

# Food-aid supplied to Gaza during seven months of the Hamas-Israel war

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*Note: This working paper is undergoing peer review. The findings are provisional and the conclusions may change*

## **Abstract**

**Background:** The ongoing Hamas-Israel war puts the civilian population in Gaza at risk of severe food and nutrition insecurity. Our goal was to provide objective, verifiable data to ascertain amounts and nutritional content of food donations entering Gaza through Israeli border crossings from January to July 2024. We aimed to assess their compliance with Sphere international humanitarian standards for food security and nutrition maintenance in crisis affected populations.

**Methods:** We obtained the registry of all food aid delivered to Gaza via air drops and land crossings for the study period from Israel's Coordinator of Government Activities in the Territories (COGAT). This registry itemizes daily food shipments, items and estimated weights. It provides more complete data than the UN dashboards because it includes food supplied by state, private, and commercial sector donors, who are not affiliated with the UN aid clusters. Each food item in each shipment was categorized, quantified, and assessed for its nutrient composition. We then summed the energy, protein, fat, and iron content of all shipments, and calculated supply per capita per day, according to the size of Gaza's population. Finally, we compared it to the Sphere standards for food security and nutrition.

**Results:** After accounting for food loss, a net total of 478,229 metric tons of food was delivered to Gaza. The average amount of energy available per person per day was 3,004 kcal, with 98 grams of protein (13.0% of energy), 61 grams of fat (18% of energy), and 23 milligrams of iron. Except for February there was a steady increase in the caloric, macronutrients and iron donated into Gaza that was registered by COGAT. The amounts of energy, protein, and fat exceed Sphere standards and remain consistent even after making adjustments for high food loss and the age distribution of the Gazan population.

**Conclusions:** This study assessed humanitarian food aid deliveries and availability in the Gaza Strip, the first pillar for meeting nutritional needs of the Gazan population. We found that with the exception of February, food aid delivered to Gaza during January-July 2024 exceeded the minimal daily per capita needs of all the people in Gaza, meeting humanitarian standards. While availability, the first pillar of food security, appears to be adequate, ensuring the food security of the population requires evaluation of the three remaining pillars of food security: access, utilization, and stability. With increased cooperation, the UN Food Security Cluster and COGAT could develop a comprehensive and continuously updated database of available food in Gaza. This would not only improve the transparent and objective assessment of food insecurity, but also ensure that future donations and their distribution could be tailored to meet the population's dynamic needs and circumstances.

**Keywords:** Hamas-Israel war, Food insecurity, Famine

## Introduction

The war between Hamas and Israel began on October 7, 2023 when Hamas and the Islamic Jihad launched a massive, coordinated terrorist attack on civilian communities in southern Israel. Over 1200 civilians, including babies, women, and elderly people, were killed, and hundreds were abducted into Gaza, where terrorist combatants, rocket launchers, and infrastructure were heavily embedded in the civilian population.

Once the Israel Defense Forces (IDF) entered Gaza on October 27, 2023, protection of the civilians of Gaza and maintaining a steady flow of humanitarian assistance became part of the operation. The population in northern Gaza was advised to move to designated humanitarian areas in the southern Gaza strip. Notwithstanding this precautionary measure, the resulting population displacement, extensive collateral damage, and constraints on the delivery and distribution of food aid in the ensuing combat operations, exacerbated pre-war food insecurity.

Fighting during November and December saw deteriorating humanitarian conditions<sup>(1)</sup>. UN humanitarian agencies, including the Office for the Coordination of Humanitarian Affairs (OCHA), The World Food Program (WFP), The United Nations Children's Fund (UNICEF), The Food and Agriculture Organization (FAO) and The World Health Organization (WHO), which are involved in providing humanitarian assistance during conflicts under the framework of the Food Security, Nutrition and Health Clusters issued several reports under the Integrated Food Security Phase Classification (IPC) process, warning that famine in Gaza was imminent if preventive measures were not immediately taken (2–4). The IPC report issued in March 2024, stated that “that Famine is imminent in the northern governorates of the Gaza Strip and projected to occur anytime between mid-March and May 2024” (4). A key claim of the report implicated Israel in obstructing the delivery of humanitarian aid, stating that “In addition to the currently constricted flow of both humanitarian and commercial imports, which is well below dietary requirements, the trajectory of food availability continues to worsen”, and “unless restrictions on the import of food

commodities from humanitarian and private initiatives are ended, food availability will only further decline" (Reference 7, Page 10). This projection, widely disseminated in influential media outlets (5–8), fueled claims in the scientific literature (9–12) that Israel was deliberately using starvation as a weapon of war. The primary evidence for these claims was a reported reduction in the number of food aid trucks crossing into the Gaza strip shortly after the war began. Even before the war, Gaza was heavily dependent on food aid. Claims of a shortfall in food aid alleged a decrease in the number of the trucks entering Gaza after the war broke out on October 7<sup>th</sup> 2023. There was no data on the nutritional value of the food delivered. Israel states that it puts no restrictions on admitting humanitarian aid into Gaza as long as it passes security screening (13). In addition, private food companies transfer food for trade in Gaza's markets. Only trucks carrying items that could be used for terror activities are prohibited.

Israel's Coordinator of the Government Activities in the Territories (COGAT) is responsible for ensuring the safe passage of humanitarian aid and workers into Gaza, and coordinating their safe passage and operation in challenging war zones(14). The food commodities are donated by international donors and aid agencies who distribute it to the population once they enter Gaza.

In this study, we focus on the availability pillar of food security, and aimed to investigate the quantity and quality of the food donated and transferred by the Food security cluster partners and by the private sector into Gaza through Israeli borders. We then used international humanitarian standards to assess whether this aid met the Gazan population's nutritional requirements. We did not have access to credible data on the distribution, access, use, and stability of food within Gaza for this report. We believe that verifiable data on these further pillars of nutritional security and an objective quantitative analysis would substantially enhance humanitarian interventions and the joint efforts of Food security cluster partners, private sector and COGAT.

## **Methods**

## **The COGAT food transfer database**

Beginning in December 2023, COGAT established a registry documenting the food donation and transfer requests and their clearance status (15). The database lists the date of shipment, the donor/source of supply, the weight (metric tons), and the food items transferred through the border crossings into Gaza. We analyzed all food shipments registered and authorized by COGAT and delivered by land and air from January through July 2024.

The COGAT data lists the gross weight of each consignment and its content. COGAT manually verifies the contents of all trucks at the crossing points, and shipment weights. In cases when the exact weight of the food on trucks was not mentioned by the donor, the weight of food was systematically accounted for according to a subsample of trucks which had documented weight provided by their donor at the beginning of the war. According to this previous experience, truck weight was assumed according to its content and donor as follows: trucks carrying food (excluding wheat flour) from UN agencies - 15 tons; trucks carrying food (excluding wheat flour) from all other sources - 20 tons; trucks carrying wheat flour from all sources – 30 tons; and trucks carrying a combination of food and other aid supply – 15 tons.

### **Supply classification**

We classified the food consignments listed for each delivery as follows, and depicted in table 1:

*1. Specific food commodities:* deliveries that included specific foods. The nutritional content contribution of each food item in the parcels was calculated based on the United States Department of Agriculture (USDA) database (16) as depicted in supplementary table 1.

