

WORKSHOP
REPORT | PREDICTIVE
ANALYTICS IN
HUMANITARIAN
RESPONSE

11-12 APRIL 2019, THE HAGUE

THE CENTRE FOR
HUMANITARIAN DATA

centre for humdata



OCHA



1. INTRODUCTION

The United Nations Office for the Coordination of Humanitarian Affairs (OCHA)'s Centre for Humanitarian Data hosted a two-day workshop from 11-12 April 2019 in The Hague. The workshop brought together 30 people from 15 organizations to discuss the promise and challenges of using predictive analytics in humanitarian response. The agenda and participants list can be found in Annex A and B.

The objectives of the workshop included:

- Exchange information about predictive analytics initiatives in the humanitarian sector, including but not limited to models for famine risk, displacement, climate risk, and humanitarian financing;
- Identify gaps, opportunities, and challenges related to the application of predictive models in humanitarian crises;
- Consider ethical issues associated with the collection and use of humanitarian data for predictive analytics purposes;
- Explore how predictive models might be integrated into existing humanitarian decision-making processes;
- Explore maturity and collaboration models and areas where the Centre can help in terms of services like data curation, peer review and model hosting.

More details on the discussion and outputs of each session can be found within this report. Although not a conclusive list, the following are key takeaways from the workshop:

- There is a strong **willingness to collaborate** across organizations and with subject matter experts to help address current capacity gaps, and ensure models are well developed and used to support decision making and action.
- There is agreement that **models are tools, not solutions** and for a model to perform well, decision makers need to be involved from the beginning (and throughout) in order to frame the question(s) for the model to answer.
- Most of the models that were shared by organizations are in a pilot phase and still **need further validation and feedback** before they can be used to create a trusted signal for the sector to respond to. Until then, pilot model outputs should work alongside existing analysis and forecasts to determine what action is needed.
- There is a desire to **develop documentation and case studies** of pilot models for collective learning.
- There is particular interest in **establishing a peer review mechanism** to strengthen ethical deliberation and offer improved transparency and accountability in this area.
- The sharing of **model-ready data** between trusted partners can save many months spent on data cleaning.

2. SESSION OUTPUTS

At the start of the workshop, participants listened to a **video message** from Under-Secretary-General for Humanitarian Affairs Mark Lowcock on how he sees predictive analytics leading to a better, faster, and cheaper response to humanitarian crises, saving more lives and helping more people than we can at the moment.

“One of the biggest opportunities we have is to try to use data, and especially the tools of predictive analytics to get ahead, to be more anticipatory, to predict what is about to happen and to trigger the response earlier.”

During the opening session, we also spent time talking about the language of predictive analytics. Everyone was asked to share a word or phrase that they had heard in conversations or read in documents but didn't completely understand. Some of these words include: tuning of the hyperparameters, weakly supervised learning, elastic net, random forest, and correlation coefficient, among many others. The point was to help participants feel comfortable with asking questions about concepts or words that are not clear. It also exposed how technical language often obscures the point of predictive analytics which is to support decision makers in managing complexity and uncertainty.

Session 1: Existing and planned predictive analytics initiatives

Six organizations presented on their predictive analytics initiatives. After each presentation, participants engaged in a discussion on each of the models. Questions were asked about the data included in the models, model design, the validation or review process, and how model outputs are connected to policy, decision making and actions.

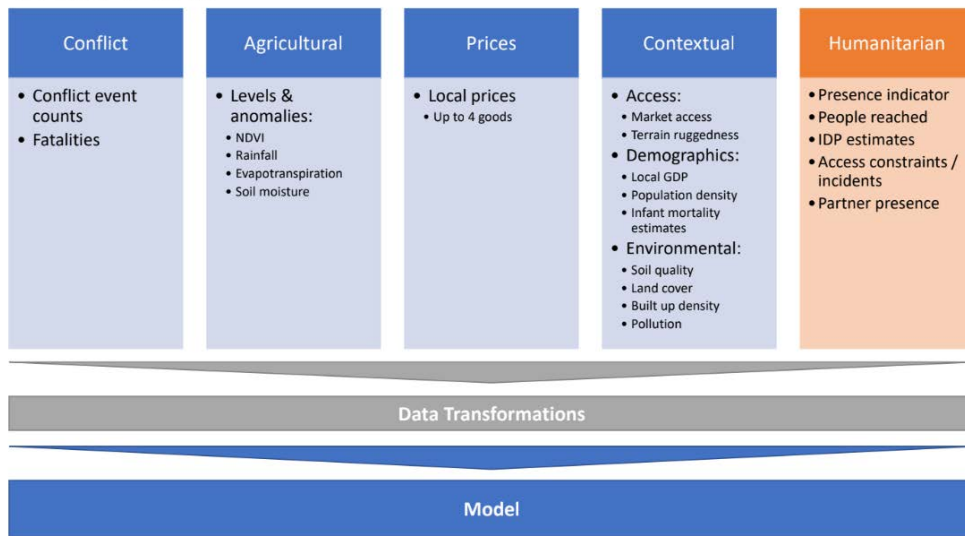
Rebeca Moreno Jimenez and Sofia Kyriazi from UNHCR Innovation shared preliminary results from Project Jetson, an effort to predict population movement from Somalia into south-eastern Ethiopia. The **presentation** focused on developing the ‘ingredients’ or variables to predict displacement and turning that into an ideal recipe which can be re-used and shared. We also heard the story of how the price of goats became a leading indicator for predicting cross-border population movement. UNHCR discovered this through ground-truth validation which included interviewing people leaving Somalia.



