics: number of household members, dependency ratio, child mother's living status, number of assets, and indicators that the head of household currently or previously participated in herding or petty trade activities. Camp characteristics: distance to nearest market, distance to water source, and an indicator of access to safe water. Other indicators (e.g. health and school facilities were tried but found to be not statistically significant). Child's age indicators, district fixed effects, and an indicator that the household resided in Lira/Oyam districts in 2006 were also included in all specifications. Conflict intensity variables: conflict intensity index at place of residence of head of household in 2006 and in 2002 (see online appendix).
In Model 3, IDP camp status (equation not shown in the table) is explained by the mother's living status, household head characteristics (age and gender), the household dependency ratio, district fixed effects, indicators that the head of household currently or previously participated in herding or petty trade activities, conflict intensity variables described above, and conflict intensity in 2006 at the place of birth of the head of household (as an instrument).Standard errors in parentheses.
* indicates that the coefficient is significant at 10% level or lower. Source: Authors' calculations based on Northern Uganda Livelihood Study 2007 (UBos/Fafo).

Figure 1: Selected characteristics for the cohort of children under the age of 5, by type of residence.



Note: Proportion of children having access to safe water (tap water or water from a protected well or borehole) or presenting morbidity symptoms (reported by household member), using sampling weights and showing 95 % confidence intervals.
Source: Authors' calculations based on Northern Uganda Livelihood Study 2007 (UBos/Fafo).

Supplementary material

Calculation of conflict intensity index

To be specific, let conflict events be labelled by subscript i, and denote the coordinate of the event defined by the two-dimensional vector ci (latitude and longitude in degrees). Let the location of interest, for which we desire to construct a synthetic conflict intensity index be "l" (again, a two-dimensional vector with geographic coordinates). In principle, if we confine in all events occurring in a given year, the conflict intensity for location "l" is defined as

$$C(l)=\sum_i g(d(c_i,l))$$

where d represents the distance between two points (the specific "event" and the location of the household at some pre-specified point in time) and g(.) is a decreasing function that "discounts" events by their distance from the location point of reference (the household). In this simple formulation, any event occurring in a given year could add to the intensity of the conflict in a specific location. Function g(.) weights events depending on their distance to the individual or household. We have defined g(x)= exp(-αx) and $d(c_i,l)=\|c_i - l\|$, with α= 25. The specific selection of the discount rate α was done by evaluating different values and choosing that which had the best fit in the models. In a nutshell, the "intensity of conflict" associated with a given location combines all conflict events, each of them discounted by the distance from the location of interest to the place where each event took place.

We have also counted events occurring in the year prior and to the reference year in which the intensity-location pair is measured, but discounting these adjacent year observations by a factor of exp(-1)=0.37.

To illustrate the outcomes of this procedure, Figure A1 shows fluctuations in the conflict intensities -as defined above- by location and time. Kampala, the capital city, located in the Central region is taken as a reference, along with three cities in the Northern region. The capital city has been relatively free from conflictive events since the mid eighties, whereas in the North, conflict between rebel groups and the government has been present in during the last decade, peaking in 2004 to decrease afterwards.

Description of Model 3

Model 3 jointly models IDP status and morbidity in children. Using our information on conflict intensity experienced by the households, we are able to distinguish whether health outcomes in children are explained by household and camp characteristics or to factors related to the geographic spread of the conflict. As suggested before, the location of the children (living in an IDP camp or not) may depend on unobservable characteristics (e.g. underlying health status) of these children and their households. Parents may stay in or around an IDP camp to have access to health facilities and thus children with poorer underlying health conditions may remain in the camps. In order to account for this potential endogeneity between location and health status, we will use geographical variables to instrument for location and then focus on the structural equation of interest, linking IDP residence status–plus covariates–to health outcomes of children. Since both IDP status and health outcomes of interest (morbidity) are dichotomous, we use a bivariate probit model where IDP status and health outcome are jointly modelled. We postulate a recursive model along the lines of Maddala,[1] (1983), with a reduced form for a potentially endogenous dichotomous variable y_{1i}^* (in our case IDP residence status of the child) and the structural equation of interest for variable y_{2i}^* (in our case child health status, the morbidity indicator). These two variables are linked through the system:

$$
\begin{aligned}
y_{1i}^* &= \beta' X_{1i} + u_{1i} \\
y_{2i}^* &= \gamma y_{1i} + \delta' X_{2i} + u_{21}
\end{aligned}
$$

and the usual relation between the dichotomous variable and its latent analogous, that is:

$$
\begin{cases} y_{ki} = 1 \Leftrightarrow y_{ki}^* > 0 \\ y_{ki} = 1 \Leftrightarrow y_{ki}^* \leq 0 \end{cases} ;\ \text{k=1,2.}
$$

Error terms are assumed to have the following distribution:

$$
\begin{pmatrix} u_{1i} \\ u_{2i} \end{pmatrix} \sim iidN\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right).
$$

Parameters are estimated via the method of Maximum Likelihood. More on identification requirements can be found in Wilde (2000).

