Indicators of humanitarian aid performance using online data: case-study of Afghanistan in 2015

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Abstract

The humanitarian emergencies of past years have evidenced significant lack of cooperation and coordination among aid organizations. One way to improve the situation is that the big aid organizations leading the cooperation and coordination efforts in a given country make use of open aid data available online to rapidly evaluate the performance of all aid organizations, and then use the insights obtained as a complement to create better coordination strategies and policies. The big aid organizations can evaluate the performance using indicators. This research is about proposing two indicators based on a model (built from open aid data) of humanitarian aid viewed as an economic supply-demand system. The first indicator measures how is the supply of humanitarian aid proportional to the demands, and the second measures how well are aid organizations reaching the provinces with the most deficit of humanitarian aid. Both indicators were tested in the Afghanistan 2015 humanitarian scenario. They brought to light information about which aid organizations and humanitarian areas (clusters) need greater improvement in coordination.

Keywords – Humanitarian aid; Indicators; Data science; Supply-demand theory; Online data

1 Introduction

Humanitarian aid is the assistance to people in need due to natural or man-made disasters, whose main purpose is to save lives and alleviate suffering. There are big aid organizations like UNOCHA and ICRC who lead the planning of humanitarian aid in most emergencies, but still the humanitarian system is very decentralized due to hundreds of organizations involved with different goals and agendas. In this decentralized system, organizations compete for funding and donations to survive, so they must balance their altruistic intentions with their own survival interests and donors' agendas. Due to this, it has been common during past years to see problems like lack of cooperation, competition and duplication of efforts, which ultimately lead to an ineffective humanitarian system (Ramalingam & Barnett, 2010).

One way to improve this situation is that the big aid organizations responsible for planning the humanitarian operations make use of the open aid data available online to rapidly evaluate the performance of all aid organizations, and then use the insights obtained as a complement to create better coordination strategies and policies. The big aid organizations can evaluate the performance using indicators, and this research is about proposing two of them. A related research was made by Coscia et al. (Coscia et al., 2013), who proposed indicators to measure systematically developmental aid performance at a global scale from online data.

We propose two indicators based on a model of humanitarian aid operations in a given country as an economic supply-demand system. The first indicator, called Supply-Proportionality, measures how is the supply of humanitarian aid proportional to the demands – grounded on the ideal that aid must be given proportionally to the demands. The second one, called Organization-Reach, measures how well are aid organizations reaching the provinces with the most deficit of humanitarian aid – grounded on the ideal that organizations must try to reach the people most in need. We then test the model and the two indicators proposed in the Afghanistan 2015 humanitarian scenario, and finally draw conclusions about the suitability of the indicators.

2 Supply-demand system model

The supply-demand system model in a given country requires dividing aid into categories called clusters. For example, in the case of Afghanistan in 2015 there were five clusters: Emergency, Shelter and Non-Food Items (ESNFI), Food Security (FSAC), Health (H), Nutrition

(N), and Water/Sanitation (WASH). For the demand side of the model, we use a dataset to calculate for every province-cluster pair a criticality value that measures how critical is the humanitarian situation; then we multiply it by the population of the province to obtain what we consider the demand of aid. For instance, if Nangarhar province in Afghanistan, which is very populated, has a very high criticality value in the Health cluster, then we say there is a high demand of humanitarian aid in this province-cluster pair. The criticality values for each province-cluster pair are calculated as weighted averages of diverse indicators reported by UNOCHA in their online Humanitarian Needs Overview reports (UNOCHA, 2014). For example, in Figure 1 we show in a color scale the criticality values of Afghanistan in 2015 for all possible province-cluster pairs.