A slide from the presentation on Project Jetson by UNHCR.

Nadia Piffaretti and Bo Andree from the World Bank shared **an overview** and preliminary results from the Artemis pilots, which is based on a model that is used to predict famine risk. The model is being tested in five countries: Chad, Somalia, South Sudan, Mali, and Niger. This work is part of the World Bank's Famine Action Mechanism, an initiative that will launch in 2020.


Data Flow




A slide from the presentation on the Artemis pilots by the World Bank.

Manu Singh from the Centre for Humanitarian Data **presented** findings from a pilot model to predict the amount of funding needed from OCHA-managed pooled funds (CERF and country-based pooled funds) to de-escalate food insecurity in Somalia and South Sudan. The initial model was developed in 2018 for Somalia and has now been replicated for South Sudan. This type of model would only work in situations where there is a history of food insecurity and a humanitarian response to this.

Maarten van der Veen and Andrew Kruczkiewicz **presented** on the Red Cross Red Crescent's forecast-based financing. The mechanism enables access to funding for early action. The model is based on a set of forecasts and risks that trigger actions including the automatic allocation of funds. The mechanism was first tested in 2008 and is now used in more than 22 countries.






Evolution of FbF in the RCRC Movement



Volunteer in FbF activation 2016

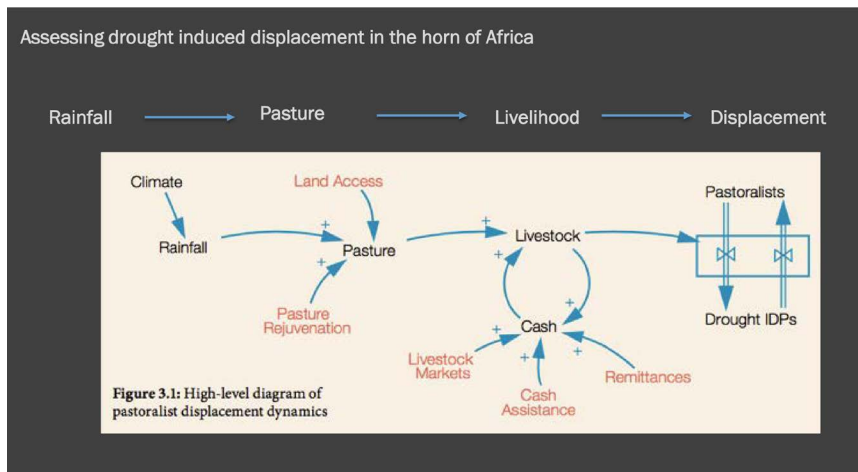
- 2019** - More than 22 National Societies implementing FbF
- 2018** - IFRC establish a funding mechanisms for Early Action - **FbA by DREF**
- 2016** - IFRC pledge to increase Forecast-based Financing during the **World Humanitarian Summit**
- 2015** - German Government develops an strategic action plan that supports FbF - new pilots start Peru, Bangladesh and mozambique - **First FbF Dialogue Platform**
- 2013** - First pilot projects start in Uganda and Togo
- 2008** - IFRC test the FbF concept in west africa, based on a seasonal forecast

A slide from the presentation on forecast-based financing from the RCRC.

Josiah Kaplan from Save the Children presented on their Migration and Displacement Initiative which was created in 2016 to respond to the increasing impact of displacement and migration crises on children. They have developed a prototype tool that predicts the duration and scale of conflict-related displacements with 75% accuracy. The tool has been piloted in multiple crises (e.g. Burundi, Ethiopia, South Sudan, Niger) with positive feedback.

