



## Causal evaluation of humanitarian aid on food security

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In a world where climate change is rapidly accelerating, droughts are becoming more frequent and severe, posing a serious challenge to food security in the most vulnerable regions. The Horn of Africa has witnessed a rise in acute malnutrition, affecting 6.5 million people in 2022 [1]. Prolonged dry spells significantly contribute to this crisis [2], yet it is crucial to recognize that droughts are not the sole driver. Various factors, including hydrological conditions, food production capabilities, market access, insufficient humanitarian aid, conflicts, and displacement, play a significant role [3,4]. Understanding the underlying causes of food insecurity is pivotal for improving the effectiveness of humanitarian actions, yet in this context, the study proves to be complex, involving multiple variables, scales, and non-linear relationships. Predictive Machine Learning (ML) techniques are not suited to understanding the causes and estimating the causal effect by default [5,6], instead, this study focuses on causal inference to quantify the impacts of climate and socioeconomic factors on food insecurity. Our key contributions involve discerning causal relationships within the intricate food security system, integrating a comprehensive database including socio-economic, weather and remote sensing data, and estimating the causal effect of humanitarian interventions on the food security index, the outcome of interest. The causal discovery task is performed via time series methods accounting for nonlinear and nonstationary relations, like the PCMC algorithm and nonlinear Granger causality [7,8], identifying the drivers in the data that are causally linked to the outcome. Besides, the causal effect estimation task is performed via a Conditional Average Treatment Effect (CATE), gaining insights into the spatiotemporal heterogeneity of the impact of humanitarian interventions on the outcome [9]. Such endeavors are crucial for facilitating more efficient future interventions and policies, thereby improving transparency and accountability in humanitarian aid.

### References

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