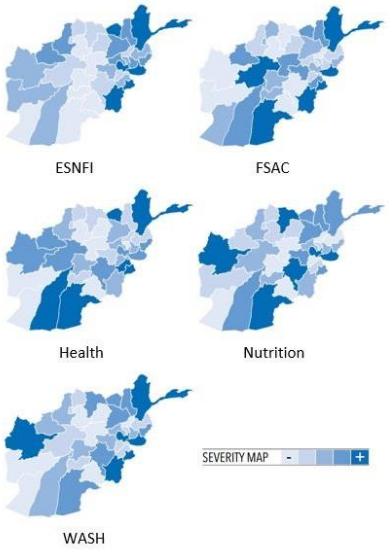

Figure 1: criticality values in color scale for all possible province-cluster pairs of Afghanistan in 2015 (UNOCHA, 2014).

For the supply side of the model, we obtain information about which humanitarian organizations are supplying aid in which provinces and in which clusters. This supply data is obtained from the popular 3W datasets (Who does What Where?) that UNOCHA publishes online in its Humanitarian Response website. Table 1 shows an excerpt of parts of Afghanistan's 3W dataset for the first trimester of 2015 (Humanitarian Data Exchange, 2015), where each row is called a project. For quantifying the supply, we define that each row or project in the dataset in equal to one unit of supply. For example, row one informs that UNICEF is present at the Estalef district in Kabul working in nutrition, so this accounts for one unit of supply in the Kabul-Nutrition (province-cluster) pair. Having quantified the demand and supply of aid for each province-cluster pair, we scale both so that in each cluster the sum of the demands is equal to the sum of the supplies. This generates a zero-sum system for each cluster, which makes it a very suitable model for analysis purposes.

Table 1: excerpt of parts of Afghanistan's 3W dataset for the first trimester of 2015 (Humanitarian Data Exchange, 2015).

PROVINCE	DISTRICT	ORG_ACRONYM	CLUSTER
Kabul	Estalef	UNICEF	Shelter
Kabul	Estalef	UNICEF	Food security
Kabul	Estalef	WFP	Shelter
Kabul	Kabul	ARCS	Shelter
⋮	⋮	⋮	⋮
Panjsher	Onaba	UNICEF	Shelter
⋮	⋮	⋮	⋮
Nangarhar	Achin	SCI	Shelter
Nangarhar	Kot	MADERA	Food security

3 The Indicators

Based on the supply-demand system model created, we propose the following two indicators of humanitarian aid performance.

3.1 Supply-Proportionality

The first indicator is called Supply-Proportionality (SP), and measures how is the supply of humanitarian aid proportional to the demands – grounded on the ideal that aid must be given proportionally to the demands. To explain this concept with a silly example, consider a small gray bear that needs one pizza to be healthy and a big brown bear that needs two pizzas to be healthy. Assume just one pizza can be supplied to these two bears, then the proportionality ideal tells us that the optimal distribution is to give one third of the pizza to the small gray bear and two thirds of the pizza to the big brown bear (see Figure 2). If we give half a pizza to each bear, then the small gray bear will have a surplus and the big brown bear a deficit with respect to what they should receive given the proportionality principle. The bigger the deviation from the optimal distribution of supply, the worst it is considered the distribution being made.

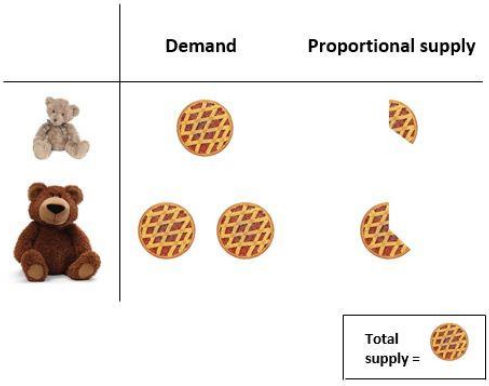

Figure 2: example of supply proportionality.