In our simultaneous model, IDP status of the child is modelled on information from the head of household the child is living in. The head of household is, more likely, the person who would have more influence in relocating away from the camp, having an impact on the location of the child IDP status itself. Table A3 shows the bivariate probit estimates, first providing estimates of the structural equation linking IDP status and morbidity of the child and then the “first stage” equation where IDP status is modelled and controlled for.

Figure A1: Conflict intensity index for selected locations

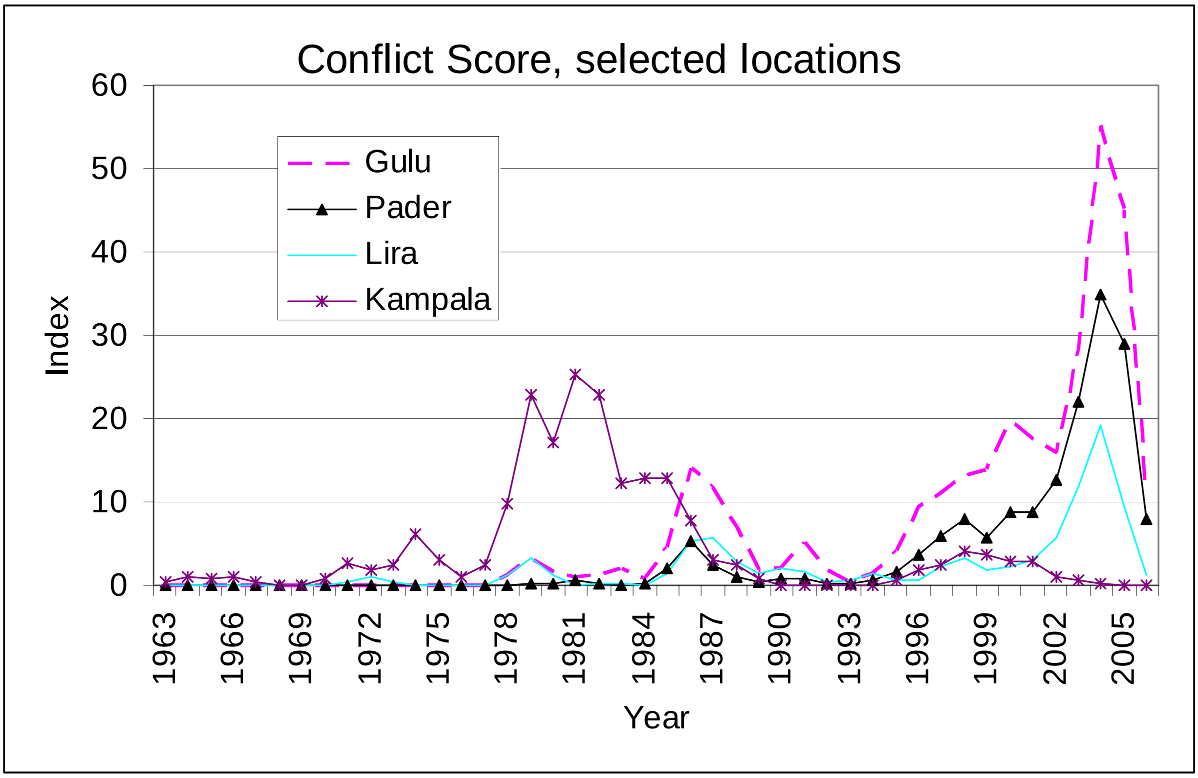


Table A1: Additional indicators for the cohort of children under age 5, by type of residence.