*2. Standardized food parcels:* shipments of food parcels from the UN and other humanitarian aid agencies that provide a detailed description of their food content. These include food parcels donated by the International Federation of the Red Cross and Red Crescent Society (IFRC ICRC), World Food Program (WFP), OXFAM,

The United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA), as well as the World Central Kitchen (WCK), and others. The nutritional contribution of each food item in the parcels was calculated based on the USDA database. The nutritional values per 100gr were calculated for gross dry food weight, as described in supplementary table 2.

*3. Non-standardized food parcels:* shipments including a large variety of food commodities in unstandardized combinations (for example, a truck carrying rice, cheese, canned legumes, watermelon, and onions). Since these deliveries varied in food combinations, we accounted for their nutritional content as the weighted mean of all food commodities delivered to the Gaza during the time of the study (supply category 1). The nutritional contribution of each food item in the parcels was calculated based on the USDA database (supplementary table 1).

*4. Mixed food parcels:* shipments listing standard and/or nonstandard food parcels together with non-food items (such as clothing, medical, or hygiene supplies). We accounted for the nutritional content of these deliveries, similarly to standardized and non-standardized food parcels (supply categories 2 and 3). Their contribution to nutrient availability to shipments stem from the adjustment of weight of food in the shipments.

*5. Cooked meals:* shipments containing cooked meals. The contents of cooked meals in deliveries were estimated based on prior knowledge of the traditional Ramadan evening meal, since most cooked meals were donated during the month of Ramadan. Our calculated meal is based on a combination of cooked grain, cooked meat in sauce, bread, two forms of spread, and dessert. The nutritional contribution of each food item in the parcels was calculated based on the USDA database.

*6. Food items for infants:* shipments which include baby food, nutritional supplementation and infant formula from 6 to 12 months of age. The nutritional contribution of each food item in the parcels was calculated based on the USDA database and commercial product food labels. Importantly, we based our assumption of the kind of infant formula in food deliveries on United Nations

Children's Fund (UNICEF) and World Health Organization (WHO) guidelines, by which food aid which is destined for distribution among the general population should not include formulas for infants under six months of age. This prohibition is based on health and food safety concerns, including lack of access to water, hygiene and sanitation in times of crisis. Since most of the food in this category was donated by UN organizations, we could assume it adhered to their specifications. Therefore, food deliveries recorded to contain "infant formula" were considered for age >6 months, and their nutritional content was assessed accordingly.

### **Food weight adjustment**

After consultation with humanitarian aid groups, we adopted the common practice of using a 15% food weight loss adjustment factor for food commodities, non-standardized food parcels, cooked meals and infant foods. In the case of standardized food parcels, we calculated the weight adjustment factor based on the standard IFRC food parcel. This parcel weighs 12 kg in total, while the dry food weight amounts to 7 kg. Therefore, we adjusted the weight of standardized parcels based on 40% loss. In cases of mixed shipments including food parcels, and other aid (such as clothing medical and hygiene supplies), we adopted a conservative approach, adjusting the net weight of food to 50% of the consignment's weight, and made further adjustments for food of 40% or 15% respectively, if parcels were standardized or non-standardized (Table 1).

### **Nutritional assessment of shipment content**

The energy (kcal/ton), protein (gr/ton), fat (gr/ton), and iron (mg/ton) content of each donated, approved shipment that passed into Gaza was estimated according to the food composition values. (Table 1, see Supplementary tables 1, 2 and 3 for details). We chose to assess energy and protein availability due to their established role in malnutrition formation, and their critical role in malnutrition treatment(17). Fat was assessed as a proxy of fat-absorbable vitamins, and iron as a proxy of protein and nutrient-dense foods (such as meat, chicken, fish, and eggs), since iron-

deficiency anemia has been a concern in the Gaza Strip before the war(18,19). Food items were further categorized according to food groups (Grains, Legumes, Vegetables, Fruit, Oils, Meat poultry and fish, Dairy products and eggs, Sweets, Snacks, Sugar sweetened beverages, Other- see Supplementary Table 1). The proportional weight of each food group within ready meals and food parcels was also estimated according to their content (Supplementary Table 4). Thus, we were able to estimate the proportional weight of different food groups from different food aid categories per month.

Table 1 lists and details our calculations of content, weight adjustment and nutritional value of each of the supply categories in our analysis



**Table1. Supply categories included in the analysis and nutritional value**

Supply category	Calculations of nutritional value	Weight adjustment factor	Protein (gr/100gr adjusted weight )	Energy (kcal/100gr adjusted weight)	Fat (gr/100gr adjusted weight)	Iron (mg/100gr adjusted weight)
Specific food commodities	USDA's food composition data	Adjustment for 15% loss <sup>a</sup> .	Please see supplementary table 1			
Standardized parcels <sup>b</sup> :	The IFRC food parcel	Adjustment for 40% loss (Supplementary table 2).	8.4	357	13.8	2.2
	OXFAM Food Parcel		13.7	265.8	7.2	4.8
	UNRWA Food Parcel		10.2	394.5	16.14	2.4
	WFP Parcels		13.9	307.5	6.8	2.4
	WCK Food Parcel		9.7	225.0	7.5	1.5
	Other (average of other standardized parcels)		10.7	292.4	10.0	2.5
Non-standardized parcels	The nutritional value was calculated as the weighted mean of all foods supplied as specific food commodities in all shipments throughout 7 months (Supplementary table 1).	Weight was adjusted by 15% loss <sup>a</sup> .	10.5	313	4.7	2.6

Standardized parcels (mixed)	We used the nutritional content of the IFRC standardized food parcel (Supplementary table 2).	Food weight was assumed as 50% of the supply weight, Further adjustment was made for 40% loss <sup>b</sup> .	8.4	357	13.8	2.2
Non-standardized parcels (mixed)	The nutritional value was calculated as the weighted mean of all specific food commodities in all shipments throughout 7 months (supplementary table 1).	Food weight was assumed as 50% of supply weight, with additional adjustment for 15% loss <sup>a</sup> .	10.5	313	4.7	2.6
Ready meals	The nutritional value of a standard main meal (Supplementary table 3).	Weight was adjusted for 15% loss <sup>a</sup> .	8.0	204	8.4	1.5
Foods for infants and toddlers						
Complementary food for infants >6 months of age (mashed vegetables)	Food labels provided by the commercial international brand.	Weight was adjusted for 15% loss <sup>a</sup> .	1.0	40.0	0	0.6
Infant nutritional supplementation	Food labels provided, (IFRC catalogue)(20).		13.4	535.0	13	45
Infant formula	Food label of a commercial international		15.5	426.0	11	10

	brand for stage 2+3 formulas.					
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We calculated the total energy (in kcal), protein (in grams and as a percentage of total kcal), fat (in grams and as a percentage of total kcal), and iron (in milligrams) delivered to Gaza each month. Based on the population size of Gaza as reported by the Gaza Central Bureau of Statistics (n= 2,226,544 )(21), we calculated the average amount of nutrients per person per day. This per capita analysis could then be compared with the needs of the Gazan population as a whole, based on the gold standard of crisis affected populations’ dietary needs, the Sphere Standards "Essential concepts in food security and nutrition", presented in Sphere Handbook Appendix 6: Minimum Population Requirements (22). These scientific standards, drawn from 25 years of experience, provide practical guidelines and establish minimum humanitarian standards for addressing food security and nutrition.

**Sensitivity analysis**

For sensitivity analysis and to avoid potential information bias, we used a stringent food-loss factor of 30% to test the ability of shipments to deliver the dietary needs of the Gazan population.