Leonardo Milano from the Internal Displacement Monitoring Centre (IDMC) provided an overview of several initiatives, including a global disaster displacement risk model; an initiative to deploy web scraping and text mining for real-time data and analysis; and a series of decision support tools intended to model complex systems.



A slide from the presentation on displacement models from IDMC.

Session 2: Mapping predictive analytics gaps, challenges and opportunities

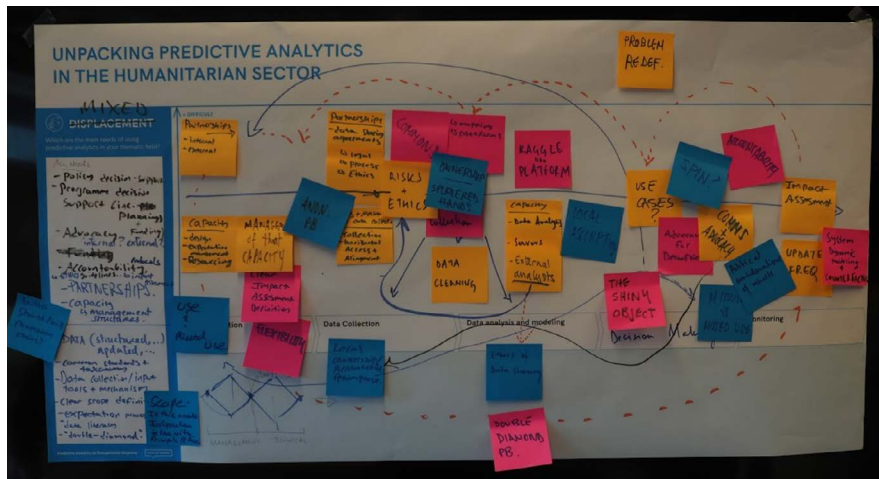
For this session, we planned to create groups for each thematic area so that colleagues working on food insecurity or displacement could work together to identify gaps, challenges and opportunities. Participants preferred to work in mixed groups. We therefore created four groups that each included people working on famine, displacement, financing and climate.

The groups first discussed the main needs. This ranged from the need to manage expectations and formulate simple and precise questions to the need to build capacity and encourage scientists to work in the humanitarian sector. One organization described the need for a ‘senior manager of expectation’ and another said we need to be able to communicate uncertainty to decision makers.

Below is a summary of the gap, challenges and opportunities identified by the four groups across the predictive analytics process. Bold font indicates something that was repeated more than once across the four groups.

Gaps and Challenges				
Scope definition	Data collection	Modelling	Decision making	Monitoring
<ul style="list-style-type: none"> • Expectation and resource management • Computer scientist not knowing humanitarian issues • Enabling end-user to formulate a question • Lack of shared language and conceptual frameworks (do we understand each other?) • Donor requirements vs end-user needs 	<ul style="list-style-type: none"> • Data sharing agreements • Missing data and not controlling data collection exercises • Data cleaning • Lack of historical data • Disconnect between field offices & HQ on data access • Open data (legal + machine readable) 	<ul style="list-style-type: none"> • Lack of capacity including people and technical infrastructure • Lack of peer review • Hard to create internal buy-in for using other orgs model • Risk of false positives and false negatives 	<ul style="list-style-type: none"> • Problem redefinition as model is developed • Common advocacy • Matching long term and short terms needs • Lack of trust • Lack of leadership • Risk appetite: space and willingness to experiment 	<ul style="list-style-type: none"> • Impact assessment • Unclear update frequency for the models • Short financing timeframes • A knowledge base/platform and dialogue • Validity control • Sustainable model implementation and ownership • Post-phenomenon inputs
Opportunities				
<ul style="list-style-type: none"> • Clear impact assessment definition 	<ul style="list-style-type: none"> • Common platforms and mapping • Automation and data collection 	<ul style="list-style-type: none"> • Kaggle-like platform • Use outliers to identify new trend exceptions 	<ul style="list-style-type: none"> • Humanitarian funding bridging to development funding 	<ul style="list-style-type: none"> • Systemic dynamic modeling + counterfactual • Scaling

The actual group worksheets looked more like the example below.



Session 3: Predictive analytics and ethics in humanitarian response

The session began with a **presentation** by Stuart Campo, the team lead for Data Policy at the Centre. The talk focused on different ethical frameworks (including virtue ethics, consequentialism, and deontology), specific approaches to humanitarian ethics, and the potential applications of these approaches in the use of advanced data science methods in humanitarian action.