In mathematical terms, the indicator is defined as an estimation of the sample standard deviation of a surplus metric calculated for each province-cluster pair as its supply minus its demand. This surplus metric is calculated for each province-cluster pair as:

$$Surplus_{i,j} = Supply_{i,j} - Demand_{i,j} \quad (1)$$

where i is a province belonging to the set of provinces (e.g. 34 in the case of Afghanistan), and j is a cluster belonging to the set of clusters (e.g. 5 in the case of Afghanistan). Then, the Supply-Proportionality indicator is mathematically defined as:

$$SP = \sqrt{\frac{\sum_{i,j}\left(\left(Surplus_{i,j} - \overline{Surplus}\right)^2\right)}{I * J}} \quad (2)$$

where $\overline{Surplus}$ is the arithmetic mean of $Surplus_{i,j}$ when averaged over all i and all j, I is the number of provinces in question, and J the number of clusters in question. The optimal and minimum value is zero; the higher the value means that the aid is being delivered less proportionally to the demands. Note that the exponent in the equation means that the SP punishes severely province-cluster pairs with very positive surplus or very negative surplus (deficit). The SP can be obtained at a country scale for all clusters or for single clusters.

3.2 Organization-Reach

The second indicator is called Organization-Reach (OR), and measures how well is an aid organization reaching the provinces with the most deficit (negative surplus) of humanitarian aid – grounded on the ideal that organizations must try to reach the people most in need. Basically, organizations that tend to work in districts of provinces with aid deficit will score much better than the ones that tend to work in districts of provinces with aid surplus. The OR can be calculated for a given cluster or for all clusters in which an organization is involved. For a given cluster, is calculated as:

$$OR_{j,k} = \frac{\sum_i\left(-Surplus_{i,j} * Supply_{i,j,k}\right)}{Supply_{j,k}} \quad (3)$$

where i is a province; j is a cluster; k is an organization; $Supply_{j,k}$ is the number of projects (rows in the supply dataset) in different districts of the country where the kth organization is working in the jth cluster; $Supply_{i,j,k}$ is the number of projects in different districts of the ith province where the kth organization is working in the jth cluster; and $Surplus_{i,j}$ is the surplus of the jth cluster in the ith province (as previously defined). The more positive $OR_{j,k}$ is, the better reach an organization has in a given cluster. This is because if the organization has projects in districts of a province with deficit (negative $Surplus_{i,j}$), then the term in the summation will be positive, but if the organization is working in districts of a province with positive $Surplus_{i,j}$ then it will be negative. The OR of an organization for all clusters involved, OR_k, is defined as the arithmetic mean of all its $OR_{j,k}$ of the clusters in which is involved – again, the more positive the better.

4 Afghanistan case of 2015

We chose to test our model and indicators in the Afghanistan 2015 scenario due to its harsh humanitarian situation that does not seem to end. To build the model, we calculated the demand data from the information provided in the UNOCHA's Humanitarian Needs Overview 2015 report (UNOCHA, 2014) and the supply data from UNOCHA's 3W dataset of the first trimester of 2015 (Humanitarian Data Exchange, 2015), containing information about 149 aid organizations working in 5 clusters and the 34 provinces.

We began by calculating the Supply-Proportionality (SP) for each cluster, shown in Table 2 in ascending order.

Table 2: SP for each cluster in the Afghanistan 2015 case.

Cluster	SP of cluster
Health	1.42
FSAC	2.08
Nutrition	2.89
WASH	3.40
ESNFI	3.77

If we consider that a good proportional supply of aid in a given cluster is when provinces receive a supply that is inside ±30% of the demand, then we heuristically found for the Afghanistan case that a good SP must be below 1.3. None of the clusters were below this threshold, but Health was very close to it. ESNFI and WASH clusters had the worst SP, which coincides with substantial disorganization reported for exclusively these two clusters in a December 2015 UNOCHA report (UNOCHA, 2015). The indicator can be used for prioritizing the coordination efforts in the clusters with high SP. Further research is needed to determine how can cluster disorganization affect the SP. The indicator can also be calculated for all clusters, but its value would be mainly relevant for comparing against other countries, which is outside the scope of this research.