Given the unique age distribution of the Gazan population, we performed an additional stringent, non-standard analysis to calculate the theoretical age-adjusted energy, protein, and iron supply (23), required by a healthy population with the Gazan age distribution, including a predominantly higher proportion of children. Daily per capita amounts of these nutrient requirements were calculated. Note that these are population-based guidelines and are not tailored for individuals or groups who are ill or for repletion of deficient individuals. Actual dietary needs might be higher.

### **Regional availability of food aid**

The Gaza strip is divided into the North Gaza and Gaza governorates in the north, the central Deir el Balah and Khan Yunis governorates, and the Rafah governorate in the south. The Al-Mawasi humanitarian zone is located along the coast of the western Rafah and Khan Yunis governorates. To address the concerns for the food availability of the Gazans remaining in the northern governorates we assessed the available data on the number of trucks and weight of food dispatched, according to a separate registry of trucks traveling internally from the southern crossing point to the north of Gaza coordinated with COGAT. We also accounted for trucks entering from the north crossing points, and food air drops to the north of Gaza. All remaining trucks entering from the southern crossing points were considered as destined to the south and center of Gaza. We could thus account for the number and weight of the trucks by destination – north vs. south and central Gaza. Content of the trucks crossing the strip from south to the northern governorates were not described so we could not assess their nutritional values.

### **Stability of food supply**

The stability of weekly aid delivery was expressed as the distribution of the weekly mean availability of daily-per-capita energy.

## **Results**

The COGAT registry records a total of 30,986 trucks and airdrops transferred into Gaza between January and July 2024, conveying food weighing 478,229 tons.

Between January and April, amounts of food delivered to the Gaza Strip increased and remained relatively stable until July. In February, when aid delivery from the Kerem Shalom crossing point was reduced, airdrops were initiated. In March, the Ashdod port in Israel was opened briefly for the transfer of aid to Gaza, and in April the northern Erez land crossing opened. After the Rafah crossing was closed by Egypt in early May, two additional land crossings were opened, and the US military established a Joint Logistics Over-the-Shore pier (JLOTS) to allow aid to be delivered directly to Gaza by sea (Table 3). Although JLOTS delivered approximately 9000 tons of aid until late June, it was shut down in July due to repeated operating difficulties in high seas, with subsequent delivery of aid by sea to northern Gaza via the Israeli port of Ashdod and the Erez Crossing(24).

The mean number of trucks crossing per month was 4,426 (147.5 per day), with a mean increase of 377 trucks per month from January to July 2024. About 42.2% by weight of the aid entering the Gaza Strip was delivered by UN humanitarian aid agencies, 14.8% by other humanitarian agencies, 7.6% by foreign states (including Israel) and 35.0% from the private sector. After adjusting for packaging and other non-food weights, the proportional weight of shipments indicates that standardized food parcels, and specific food commodities account for most of the food supply (Table 2). Noticeably, UN agencies gradually decreased the amounts of food delivered between May and July, from 51% of all food delivered in April, to 22.1% in July (Supplementary Figure 1), with decreased amounts of standardized food parcels and an increase in non-standardized food parcels, consisting mostly of vegetables.

**Table 2. Food supplied to the Gaza Strip between January-July**

	January		February		March		April		May		June		July	
Crossing points or routs of entry for food aid														
Operating crossing points <sup>a</sup>	Kerem Shalom Nitzana\Rafah		Kerem Shalom Nitzana\Rafah <b>Airdrops</b>		Kerem Shalom Nitzana\Rafah Airdrops		Kerem Shalom Nitzana\Rafah Airdrops <b>Erez<sup>b</sup></b>		Kerem Shalom Nitzana\Rafah <sup>c</sup> Airdrops Erez <b>JLOTS</b>		Kerem Shalom Airdrops Erez JLOTS		Kerem Shalom Airdrops Erez	
Operating aid delivery routes <sup>a</sup>	Jordan Egypt		Jordan Egypt		Jordan Egypt <b>Ashdod port</b>		Jordan Egypt Ashdod port <b>Israel</b>		Jordan Egypt Ashdod port Israel <b>Judea&amp;Samaria</b>		Jordan Egypt Ashdod port Israel Judea&Samaria		Jordan Egypt Ashdod port Israel Judea&Samaria	
Summary of food aid delivered														
Total deliveries (trucks and airdrops)	3,693		2,406		3,884		5,023		5,275		4,748		5,957	
Total weight (Tons)	52,293		30,290		61,330		83,587		94,884		71,903		83,942	
Food aid by donor (Tons, % of monthly total)														
UN aid agency	29,074	55.6%	14,550	55.6%	30,353	49.5%	43,207	51.7%	39,116	41.2%	27,297	38.0%	18,514	22.1%
International aid agency	12,173	23.3%	10,811	23.3%	14,755	24.1%	23,088	27.6%	7,024	7.4%	2,733	3.8%	917	1.1%

	January		February		March		April		May		June		July	
Nationalities, including Israel	3,493	6.7%	1,194	6.7%	5,412	8.8%	12,806	15.3%	5,296	5.6%	6,548	9.1%	2,113	2.5%
Private sector	7,553	14.4%	3,734	14.4%	10,810	17.6%	4,487	5.4%	43,448	45.8%	35,325	49.1%	62,398	74.3%
Food aid by crossing point and destination (Tons, % of monthly total)														
Nitsana	19,790	37.8%	10,368	34.2%	17,605	28.7%	21,661	25.9%	2,857	3.0%	0	0.0%	0	0.0%
Kerem shalom – destined to south and center	0	0.0%	0	0.0%	8,380	13.7%	34,910	41.8%	7,640	8.1%	7,641	10.6%	0	0.0%
Kerem shalom – destined to north	32,503	62.2%	19,835	65.5%	33,850	55.2%	25,113	30.0%	63,197	66.6%	52,607	73.2%	69,030	82.2%
Erez	0	0.0%	0	0.0%	0	0.0%	0	0.0%	19,954	21.0%	9,941	13.8%	14,877	17.7%
Air drops	0	0.0%	86	0.3%	1,496	2.4%	1,904	2.3%	611	0.6%	103	0.1%	35	0.0%
JLOTS	0	0.0%	0	0.0%	0	0.0%	0	0.0%	626	0.7%	1,611	2.2%	0	0.0%
Food aid by supply type (Tons, % of monthly total)														
Specific food commodities	27,238	52.1%	14,707	48.6%	39,264	64.0%	56,105	67.1%	78,064	82.3%	49,772	69.2%	55,696	66.4%
Standardized food parcels	23,759	45.4%	15,130	50.0%	19,104	31.1%	22,906	27.4%	10,904	11.5%	7,885	11.0%	4,907	5.8%
Non-standardized food parcels	523	1.0%	83	0.3%	349	0.6%	1,679	2.0%	5,202	5.5%	13,689	19.0%	22,653	27.0%
Cooked meals	327	0.6%	218	0.7%	2,422	3.9%	2,639	3.2%	510	0.5%	476	0.7%	166	0.2%
Infant food <sup>d</sup>	259	0.5%	29	0.1%	119	0.2%	60	0.1%	68	0.1%	9	0.0%	455	0.5%

	<b>January</b>		<b>February</b>		<b>March</b>		<b>April</b>		<b>May</b>		<b>June</b>		<b>July</b>	
Standardized food parcels (Mixed)	180	0.3%	123	0.4%	54	0.1%	122	0.1%	0	0.0%	0	0.0%	0	0.0%
Non-standardized food parcels (mixed)	6	0.0%	0	0.0%	19	0.0%	77	0.1%	136	0.1%	72	0.1%	66	0.1%

<sup>a</sup> Newly opened food sourcing and delivery routes are indicated in **Bold** font during the first month of operation

<sup>b</sup> Erez crossing opened on 17\04\24

<sup>c</sup> Rafah crossing closed by Egypt on 5\5\24

<sup>d</sup> Adjusted weight accounting for food loss, as depicted in Table 1.