The presentation drew heavily on Hugo Slim's *Humanitarian Ethics* and Jennifer Rubenstein's *Between Samaritans and States*, and was structured around three key aspects of humanitarian action: (a) the values that drive it, (b) the moral problems that arise in doing it, and (c) the ways in which humanitarian organizations and their staff can think through these problems to become more accountable for their decisions.

Participants were familiar with the principle-based nature of humanitarian action as this relates to ethical deliberation in the sector. Participants were able to identify the foundational humanitarian principles of humanity, impartiality, neutrality, and independence, as well as some of the core sources¹ of humanitarian principles and standards.

On the second point, participants were less clear on the specific nature and types of ethical problems that arise in humanitarian action. The discussion explored examples of persistent ethical dilemmas, such as the potential harmfulness of humanitarian action and difficulties in association (as identified by Hugo Slim), and ethical predicaments, such as the 'cost-effectiveness conundrum' (as identified by Jennifer Rubenstein).

The group then focused on ethical concerns in data science, including issues of fairness, validity, anonymity, privacy, ownership of data and insights, and issues common to human subjects research. The issue of 'ossification', or the tendency of algorithmic methods to learn and codify the current state of the world and thereby make it harder to change, seemed of particular concern to participants in relation to current use cases for predictive analytics in the humanitarian sector, e.g. are we building models that perpetuate and encode past mistakes?

Participants then worked in groups to identify ethical issues for each phase of the predictive analytics process building on the gap and opportunity analysis from the previous session. Some of the issues included biased training data, overselling, political considerations of results, and local ownership.

There was broad recognition amongst the participants that individual institutions and the sector more broadly lack the mechanisms and depth of expertise to effectively identify, deliberate on, and track the ethical decisions or choices that are being made across the predictive analytics project cycle (e.g. from design through to decision-making or action based on a model output).

¹ These include the Humanitarian Charter and Minimum Standards in Humanitarian Response, including the Sphere Core Standards and the Protection Principles, the Core Humanitarian Standard, and the Red Cross/NGO Code of Conduct.

Session 4+5: A maturity model for predictive analytics & creating an enabling environment

This session required participants to think about the future and where we want to be in six months, two years and ten years. Participants worked in groups to define the goals of predictive analytics in humanitarian response and then to identify the key milestones over time. After that, groups were asked to add key enablers and suggested actors to reach the milestones.

The goals for predictive analytics ranged from the high-level (improving decision making and creating an anticipatory culture) to the practical (creating a research agenda and a peer review process). Key enablers included inter-agency coordination, academic partnerships, capacity building initiatives, shared technical resources and a common workspace, and documentation and communication.

A summary of milestones from all groups are combined below; bold font indicates a milestone that was repeated more than once across the four groups.

Milestones		
6 months	2 years	10 years
<ul style="list-style-type: none"> • Know and leverage what is already available and integrate with existing programmes • Clarity on ambition, intention and need for predictive analytics • Develop academic partnerships • Develop network, identify champions and create a community of practice • Define process for model creation and use • Coordination and awareness of predictive analytic pilots • Agree shared research agenda • Dedicated and shared resources 	<ul style="list-style-type: none"> • Strong use of predictive analytics in organizations • Evidence of success and impact through documentation and case studies • Clear cost/benefit analysis of anticipatory action • Clear processes to exchange model information vertically (field to analyst) and horizontally (between organizations) • Trusted and robust peer review process -Joint Taskforce for predictive analytics 	<ul style="list-style-type: none"> • Include predictive analytics in organization performance indicators and individual performance evaluation • Anticipatory action through semi-automated triggers is normal operations • Proactive decision making • Redefine humanitarian response framework

Session 6: Collaboration on predictive analytics for humanitarian response

In the final session of the workshop, participants again worked in groups to consider what collaboration might look like for the Horn of Africa. The regional Food Security and Nutrition Working Group had just released a forecast of rainfall deficits that may lead to an increase in food insecurity which would peak from June to October 2019.

Based on an actual request from the Office of the Under-Secretary-General for Humanitarian Affairs, groups were asked what action should be taken based on the rainfall forecast. What analysis is available and what might be missing? How could the existing pilot models be leveraged? Does a new model need to be created? The groups considered data sources and needs, applicable models, key partners and roles, and potential model outputs and related actions for decision makers.

