

Background



- DRC has for several years sought to better develop our competencies around evidence, data and IM to become an even stronger advocate on behalf of the displaced and to deliver even better results. In 2018 we entered into a pro-bono partnership with IBM to explore the use of [predictive analytics](#). Received a 3-year grant from the Danish Ministry of Foreign Affairs to help us scale-up capacities. Currently funded through grants from ECHO and Danish Ministry of Foreign Affairs
- Ambition to enhance DRC's ability to manage and analyze increasing amounts of (big) data and gain experience with new, statistical approaches such as machine learning
- Objective is to develop tools that can enhance our understanding of the focus areas of our work, and **provide us and the wider humanitarian sector provide with accurate forecasts and scenarios for strategic planning, operational response and programming in support of better prevention, anticipatory action and protection to displacement affected populations**

Anticipatory Humanitarian Action for Displacement



- The [Anticipatory Humanitarian Action for Displacement](#) (AHEAD) model emerged out of a project in the Sahel region to develop a **forecasting model to predict displacement at the sub-national level** (admin 1 and admin 2 level).
- The model should complement the [Foresight model](#), which was developed to support overall annual strategic planning, with a more operational model to inform direct on-the-ground planning and response.
- The model was developed to initially to focus on the Liptako-Gourma triangle i.e. **Burkina Faso, Mali and Niger**. It has since been expanded to **DR Congo, Ethiopia, South Sudan and Sudan** as well. The model forecasts the number of displaced people at the admin 1 and admin 2 level 3-4 months into the future.

Methodology



- Since the data on displacement at subnational level is often sparse and sporadic with no reliable frequency of publication the standard methods for working with regular-spaced time series are not feasible. To forecast displacement at a sub-yearly frequency the model is constructed to work with the outcome data being available at irregular intervals. **The basis of the model is Bayesian state-space model for the stock number of internally displaced people** D at time t in area s , where the time steps are monthly, and the areas are the relevant administrative levels of the country: $D_{-}(s,t)=D_{-}(s,t-1)+\beta x_t+\varepsilon_t$
- The evolution of the state is determined by a number of external covariates x_t that describe the conditions in the area s and the neighbouring areas at time t with the assumption being that most internal displacement is within the same area or between neighbouring areas.
- We assume that the functional relationship between the covariates and the outcome variable of displacement is constant in time and space, which allows us to infer this relationship fitting the model to historical data. The model structure treats the months with missing displacement data as additional parameters to be inferred and this allows us to work with datasets on displacement that contain gaps and missing information.

AHEAD Model

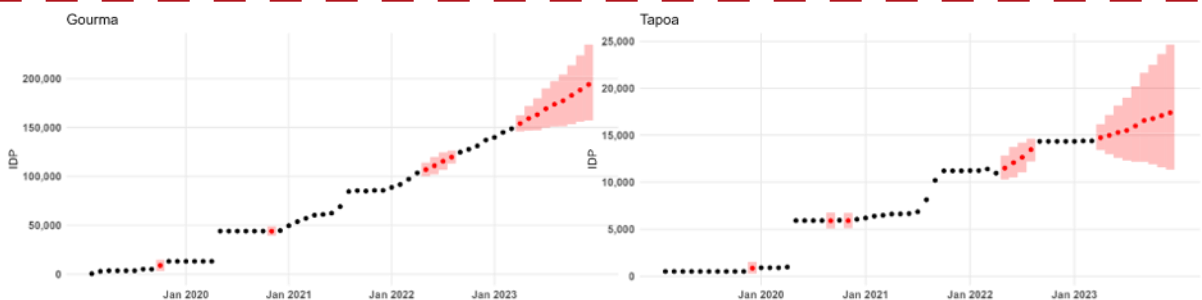
DRC

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Data and Sources

Indicators	Theme	Source
Violent events, kidnappings/lootings, attacks from extremist groups, deaths from violence against civilians	Conflict	ACLED
Share of people in classification 3+	Food security	Cadre Harmonisé / FEWS Net
Food prices	Food security	WFP
Vegetation Health Index	Climate	FAO
Mortality rate among small children	Development	WHO
Feelings of safety / protection incidents	Protection	Protection monitoring (e.g. Project21)

Outputs and Results



- Based on 315 historical forecasts in Burkina Faso, the **model has shown that the mean absolute %-error is 15%**. For other countries the average error is between 10-27%. The hindcasts are constructed by setting a past now at a historical date, training the model on all historical data and attempting to forecast displacement 4 months into the “future”, where we have historical records to compare to.
- We benchmark the model against two simple approaches: The first is forecasting a constant level of displacement with no change and the second model is forecasting that displacement in each province will evolve with a rate of displacement per month as it has in the previous 24 months. Both approaches have shown a higher mean absolute %-error
- As evaluation results show, the model generally performs well and outperforms other approaches. That being said the model is still limited in its ability to forecast new displacement crises and unprecedented changes in displacement

Use Cases

- Early warning and anticipatory action:** We are currently piloting the model for early warning and anticipatory action in a number of countries. Combining the model forecasts with community level indicators to trigger actions that can mitigate the impact of conflict-induced displacement or try to prevent the conflict and displacement from happening in the first place. Early pilots have shown promising [results](#)
- Multi-hazard early warning system:** In Somalia, we are collaborating with IOM on a multi-hazard early warning system for disaster preparedness. The [system](#) includes projections and forecasts on displacements due to drought, floods and conflict to inform sector wide responses