To address aid supply to the northern parts of the strip, we analyzed the weight of food deliveries entering the Strip from different crossing points, and from Kerem Shalom with different destinations. Some 300,000 people reside in the northern governorates of the Gaza Strip (13% of the population), compared to 1,926,544 people (87%) in the center and southern governorates of Gaza. This difference is reflected in the total number of trucks delivered during the 7 months analyzed: 5,423 (17.5% of all deliveries) of 109,815 tons of food, or 22.9.0% of all food weight, to northern Gaza, as compared to 25,5663 truck deliveries (82.4% of all deliveries), carrying 368,415 tons (77.0% of all food weight) delivered to the southern and central Gaza (Figure 1).

**Figure 1. Monthly food delivered to the northern governorates, as a proportion of the total food weight entering the Gaza Strip**

Trucks from Erez crossing, airdrops and JLOTS shipments, and a partial number of trucks authorized missions to the north of Gaza, were categorized as those destined to the northern governorates. Trucks from Nitsana and the rest of trucks from Kerem Shalom were categorized as those destined to the southern and central governorates.

The weight of food from different food groups from all supply categories combined, demonstrates that shipments delivered a wide variety of foods to the Gaza Strip, and these increased each month (Figure 2). The most abundant food group delivered was Grains, with 241,434 tons over 7 months, and a mean increase of 533 tons per month. Next, Vegetables and legumes were delivered in high amounts (50,263 tons and 44,908 tons). However, while the mean monthly increase in vegetables was highest (2,497 tons per month), the amounts of legumes delivered decreased by a mean of -1,032 tons per month. Similar amounts of meat, chicken and fish, and sweets were delivered with 30,687 tons and 28,285 tons, respectively.

**Figure 2. Amounts of food by food-group, delivered to the Gaza Strip in total (A) and by month (B)**

The nutrient content also increased over the period under analysis, with the highest amount in April. The mean monthly energy supply over 7 months was 3,004 kcal per capita per day. The mean amount of protein was 98.0 gr per capita per day, comprising 13.2% of the energy intake, the mean amount of fat was 61.2 gr per capita per day (18.5% of daily kcal), and iron was 23.4 mg per capita per day. We performed a sensitivity analysis using a more stringent approach with a food-loss factor of 30%. Even with this conservative factor, energy and protein remained compliant with Sphere standards (Table 3).

**Table 3. Nutrient content of food supplied to the Gaza Strip, between January-July**

Month	January	February	March	April	May	June	July	Overall Average <sup>a</sup>
Days per month	(31 days)	(28 days)	(31 days)	(30 days)	(31 days)	(30 days)	(31 days)	(7 months)
<b>Adjusting by 15% food weight loss</b>								
Average kcal / capita / day <sup>b</sup>	2,424	1,508	2,919	4,167	3,886	2,893	3,232	3,004
Average gr protein / capita / day <sup>b</sup>	91.5	55.2	100.2	142.4	119.2	91.4	85.9	98.0
Average % of kcal from protein / capita / day <sup>b</sup>	15.1	14.6	13.7	13.7	12.3	12.6	10.6	13.2
Average gr fat / capita / day <sup>b</sup>	38.0	34.0	67.7	84.3	58.5	53.3	92.9	61.2
% of kcal from fat / capita / day <sup>b</sup>	14.1	20.3	20.9	18.2	13.6	16.6	25.9	18.5
Average Mg iron / capita / day <sup>b</sup>	21.2	12.3	23.1	34.0	29.0	22.6	21.6	23.4
<b>Adjusting by 30% food weight loss</b>								
Average kcal / capita / day <sup>b</sup>	2,171	1,366	2,546	3,615	3,281	2,445	2,701	2,589
Average gr protein / capita / day <sup>b</sup>	82.4	50.2	88.0	124.2	101.2	77.7	72.2	85.1
Average % of kcal from protein / capita / day <sup>b</sup>	15.2	14.7	13.8	13.7	12.3	12.7	10.7	13.3
Average gr fat / capita / day <sup>b</sup>	36.5	31.9	60.2	75.2	50.8	45.8	77.7	54.0
% of kcal from fat / capita / day <sup>b</sup>	15.1	21.0	21.3	18.7	13.9	16.9	25.9	19.0
Average Mg iron / capita / day <sup>b</sup>	18.8	11.1	20.2	29.5	24.5	19.1	18.1	20.2

<sup>a</sup> Overall average was calculated as is the sum of each nutrient across 7 months, calculated according to the nutritional value of each food/supply category after adjustment of weight by 15% and -30%, and divided by the sum of all days between January and July.

<sup>b</sup> Per capita per day analysis was performed by dividing the total amount of each nutrient by the population of Gaza (2,226,544 people), and the number of days.

The amounts of energy, protein, and fat supplied to Gaza exceed the Sphere standards for conflict-affected populations, with adjustment by both 15% and 30% for food weight loss (Table 4).

**Table 4. Comparison between foods supplied to the Gaza Strip and Sphere standards for humanitarian aid supply to conflict-affected populations**

Average Individual Daily Requirements	Sphere standards for humanitarian food supply a	Weight loss – 15%		Weight loss – 30%	
		Nutrients Supplied to Gaza	Percent of Sphere standards met by supply	Nutrients Supplied to Gaza	Percent of Sphere standards met by supply
Energy (Kcal/day)	2,100	3,004	143%	2,589	123%
Protein (gr/day)	53	98.0	185%	85.1	161%
Protein (% as a proportion of total energy supply)	10%	13.2%	132%	13.3%	133%
Fat (gr/day)	40	61.2	153%	54.0	135%
Fat (% as a proportion of total energy supply)	17%	18.5%	109%	19.0%	112%
Iron (mg/day)	32	23.4	73%	20.2	63%

<sup>a</sup> Population dietary needs according to Sphere standards were calculated by multiplying Sphere personal needs, with Gaza population size in 2023 (2,226,544 people).

### Sensitivity analysis

In a final stringency, we calculated the age-adjusted energy, protein, and iron supply(25), required by a healthy population with the Gazan age distribution, which includes ~30% children under the age of 14, with appropriate dietary needs. The mean weighted theoretical daily requirements per capita for a population with such an age distribution were 1,934 kcal, 43 gr protein, and 12 mg of iron (Supplementary table 4). The food supplied to the Gaza Strip between January and July also exceeded these more stringent thresholds.

### **Food availability stability analysis**

The weekly mean daily energy availability per capita ranged between 1,187 kcal/capita/day (occurred between 18-25.2.24), and 5,519 (occurred between 16-23.5.24), with a mean of  $3,002 \pm 1054$  kcal per day, and a median of 3,017 kcal per day (Figure 3). Mean energy availability fell below the Sphere standards of 2,100 kcal per day only 4 times in the 26 week study-period. These occurred during periods of intense fighting, three in February and the fourth during the first week of May.

