

# Targeting mobile money cash transfers for emergency relief using Call Detail Records in the Democratic Republic of the Congo (DRC)

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## 1. INTRODUCTION

Armed conflicts and instability in the DRC often cause large-scale internal displacement, including in remote areas where identifying and targeting internally displaced persons (IDPs) by field operations is slow, costly, and geographically limited. To address these challenges, Flowminder has developed a novel targeting method using daily anonymised statistics derived from Call Detail Records (CDR) to detect displacements in near real-time. Together with GiveDirectly and a mobile network operator (MNO), we created and operated a live CDR-driven cash transfer pipeline based on this novel targeting method, as a pilot project in the provinces of North and South Kivu (DRC). The targeting pipeline was repeated for 8 armed attacks within 5 months, reaching over 5,600 displaced subscribers in total. Crucially, the method and pipeline dramatically improved response times: after the first attack, 490 displaced people received \$125 each within 7 days, compared to the typical 100–130 day delays of traditional aid. Our CDR-driven remote cash transfer programming pipeline is currently operational to respond to ongoing displacement events in the North-East of the DRC, enabling rapid and targeted humanitarian cash transfers when and where needed.

## 2. A CDR-DRIVEN CASH TRANSFER PIPELINE

GiveDirectly operates unconditional cash transfer, including in emergencies, to people displaced by crisis and conflicts. Identification and targeting displaced people often take a long time with difficulties to reach remote and unsafe areas. CDR data contain information which can help to detect displacements remotely if the area of interest has mobile phone coverage before, during and after an incident. We developed a CDR-driven cash transfer pipeline which allows rapid response in conflicts and crisis situations. The pipeline consists of five steps:

1. **Incident Identification:** GiveDirectly identifies displacement-triggering events of interest through local situational awareness and intelligence gathering.
2. **Calculation of mobility statistics from CDRs:** The MNO uses SQL queries provided by Flowminder to

aggregate CDR traces across subscribers and compute mobility statistics, updated every day for a time period spanning the event and for the region of interest. Any statistics lower than 15 subscribers is redacted for privacy purposes so that the dataset can be shared with Flowminder for analysis.

3. **Displacement Inference:** Using a novel methodology described below, Flowminder detects the locations, timings and number of probable displacements related to the events of interest and potentially newly detected events. Displacement estimates are subsequently approved by GiveDirectly, and shared with the MNO.
4. **Data Sharing:** From the estimates and locations computed by Flowminder the MNO selects the subscribers most likely to be displaced and shares the list with GiveDirectly.
5. **Verification of the subscriber selection:** GiveDirectly verifies identities and eligibility of subscribers by contacting them.
6. **Cash transfer:** GiveDirectly enrolls individuals and initiates remote cash transfers.

## 3. METHODOLOGY FOR DETECTING DISPLACEMENTS

Displacement patterns are inferred from changes in mobile subscribers' "stay locations" and network activity. Four key metrics are used: **Relocations In** (a number of subscribers whose stay location (main location over the past X days) changes to a given cluster of cell towers on a specific day); **Relocations Out** (a number of subscribers whose stay location changes away from a given cluster on a specific day); from these we can compute the net relocation flow to a given cluster (in - out). Then **Pairwise Consecutive Relocations** (the count of subscriber movements from one cluster to another) provide the origin and destination of relocation flows. Finally **Active Cell Counts** (a number of cells with at least one active subscriber for a given day in a cluster) enable us to check for network outages and potential call redirections, which risk being confused for movements.

Our **Displacement Detection method** from CDRs is based on the hypothesis that forced displacements will manifest as statistically significant outliers in mobility flows

(changes in 'stay' location) following specific incidents (e.g., conflict events). Clusters of cell towers exhibiting outliers in flows (relocations) are automatically flagged as 'affected' by the conflict, in particular those with a deficit in net relocations and excess relocations out, and from these the methodology estimates: the number of potentially displaced subscribers and the outlier magnitude, to prioritise clusters with the most significant outlier flows.

However, mobility outliers can be produced by network outages, which themselves can stem from the conflict events. To rule out effects of outages and call redirections we only select locations where the number of active cells remains stable over the time period of interest. Additional validation involves identifying host clusters from the pairwise relocations, as statistically significant excesses of arrivals from affected clusters [1]. Detection of multiple host clusters, if supported by local knowledge, strengthens confidence in inferred displacements.