We then calculated the Organization-Reach (OR) for each of the 149 humanitarian aid organizations in Afghanistan reporting to UNOCHA during the first trimester of 2015. Table 3 shows the organizations with the top 10 best and top 10 ten worst OR_k values.

Table 3: top 10 best and top 10 ten worst organizations according to their OR_k values.

ACRONYM	NAME	ORG_TYPE	OR	RANK
IRA	Islamic Relief for Aghanistan	International NGO	13.20	1
BRAC	Bangladesh Rural Advancement Committee Afghanistan	International NGO	8.17	2
NEI	Nutrition & Education International	International NGO	6.93	3
TDH	Terre Des Hommes	International NGO	4.60	4
HELP	Hilfe zur Selbsthilfe e.V.	International NGO	4.47	5
IFRC	Int. Fed. of Red Cross and Red Crescent Societies	ICRC	4.47	6
AWRC	Afghan Women's Resource Center	National NGO	3.95	7
CARD-F	Comprehensive Agriculture Rural Developoment Facility	National NGO	3.95	8
CARITAS-G	Caritas Germany	International NGO	3.95	9
NFUAJ	National Federation of UNESCO Association in Japan	International NGO	3.95	10
WSTA	Watan Social and Technical Services Association	National NGO	-4.30	140
NPO/RRAA	Rural Rehabilitation Association for Afghanistan	International NGO	-4.30	141
APWO	Afghan Public Welfare Organization	National NGO	-4.32	142
TLO	The Liaison Office	National NGO	-4.43	143
AAID	Afghan Agency for Integrated Development	National NGO	-4.51	144
SI	Solidarites International	International NGO	-4.54	145
APA	Afghan Planning Agency	National NGO	-5.45	146
AGHCO	Afghan General Help Coordination Office	National NGO	-6.59	147
FGA	Future Generations Afghanistan	National NGO	-7.77	148
UNHABITAT	United Nations Human Settlements Programme	United Nations	-12.00	149

International organizations ranked much better than nationals, 8 of them in the top 10 best while just 3 in the top 10 worst. This suggests that international organizations in Afghanistan are being more able than the nationals in reaching the districts most in need. A possible explanation is that international organizations have more resources and are more neutral, which allows them to reach more. The Organization-Reach indicator can be used for urging specific organizations or groups of organizations (e.g. like national organizations) with very negative values to go to the provinces and districts more in need of aid.

5 Limitations

The indicators proposed are based on the following assumptions: 1) The data provided by UNOCHA to calculate the demand is reliable (for example: no sampling bias). 2) Projects (or rows in the supply dataset) are all of the same size or have a similar impact; however, they might vary considerably between big and small aid organizations. 3) The SP indicator implies that it is a humanitarian coordination failure if supply is far away from being proportional to the demand, but there might be political and security issues beyond humanitarian coordination that might cause it not to be proportional. 4) Weak values in the OR_k indicator obtained by an organization (e.g. like UNHABITAT in our Afghanistan case) might be not because the organization is not reaching the districts with most deficit, but because they arrived first to those districts and then other organizations copied them in going there.

6 Discussion and conclusions

The two indicators proposed provide fast and useful information about the humanitarian situation in a country, which can be used as a complement for coordination strategy and policy making. The Supply-Proportionality indicator can be used to prioritize the coordination efforts in the clusters with worst values of the indicator, like WASH and ESNFI in the case of Afghanistan. The Organization-Reach indicator can be used to urge organizations with very negative values of the indicator to try to reach the most in need, like many national organizations in the Afghanistan case. It should be noted that the two indicators are related. For example, if an organization improves its Organization-Reach by moving to districts more in need, then the Supply-Proportionality will necessarily improve. Future research will focus in improving the assumptions of the model and in calculating the indicators of other countries for comparison purposes.

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