### **Figure 3. Supply stability, distribution of the weekly mean energy per capita, per day delivered to the Gaza Strip**

### **Discussion**

This detailed analysis of the food per capita delivered to Gaza between January and July 2024, reveals that it meets the Sphere standards, even after applying stringent assumptions of food loss (e.g. food loss factors of 15 and 30 percent). In other words, the food supplied should have been sufficient to provide the nutritional needs of the entire Gazan population. The amounts of food in shipments significantly increased monthly from March, while April showed the highest amount of food, energy, protein, fat, and iron transferred into Gaza. The lowest amounts were

supplied in February, during which mean daily per capita amounts of energy or nutrients did not reach the Sphere standards. This was corrected with improved food deliveries by March, April and May. The amounts of Iron available by food supplied to the Gaza Strip was insufficient throughout the time period examined, though this result may be biased the fact that we did not account for iron content in nutritional supplements of iron and other micronutrients, which were included in shipments, and for iron fortification of foods delivered by aid organizations. Sub-optimal supply of food to the strip during February may have caused a decrease in the food security of the Gazan population, and low supply of dietary iron might have adversely affected the prevalence of anemia in Gaza during this period (19). It is noteworthy that the fourth most prevalent food group supplied throughout the time frame of the study was "sweets". This food group contained cakes, cookies, candies, chocolate etc., which provide energy but contribute little to the supply of essential nutrients. Aid donors and private sector suppliers of food should be mindful of the need to maintain a nutritious food supply.

Though the nutritional value of the food supply changed by month, the mean amounts of daily per capita energy and protein content of food remained above sphere standards throughout all months examined. The overall distribution of mean daily per capita energy of food supplied to Gaza by week showed overall consistent and stable results, with 4 exceptional weeks in which they fell below the sphere standards. Energy supply was lowest in February, coinciding with efforts by some Israeli activists to halt the passage of humanitarian aid trucks via Kerem Shalom, claiming they were fueling Hamas, during a period of fierce compact operations (10,26). Another week in which energy supply was low was the first week of May, when Egypt closed the Rafah crossing point following Israel's incursion to Rafah (27). In spite of these disruptions, the cooperation between COGAT and international donors, enabled aid entry sufficient to the population's needs.

Analyzing regional aid delivery allowed us to document the month-by-month joints efforts made by aid agencies and COGAT to expand aid delivery routes and crossing

points to the north of Gaza. This analysis was crucial given warnings of imminent famine in the Northern governorates. Initially, Kerem Shalom and Rafah land crossings, were the only routes of entry of food to the strip. This constrained food distribution to the north from within the Gaza Strip. The latest IPC report (June 2024), noted the subsequent opening of the northern Erez and “96” land crossings as well as air and sea delivery routes as positive developments, improving the aid available to northern Gaza. The IPC report states: "In the northern governorates, the increase in the delivery of food commodities has been steady since March, ultimately reaching in May a total quantity that could potentially suffice to cover the needs of the 300,000 people residing in the north"(3). Our findings support the conclusion that the facilitation of food shipments to the northern governorates was proportional to the assessed population size in these regions. The June IPC report also suggested that much of the food supplied via the North was commercial, and might have been out of reach economically for some of the population. Our data systematically covers commercial sector transport from all crossing points, and records that, on the contrary, of 83,587 tons of food delivered to the Gaza Strip in total throughout April, only 4,487 tons, or 5.4%, came from commercial trucks. We have no information about which deliveries were designated to the north, but even if all these deliveries were systematically destined to the northern governorates, they would amount to only 12% of the total 36,814 tons that reached the north in April. In accordance, the IPC report describes results from the World Food Program Computer Assisted Telephone Interview (WFP CATI) household survey, indicating that in May, more than 80% of respondent households in northern Gaza received food aid. This could imply that food aid was readily supplied and accessible to most of the needy population in the north.

Analyzing the food security crisis in Gaza should separate food availability assurance from other key factors that may hinder efforts of aid agencies to increase the amount of aid reaching the civilian population of Gaza. COGAT stated clearly, that it does not restrict the amount of humanitarian aid transferred into Gaza, provided it is

registered and passes security screening(28,29). COGAT reports that 98.7% of all aid trucks sent were allowed to enter the Gaza Strip. Only 1.3% of the trucks (307 trucks) were rejected or sent for repackaging because they carried unauthorized dual-use items (i.e. could be reprocessed for warfare and terrorist activities) (30). The OCHA online dashboard(31) indicates that during January-September 2023, in the period preceding the war, the average daily rate of trucks entering Gaza was 321 (87,707 in total over 273 days), of which 100 per day were carrying food (27,434 trucks). According to UNRWA's dashboard(32), which provides information regarding UN agency aid alone, the average number of trucks carrying food into Gaza daily increased from 55 in November to 97 in January and 118 in March 2024 (a number that approximates those in our analysis of COGAT data). These amounts resemble those entering Gaza before the war. Indeed, the evidence is inconsistent with repeated claims that Israel is deliberately restricting food aid to Gaza. Rather, food insecurity in Gaza is more likely to be related to how effectively food aid is distributed by the Food Security Cluster, and to the difficulty regulating stable access to aid and its utilization by the population once it reaches Gaza. Several key factors that may hinder efforts of aid agencies to increase the amount of aid reaching crisis affected people include security risks to aid workers(33), and the theft, looting, and hoarding of food and other supplies (34–36). The extent and impact of these factors in Gaza should be addressed in future research. Although aid workers coordinate missions and food dispatches inside Gaza with COGAT (termed “de-confliction”), the de-confliction system is not perfect, and errors occur as underscored by the tragic killing of World Central Kitchen workers in April (37). Deliberate attacks by Hamas on humanitarian aid crossing points and corridors also disrupt the supply and distribution of humanitarian aid. Hamas routinely fires rockets from within, nearby, and even towards humanitarian zones, at IDF forces protecting humanitarian corridors, and at such critical infrastructures as a desalination plant funded by the international community (38). For example, Kerem Shalom, a major crossing point for humanitarian aid trucks, repeatedly came under fire and endured three mortar barrages (on May 8<sup>th</sup> 2024), and 16 rocket attacks (May 5<sup>th</sup> and 7<sup>th</sup> 2024). The



northern pier and humanitarian corridor also endured fire and rocket attacks for several days (May 3<sup>rd</sup> to 6<sup>th</sup> 2024)(39–41). Another significant challenge is that Gazan populations that have not evacuated war zones are harder to reach, and there is a general uncertainty as to their numbers and actual place of shelter. Access to people residing in combat zones is understandably often restricted by aid agencies to reduce risk. Damaged infrastructure, lack of aid workers, trucks, parts, and fuel can also impede aid missions.

The Hamas-Israel war's impact on the food and nutrition security of the Gazan population, is related to its vulnerability prior to October 7<sup>th</sup>, 2023. Israel and Egypt have controlled the borders of Gaza since 2007, when Hamas, a terrorist organization according to Israel, the United States, and the European Union, forcibly overthrew the Palestinian Authority in Gaza (42,43). International agreements allow for Israeli control over the northern and eastern border crossings, while Egypt controls the southern Rafah crossing. In 2022, the European Union and the Food and Agricultural Organization (FAO), reported that the prevalence of household food insecurity is decreasing with time, from 68.5% in 2018 and 64.3% in 2020 to 42.8% in 2022, but remains high. The report lists several driving factors to account for chronic food insecurity in Gaza. One factor is the Israeli blockade, though there is no mention that Egypt controls the southern border. In addition the report points to "the weakness of public institutions and governance, demographic and sociocultural factors, such as urbanization and population growth, poverty and unemployment, lack of basic social services and infrastructure, inadequate support programs for vulnerable groups, ineffective nutrition awareness programmers, weak regulatory and monitoring mechanisms, environmental degradation and climate shocks." (44). The report further assessed that most of the financial support provided to Gaza by various donors was diverted from food and medical supplies to other purposes including building up military infrastructure.