	Moved away from Camp	Still in the Camp or Commutes	p-value of Ho: Difference=0
Indicator: Father known to be alive	88·5%	84·7%	0·026
Indicator: Mother known to be alive	95·2%	91·9%	0·005
Age of Child (yr)	2·69	2·72	0·673
Indicator: Access to safe water	52·70%	92·70%	0
Indicator: Mother known to be widow	6·10%	5·00%	0·427
Indicator: Female headed household	15·80%	17·90%	0·404
Indicator: Number of assets in the household (HH)	5·94	5·53	0·038
Indicator: HH receives food	65·20%	81·30%	0
Indicator: HH receives seeds	51·30%	66·70%	0
Age of head of HH (yrs.)	38·50%	38·30%	0·754
Dependency ratio	1·79	1·82	0·716
Intensity of violence, location of head of household in 2006	5·77	12·89	0
Intensity of violence, birthplace of HH in 2006	4·93	7.7	0

Notes: Assets include radio/cassette player, bicycle, motorbike, bed, tables, blankets, mattress, cupboard, sewing machine, cell phone, panga/machete, hoe, plough, rifles, slingshot, jerry, can, torch/flashlight.

Table A2: Determinants of morbidity by main components.

	Fever/Malaria	Diarrhoea	Cough
IDP camp effect	**0·0840***	**0·0291***	**0·0065***
	(0·0192)	**(0·008)**	**(0·0026)**
Test of IDP camp residence exogeneity $\chi^2(1)$ and p-val.	**11·514 (p<0·001)**	**4·84 (p=0·028)**	**3·44 (p=0·064)**
Observations	**2905**	**2905**	**2905**

Notes: Change in the probability that the child was ill in last two weeks explained by IDP camp status by different types of morbidity.
Same controls as Model 3 in Table 1 in the paper. Standard errors in parentheses.
* indicates that the coefficient is significant at 10% level or lower.

Table A3: Determinants of acute morbidity in children under the age of 5 (bivariate probit estimates).

Second Stage Equation | Determinants of acute morbidity

	Indicator: Any illness in last 2 weeks	Indicator: Fever/Malaria last 2 wk.	Indicator: Diarrhea last 2 wk.	Indicator: Cough/TB last 2 wk.
Ind: IDP resident or commutes to IDP	1.568	1.325	1.363	1.656
	[0.213]***	[0.302]***	[0.382]***	[0.652]**
Ind: Access to safe water (tap or protected well)	-0.454	-0.644	0.018	-0.002
	[0.229]**	[0.303]**	[0.349]	[0.334]
Log Distance to Safe Water Source	0.037	-0.034	0.186	-0.028
	[0.041]	[0.047]	[0.068]***	[0.050]
Log distance to market (km)	-0.015	0.013	-0.08	0.01
	[0.039]	[0.039]	[0.054]	[0.056]
Unknown distance to Closest Market	0.097	-0.078	0.442	-0.207
	[0.246]	[0.239]	[0.424]	[0.343]
Unknown Distance to Safe Water Source	-0.454	-0.613	-0.065	0.178
	[0.235]*	[0.322]*	[0.472]	[0.288]
Number of Assets	0.072	0.038	0.067	0.248
	[0.041]*	[0.044]	[0.063]	[0.084]***
Number of Assets Squared	-0.005	-0.002	-0.004	-0.022
	[0.003]	[0.003]	[0.005]	[0.008]***
Indic: Mother Alive	0.093	0.097	-0.003	0.228
	[0.162]	[0.172]	[0.247]	[0.331]
Indic: Mother Life Status Unk	-0.075	-0.555	0.3	0.388
	[0.338]	[0.367]	[0.428]	[0.503]
Indic: Head of Household (HH) ever had Animals	-0.074	-0.06	-0.095	0.162
	[0.061]	[0.087]	[0.094]	[0.145]
Indic: Head of HH ever involved on Petty Trade	0.007	-0.077	0.241	0.059
	[0.082]	[0.085]	[0.141]*	[0.144]
Indic: Age 1	0.297	0.266	0.388	-0.105
	[0.112]***	[0.122]**	[0.145]***	[0.226]
Indic: Age 2	0.187	0.222	0.194	0.06
	[0.113]*	[0.134]*	[0.126]	[0.224]