All inferred displacements are then reviewed by GiveDirectly, incorporating field intelligence. Validated events and estimates trigger secure and anonymised subscriber selection by the MNO, and ID transfers from the MNO to GiveDirectly for identity verification and potential cash transfers.

#### 4. RESULTS: DISPLACEMENT INFERENCE

In order to prevent fraud through exposure of the detailed targeting methodology, as previously experienced by GiveDirectly [2], we are unable to disclose further details and results from the methodology in use in our operational CDR-driven cash transfer pipeline.

However, we have applied the same displacement inference methodology to CDRs from another MNO in the DRC (Vodacom), and can show example results (Fig. 1). Fig. 1 shows inferred displacement flows between health zones of South Kivu during the week of 8–14 April 2025. An estimated 3,400 newly displaced subscribers relocated between different health zones (and an additional 3,600 subscribers may have relocated within their health zone - not shown). The main origins of displacements were Nyantende (also recorded by ACLED), Mulungu, and Ruzizi (also reported by country sources), while the main host zones were Nyangezi, Uvira, and Kabare. The largest detected displacement flow was from Nyantende to Nyangezi, involving approximately 700 newly displaced subscribers. No cash transfers were initiated for these inferred displacements from Vodacom CDRs. Statistics on cash transfers done via the operational pipeline with another MNO are provided in the abstract.

#### 5. FURTHER DEVELOPMENTS

This study demonstrates the feasibility of using mobile phone data to rapidly identify and assist IDPs in conflict settings at scale. The developed pipeline could become a new asset for humanitarian crisis response: it can be used in remote places with mobile network coverage; and crucially it permits very rapid cash assistance. Currently the entire

process can last as little as 6 or 7 days, which is a step change for emergency relief, particularly in remote areas.

Given the success of our pilot in the DRC, all partners are working on maturing the solution, focussing on improving the robustness and validation of results (rather than speed, as at least 6 days are required to cover steps 1-6), while also ensuring that potential operational delays are minimised through automation. Flowminder is refining its CDR analysis methods, inferring displacements from trajectory-based features and not only from outliers in group mobility, improving the accuracy of displacement detection and its sensitivity (enabling detection of smaller numbers of displacements per location and shorter displacement distance for example). We will validate and compare the performances of our CDR displacement detection methods by conducting a phone survey in North East DRC, currently in preparation.

Estimated displacement flows (demo) - South Kivu  
8 - 14 Apr 25

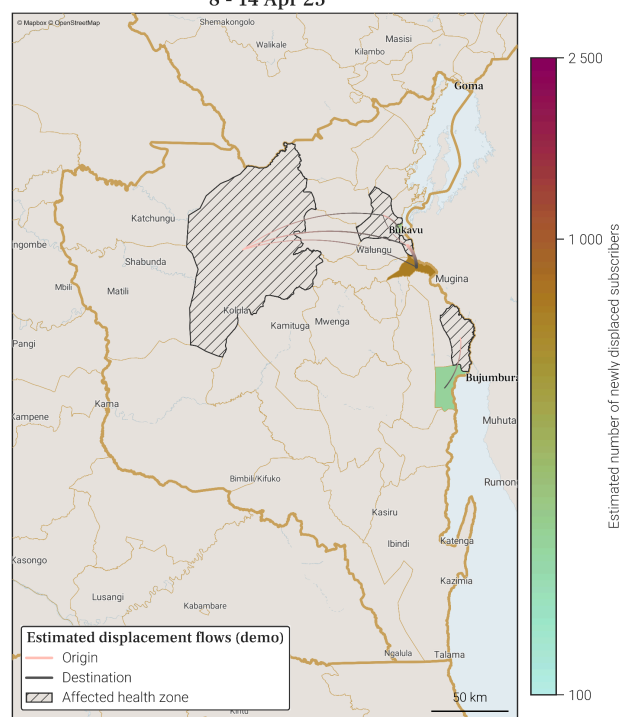


Fig. 1. Estimated new displacements (8-14 April 2025), derived in privacy conscious manner from Vodacom CDRs [3]

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**Data Availability.** Data underlying the results presented in this paper are not publicly available due to privacy.

**Disclosures.** The authors declare no conflicts of interest

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2. [Report: risks we faced delivering cash in 2024 | GiveDirectly](#)
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