Despite the dire projections of famine in the early IPC reports from December through March(2,4), the most recent report from June, states that "In contrast with

the assumptions made for the projection period (March – July 2024), the amount of food and non-food commodities allowed into the northern governorates increased. Additionally, the response in the nutrition, water sanitation and hygiene (WASH) and health sectors was scaled up”(3). This is consistent with our findings.

The study has significant strengths including its foundation on systematically and comprehensively recorded data, compiled by COGAT since the end of December from approved and completed food-aid consignments transferred across the border by UN agencies, State and humanitarian donors, and by private sector actors. This registry is more comprehensive than the UN databases of UNRWA, WFP and OCHA, which reflect only a part of the aid flow, and differ amongst themselves. Detailed analysis of the gaps and differences between UN and COGAT records reflect different methods of counting trucks, recording their contents and estimating shipment weights. For instance, the UNRWA dashboard largely lists the number of aid pallets rather than weights. UNRWA also only reports UN trucks entering Gaza via Rafah and Kerem Shalom land crossings that are handled by UNRWA. Trucks from other donors, from the private sector, or entering via other routes are not counted by the UN. Furthermore, UNRWA registers the trucks upon arrival at their warehouse, and thus may fail to account for trucks entering Gaza that are subsequently looted or stolen during transit (45). The A working paper published by Rosen and Nitzan described discrepancies of thousands of trucks listed in the COGAT database but absent from UNRWA records (46). The June IPC report that compares COGAT, WFP, FEWSNET and OCHA data, clearly illustrates under-reporting of the food supply by the UN agencies (pp. 10-11, Fig 5a and 5b) (3). The report’s authors acknowledge that inconsistent methods of recording shipments by the different actors makes it difficult to interpret the large discrepancies in the reported data. Therefore, they assessed trends in aid flow instead of trying to reconcile absolute quantities, and concluded that the different databases describe consistent trends: "Between March and the end of April, the supply of food commodities in the northern governorates... the southern and middle governorates steadily increased according to many sources, despite

differences in the absolute figures". The consistency of the trends despite the UN agencies under-reporting, lends confidence in our findings.

Our study is the first detailed analysis of data on the nutritional adequacy of the food aid supplied to the Gaza Strip during the war. It is reassuring that the mean food supply meets the Sphere standards which take into account the dietary requirements of all age groups and both sexes, including pregnant and breastfeeding women, and the potential conflict-related dietary needs of the population (47). Nevertheless, the gradual decline in the amount of food delivered by UN agencies from 51% of all food delivered in April, to 22.1% in July is a cause for concern, since it involves fewer standardized food parcels and more nonstandard food parcels, which have very different nutritional content. Standardized parcels are nutritionally balanced, and include high amounts of protein rich foods and iron fortified wheat flour. On the other hand, nonstandard parcels contain relatively lower proportions of legumes, meat, chicken or fish. Our study emphasizes that to ensure that the nutritional needs of the conflict affected population continue to be met, cooperation and coordination between aid donors and COGAT are crucial in order to monitor the quality as well as the quantity of the food supplied to Gaza.

Our study has several limitations. First, we only examined the first pillar of food security, namely, food availability, between January and July 2024. COGAT did not have a processes in place to facilitate the delivery and documentation of a massive humanitarian intervention. As a result, reliable and systematic data did not become available until January. We did not evaluate access, utilization, and stability of food obtained by conflict-affected people in Gaza. The per capita food availability data do not imply the nutritional intake of individuals in the population. Rather they indicate availability of adequate nourishment provided it is equitably and efficiently distributed. Systematic, quantifiable, objective, and verifiable examination of access to commercial and humanitarian food assistance is needed to augment the distribution of aid to conflict affected people. Increased cooperation between the Food Cluster with COGAT could help in this regard. The estimation and recording of

gross consignment weight limits the accuracy of the estimation. Since this estimation was consistent across all shipments documented, we believe any potential bias would likely be non-differential. Stringent adjustment factors we used to account for the potential overestimation of the food supply lend confidence that the absolute values we report are more likely to be underestimated than overestimated. Energy, protein, fat, and iron are imperfect proxies for total nutrient content of the supply. Because food storage and cooking conditions could not be verified, we could not reliably evaluate the actual micronutrient supply. Nevertheless, we chose to analyze iron as a reasonable proxy of foods with high nutrient density (both natural and fortified), and because of its importance for preventing iron-deficiency anemia. Last, our analysis only looked at the nutritional aspect of the humanitarian aid delivered to the Gaza Strip. Other aspects such as water, shelter and medical care should also be analyzed.

## **Conclusions**

Food aid delivered to Gaza during the war to date exceeds the minimal daily nutritional needs of more than two million conflict affected persons, meeting humanitarian standards. This finding belies allegations that Israel has deliberately obstructed the delivery of humanitarian aid in an attempt to starve Gaza into submission. In fact, it underscores that Israel has facilitated the sustained supply of humanitarian assistance to the civilian population in Gaza.

We recognize that the adequacy of the first pillar of food security, that is availability, is crucial, but cannot in itself ensure the food security of a population, let alone one in a conflict zone. To do so will require objective, transparent, and timely monitoring and strengthening of the three remaining pillars of food security: access, utilization, and stability. Enhanced coordination between the UN Food Security Cluster and COGAT and the systematic, objective, and verifiable assessment of nutritional security are essential so that future donations can be tailored and distributed to meet the dynamic needs and circumstances of Gaza's population, not only during

but after the war. In the past, Israeli and Palestinian health and nutrition professionals cooperated in the interests of both people (19). Health professionals must work together now, even before “the day after,” to provide a bridge to a secure future for citizens on both sides of the border.

DRAFT

**Declarations:**

- Ethics approval and consent to participate –This study analyzed logistics data provided by COGAT. Ethical approval is not needed for research that does not involve human subjects.
- Consent for publication-not relevant
- Availability of data and materials – data available upon request
- Competing interests - The authors declare that they have no competing interests
- Funding - none
- Authors' contributions –
  - NFI – data analysis, manuscript draft writing.
  - DN, AMT, RE, MBM – analysis supervision, revision, and critical manuscript review.
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#### **Abbreviations:**

COGAT - Coordinator of Government Activities in the Territories

IDF - Israeli Defense Forces

UN – United Nations

NGO – Nongovernmental organizations

IPC - Integrated Food Security Phase Classification

UNRWA - United Nations Relief and Works Agency for Palestine Refugees in the Near East