Given the very real scenario of increased food insecurity in the Horn, the discussion became more focused on how we could work together, what could be shared, and whether a new model should be developed that combined existing models (with specific reference to Somalia). Participants debated what was needed by decision makers to get them to act and why the existing forecasts were not enough. There was also a lack of clarity on what should be predicted, i.e. food insecurity as with the Artemis model, displacement as with the Jetson model, or a complex system model that shows the probability of the number of people in need of assistance across locations.

Participants closed the session by agreeing to established a task team that could take the discussion and work forward over the coming weeks. The task team would bring together interested organizations through a series of calls and a possible face-to-face meeting to work on existing and possibly new models for the Horn.

3. CLOSING AND NEXT STEPS

At the end of the two-day workshop, participants were asked to reflect on what stood out for them from the sessions and discussions. We discussed what roles the participating organizations could play and how we could extend the work beyond the workshop, including to organizations that were not present.

Several participants asked the Centre to convene additional meetings on predictive analytics in the coming year. Others suggested the creation of a roster of deployable predictive analytics experts who could work with UN Country Teams to build actionable models. One group of participants asked the Centre to ensure that predictive analytics data sources and case studies are shared and made available through a community of practice.

Other suggested roles for the Centre included:

- Build on the work of the Humanitarian Data Exchange to make model-ready data available for use and re-use
- Create a validation and peer review process as a service for organizations
- Create a community of practice and a neutral convening space
- Map out who is doing what where – a 3W for predictive analytics initiatives

As an immediate next step, the Centre agreed to create a task team/modeling group for the Horn with interested organizations. An initial call was held on 17 April to develop a scope of work.

One participant summed up the workshop by stating that ‘progress depends most crucially on our ability to collaborate and build institutional support for our work’. OCHA stands ready to support this effort and we look forward to making progress in the shift from responding to crises to anticipating them.

The workshop would not have been possible without the additional support of the municipality of The Hague. Very special thanks to Deputy Mayor Saskia Bruines, The Hague’s alderman for Education, Knowledge Economy and International Affairs, for making remarks to the group on 11 April. We also appreciate the great support of the facilitators from Oblo, Agata Brillì and Angeles Briones, who kept us focused and did an amazing job of turning everyone’s scribbles into something readable!

For additional information about the workshop or OCHA’s work on predictive analytics, please contact centrehumdata@un.org

ANNEX A | PREDICTIVE
AGENDA | ANALYTICS IN
HUMANITARIAN
RESPONSE

THE CENTRE FOR
HUMANITARIAN DATA



WORKSHOP ON PREDICTIVE ANALYTICS IN HUMANITARIAN RESPONSE AGENDA

Objective

1. Exchange information about predictive analytics initiatives in the humanitarian sector, including but not limited to models for famine, migration, climate risk, humanitarian financing, and other topics;
2. Identify gaps, opportunities, and challenges related to the application of predictive models in humanitarian crises;
3. Consider legal and ethical issues associated with the collection and use of humanitarian data for predictive analytics purposes;
4. Explore how predictive models might be integrated into existing humanitarian decision-making processes;
5. Explore maturity and collaboration models and areas where the Centre can help in terms of services like data curation, peer review and model hosting.

Agenda

Thursday, 11 April 2019

Time	Session and Description
09:15 - 09:30	Arrival at the Centre for Humanitarian Data Coffee and tea will be available.
09:30 - 10:00	Introductions and opening remarks <ul style="list-style-type: none"> • Mark Lowcock, Under-Secretary-General and Emergency Relief Coordinator, OCHA (via video message) • Sarah Telford, Lead, Centre for Humanitarian Data, OCHA
10:00 - 12:30	Share out of existing and planned predictive analytics initiatives Select organizations will present their existing and planned predictive analytics initiatives followed by a Q&A.
12:30 - 13:30	Lunch at the Hub (provided by the Centre) <ul style="list-style-type: none"> • Saskia Bruines, Deputy Mayor of the City of The Hague and Alderman for Education, Knowledge Economy and International Affairs
13:30 - 15:00	Mapping predictive analytics gaps and challenges Breakout groups will examine the needs, gaps, and challenges around predictive analytics in humanitarian response, including technical and non-technical issues.
15:00 - 15:30	Coffee break
15:30 - 16:30	Predictive analytics and ethics in humanitarian response What are the ethical risks associated with predictive analytics models in terms of bias, use of beneficiary data, modelling flaws, closed models, and other issues.
16:30 - 16:45	Day one wrap-up Breakout groups will present their key outcomes from the day, focusing on their most relevant challenges, opportunities, and ethical issues to keep in mind.
17:00 - 18:00	Crisis mitigation and predictive analytics: measuring famine risks An informal presentation on the World Bank's Famine Action Mechanism (FAM) open to all Hub members. Drinks and snacks will be available. <ul style="list-style-type: none"> • Nadia Piffaretti, Senior Economist - Financing Solutions, Strategy and Analytics, Fragility Conflict Violence and Forced Displacement, World Bank