Indic: Age 3	-0.001	-0.036	0.014	-0.006
	[0.073]	[0.098]	[0.160]	[0.232]
Indic: Age 4	-0.047	-0.153	0.005	0.222
	[0.084]	[0.103]	[0.170]	[0.226]
Female	-0.196	-0.092	-0.211	-0.411
	[0.067]***	[0.075]	[0.096]**	[0.113]***
Access to market	0.235	0.257	-0.224	0.512
	[0.190]	[0.233]	[0.356]	[0.316]
HH Size Squared	0.002	0.002	-0.011	0.006
	[0.003]	[0.003]	[0.010]	[0.003]*
HH Size	-0.077	-0.067	0.121	-0.121
	[0.055]	[0.056]	[0.152]	[0.081]
Dependency ratio	-0.074	-0.073	-0.064	-0.104
	[0.043]*	[0.045]	[0.058]	[0.065]
Age HH Squared	0	0	-0.001	0
	[0.000]	[0.000]	[0.000]**	[0.000]
Age HH Squared	0.017	-0.012	0.075	0.01
	[0.023]	[0.025]	[0.034]**	[0.033]
Indic: Female Head of HH	0.041	0.131	-0.283	0.292
	[0.098]	[0.103]	[0.178]	[0.205]
Ind: Water source unknown	0.388	-0.404	1.001	-4.624
	[0.283]	[0.359]	[0.328]***	[0.335]***
Conflict Intensity Index at place of residence in 2006	-0.027	-0.061	0.109	-0.045
	[0.037]	[0.047]	[0.053]**	[0.075]
Conflict Intensity Index at place of residence in 2002	-0.127	-0.117	-0.153	0.037
	[0.043]***	[0.048]**	[0.065]**	[0.099]
Distance of Head of HH in 2006 to place of Birth	-0.302	-0.263	0.269	-1.563
	[0.254]	[0.267]	[0.294]	[0.760]**
Distance of Head of HH in 2006 to place of Birth Unk.	0.667	0.531	0.459	0.766
	[0.141]***	[0.164]***	[0.207]**	[0.123]***
Constant	-0.895	-0.298	-3.985	-3.419
	[0.674]	[0.775]	[0.950]***	[0.889]***
Observations	2908	2905	2905	2905

First Stage Equation | Determinants of IDP status (Still linked to IDP camp or not)

Indic: Mother Alive	-0.077	-0.049	-0.019	-0.027
	[0.230]	[0.233]	[0.233]	[0.236]
Indic: Mother Life Status Unk	0.972	1.075	1.038	0.996
	[0.495]**	[0.586]*	[0.496]**	[0.482]**
Indic: Head of HH ever had Animals	-0.053	-0.063	-0.057	-0.053
	[0.104]	[0.101]	[0.108]	[0.107]
Indic: Head of HH ever involved on Petty Trade	-0.045	-0.037	-0.042	-0.037
	[0.105]	[0.109]	[0.114]	[0.116]
HH Size	-0.041	-0.039	-0.037	-0.035
	[0.025]	[0.027]	[0.028]	[0.028]
Dependency ratio	0.093	0.101	0.103	0.1
	[0.060]	[0.062]	[0.060]*	[0.060]*
Age Head of HH Sq	0	0	0	0
	[0.000]	[0.000]	[0.000]	[0.000]
Age Head of HH	0	0.002	-0.009	-0.007
	[0.031]	[0.031]	[0.029]	[0.029]
Indic: Female Head of HH	-0.003	0.008	0.028	0.027
	[0.126]	[0.122]	[0.130]	[0.135]
Conflict Intensity Index at place of residence in 2006	-0.274	-0.275	-0.249	-0.262
	[0.089]***	[0.092]***	[0.105]**	[0.097]***
Conflict Intensity Index at place of residence in 2002	0.253	0.262	0.252	0.253
	[0.061]***	[0.062]***	[0.064]***	[0.063]***
Distance of Head of HH in 2006 to place of Birth	0.712	0.704	0.714	0.672
	[0.645]	[0.688]	[0.703]	[0.702]
Distance of Head of HH in 2006 to place of Birth Unk.	-1.349	-1.352	-1.346	-1.357
	[0.104]***	[0.108]***	[0.108]***	[0.110]***
Conflict Intensity Index at place of birth in 2006 (Instrument)	0.238	0.231	0.213	0.23
	[0.080]***	[0.088]***	[0.083]***	[0.075]***
Constant	1.231	1.096	1.317	1.228
	[0.678]*	[0.683]	[0.659]**	[0.658]*

Notes: District fixed effects estimates not shown
Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Reference

1 Maddala G. Limited dependent and qualitative variables in econometrics. Cambridge: Cambridge University Press, 1983