ICRC – International Committee of the Red Cross

IFRC - International Federation of the Red Cross and Red Crescent Societies

USDA – United States Department of Agriculture

RDA - Recommended Dietary Allowance

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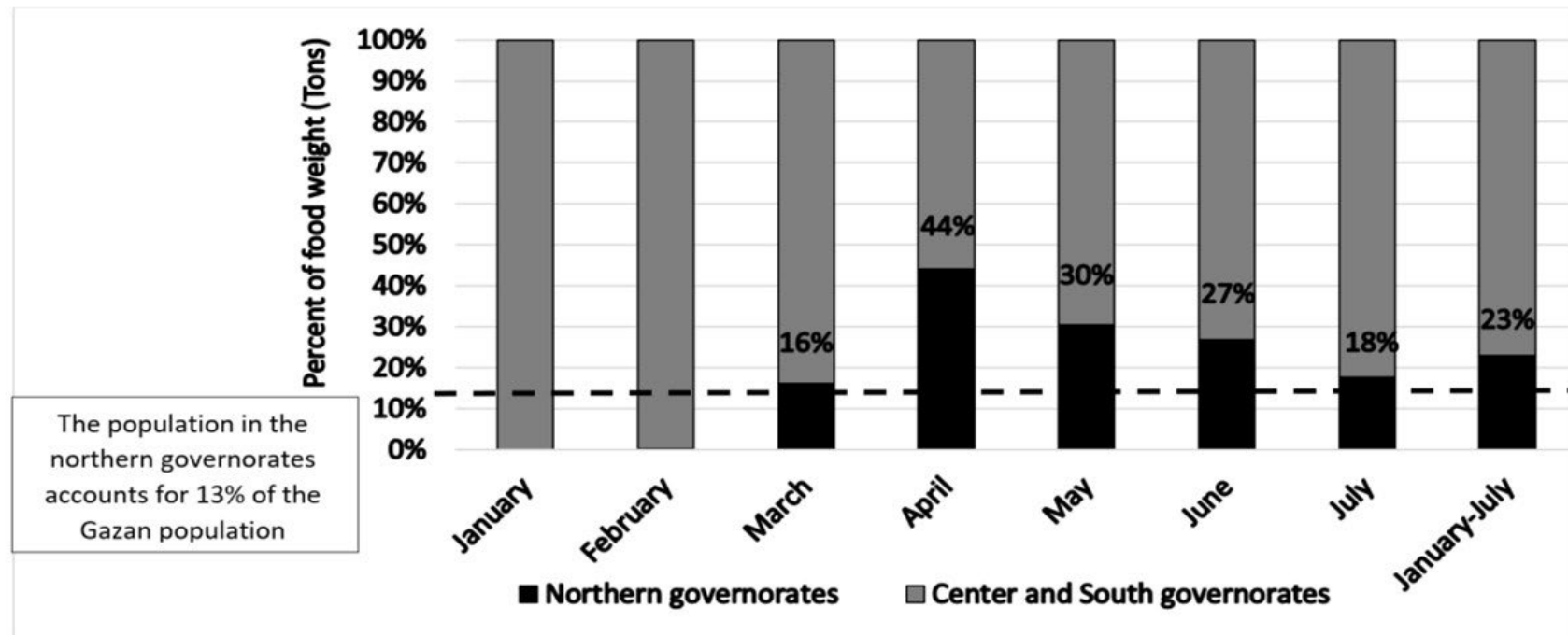


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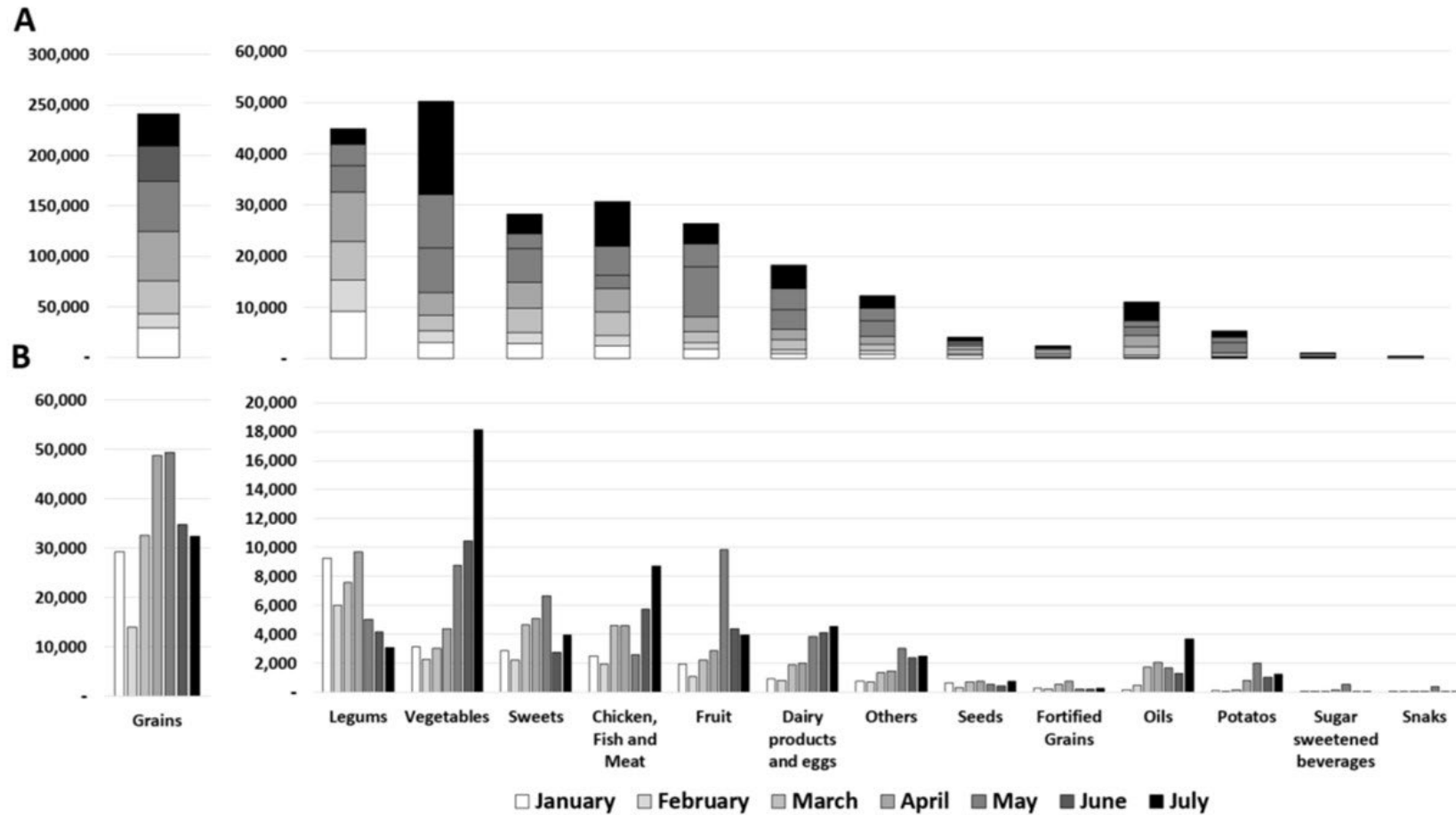
**Figure 1**