Time	Session and Description
09:15 - 09:30	Arrival at the Centre for Humanitarian Data Coffee and tea will be available.
09:30 - 11:00	A maturity model for predictive analytics Breakout groups will define a vision for the use of predictive models in humanitarian response. What are our shared goals and milestones? What mechanisms need to be in place to get us there?
11:00 - 11:30	Coffee break
11:30 - 12:30	Creating an enabling policy environment How can predictive models be integrated into decision-making processes? What new policies need to be adopted to facilitate the use of these models to trigger action?
12:30 - 13:30	Lunch at the Hub (provided by the Centre)
13:30 - 15:00	Collaboration on predictive analytics for humanitarian response What are the areas for collaboration and what might be the role of each of our institutions? What role can and should the Centre play to support our partners?
15:00 - 15:30	Closing remarks and next steps

ANNEX B | PREDICTIVE
PARTICIPANT LIST | ANALYTICS IN
HUMANITARIAN
RESPONSE

THE CENTRE FOR
HUMANITARIAN DATA



WORKSHOP ON PREDICTIVE ANALYTICS IN HUMANITARIAN RESPONSE

PARTICIPANT LIST

Name	Title	Organization
Andrew Alspach	Chief, Information Management Branch	OCHA
Bo Pieter Johannes Andree	Lead AI Modeler, Fragility Conflict Violence and Forced Displacement	World Bank
Jeremy Boy	Data Visualization and Design Specialist	UN Global Pulse
Agata Brilli	Information Designer (workshop facilitator)	Oblo
Stuart Campo	Data Policy Team Lead, Centre for Humanitarian Data	OCHA
Juan Chaves-Gonzalez	Humanitarian Affairs Officer, Humanitarian Financing Strategy and Analysis Unit	OCHA
Kate Dodgson	Project Manager, Data Science Initiative	City of The Hague
Jeroen de Lange	Founder	TRAC
Maria De Los Angeles Briones Rojas	Information Designer (workshop facilitator)	Oblo
Kareem Elbayar	Partnerships Manager, Centre for Humanitarian Data	OCHA
Björn Hoffman	Humanitarian Advisor	Ministry of Foreign Affairs of the Netherlands
Sanne Hogesteeger	Project Coordinator, Partners for Resilience	Red Cross Red Crescent Climate Centre
Michael Jensen	Chief, Central Emergency Response Fund (CERF) Secretariat	OCHA
Josiah Kaplan	Research Advisor, Global Migration and Displacement Initiative	Save the Children International
Juliane Klatt	Data Science Consultant	IOM
Andrew Kruczkiewicz	Senior Staff Associate	International Research Institute for Climate and Society at Columbia University
Richard Kumapley	Statistics and Monitoring Officer	UNICEF
Sofia Kyriazi	Data & AI Engineer	UNHCR
David Leblang	Director, Global Policy Center	University of Virginia
Jacopo Margutti	Data Scientist - 510	Netherlands Red Cross

Name	Title	Organization
Yelena Mejova	Research Leader	ISI Foundation
Leonardo Milano	Senior Data Scientist	Internal Displacement Monitoring Centre
Rebeca Moreno Jimenez	Innovation Officer - Data Scientist	UNHCR
Dirk-Jan Omtzigt	Head, Humanitarian Financing Strategy and Analysis Unit	OCHA
Nadia Fernanda Piffaretti	Senior Economist, Fragility Conflict Violence and Forced Displacement	World Bank
Jonathan Rivers	Head, mVAM	WFP
Karim Saba	Head, Internal Communications	OCHA
Manu Singh	Predictive Analytics Consultant, Centre for Humanitarian Data	OCHA
Fawad Hussain Syed	Humanitarian Affairs Officer, Assessment Planning and Monitoring Branch	OCHA
Sarah Telford	Lead, Centre for Humanitarian Data	OCHA
Maarten van der Veen	Strategic Lead - 510	Netherlands Red Cross
Valentin Wathelet	Research assistant, Centre for Research on the Epidemiology of Disasters (CRED)	Université catholique de Louvain