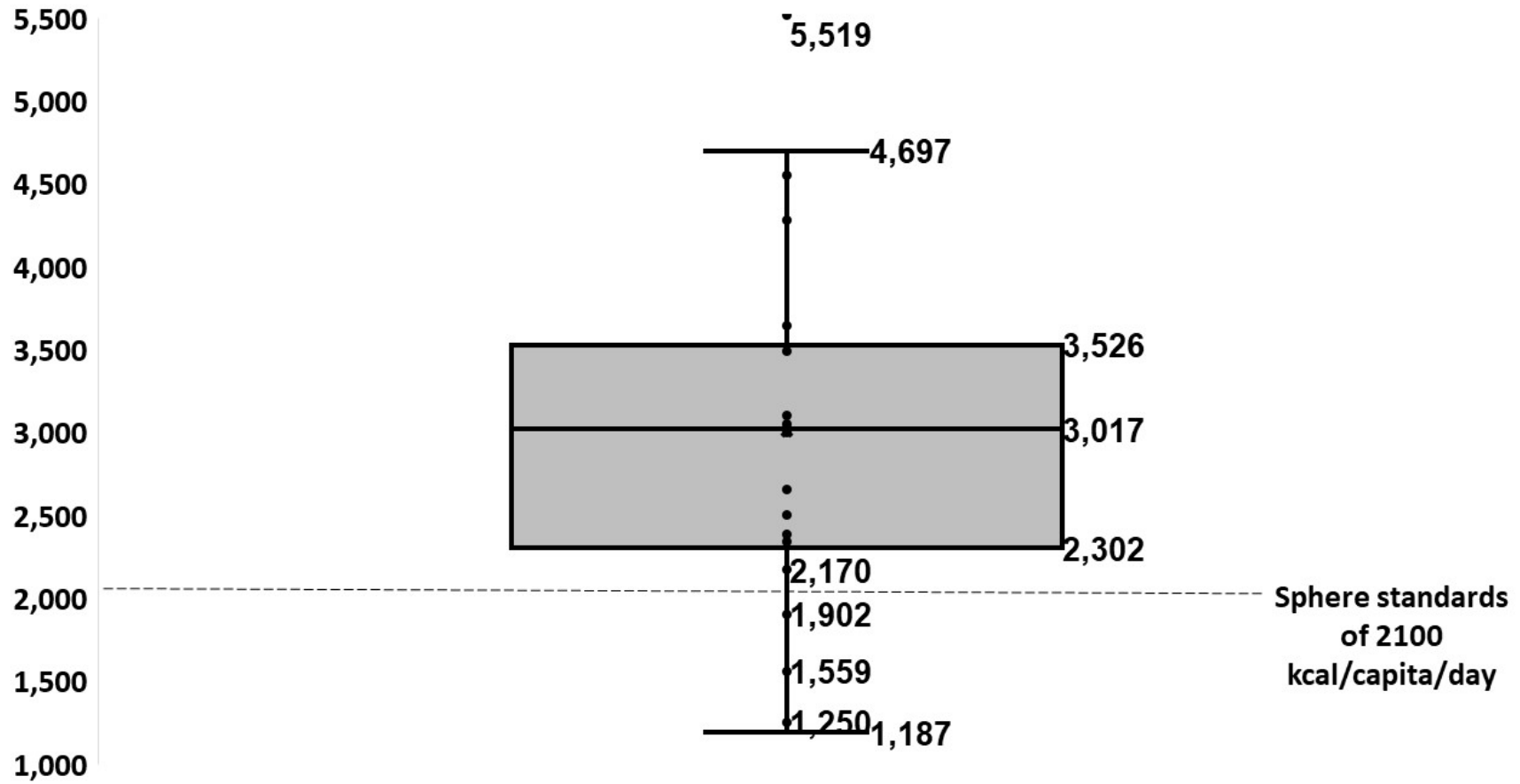
Tons	January	February	March	April	May	June	July	January-July
Northern governorates	-	86	9,876	36,814	28,831	19,296	14,912	<b>109,815</b>
Center and South governorates	52,293	30,203	51,455	46,774	66,054	52,607	69,030	<b>368,415</b>

Trucks from Erez crossing, airdrops and JLOTS shipments, and a partial number of trucks authorized missions to the north of Gaza, were categorized as those destined to the northern governorates. Trucks from Nitsana and the rest of trucks from Kerem Shalom were categorized as those destined to the southern and central governorates.

**Figure 2**



**Figure 3**



**Supplementary material**

**Supplementary table 1. Defined food commodities delivered to the Gaza Strip, food group categorization, nutritional value, and proportional weight in food commodities shipments**

Food name	Energy (kcal/100 gr)	Protein (gr/100 gr)	Fat (gr/100 gr)	Iron (mg/100 gr)	Food group	Food weight (Tons)	Proportional weight (%) from all shipments
Flour, wheat, all-purpose, enriched	359	13.1	1.48	3.44	Grains	206,306	62.68
Rice, white, long grain, unenriched	359	7	1.03	0.14	Grains	6,017	1.82
Pasta, dry, unenriched	371	13	1.51	1.3	Grains	7,975	2.41
Bread, pita, white, unenriched	275	9	1.2	1.4	Grains	355	0.11
Crackers, wheat, regular	455	7.3	16.4	2.64	Grains	362	0.11
Buckwheat groats, roasted, dry	692	23.4	2.71	2.47	Grains	200	0.06
Corn, sweet, yellow, canned	61	2	0.77	0.36	Grains	245	0.07
Corn meal	371	8.8	1.2	1	Grains	80	0.02
Oat Bran	728	34	7.97	8.07	Grains	20	0.01
Semolina	720	26	1.05	1.23	Grains	340	0.1
Bulgur, dry	342	12.3	1.33	2.46	Grains	160	0.05
Barley	139	2.2	2.74	1.28	Grains	1,780	0.54
Energy bar, emergency <sup>a</sup>	440	16	15	9	Fortified Grains	240	0.07

Legumes, (Non specified) <sup>b</sup>	354	23	2.8	6.76	Legumes	20	0.01
Beans, white, mature seeds, raw	333	23.4	0.85	10.4	Legumes	2,242	0.68
Lentils, raw	352	24.6	1.06	6.51	Legumes	1,465	0.44
Chickpeas mature seeds, raw	378	20.5	6.04	4.31	Legumes	1,785	0.54
Peas, green, split, mature seeds, raw	364	23.1	3.89	4.73	Legumes	265	0.08
Sesame butter, tahini	592	17.4	53	4.42	Seeds	420	0.13
Peanuts, all types, raw	567	25.8	49.2	4.58	Seeds	340	0.1
Seeds, sesame seeds, whole, dried	573	17.7	49.7	14.6	Seeds	60	0.02
Oil, canola	884	0	100	0	Oils	7,460	2.26
Chicken, broilers or fryers, meat and skin, raw	215	18.6	15.1	0.9	Chicken, Fish and Meat	4,385.5	1.33
Beef, cured, corned beef, canned	250	27	14.9	2.08	Chicken, Fish and Meat	898.6	0.27
Fish, cod, Pacific, raw	69	15.3	0.41	0.16	Chicken, Fish and Meat	2,583.5	0.78
Fish, tuna, light, canned in oil	198	29.1	8.21	1.39	Chicken, Fish and Meat	725	0.22
Beef, variety meats and by-products	276	15	23.5	5.67	Chicken, Fish and Meat	3,915	1.18



Cookies, butter, commercially prepared, unenriched	467	6.1	18.8	0.29	Sweets	1,288	0.39
Cake, sponge, commercially prepared	290	5.5	2.7	2.72	Sweets	1,240	0.38
Candies, halavah, plain	469	12.5	21.5	4.53	Sweets	294	0.09
Sweets, (Non specified) <sup>b</sup>	355.16	6.45	15.26	2.10	Sweets	30	0.01
Candies, milk chocolate	535	7.65	29.7	2.35	Sweets	80	0.02
Biscuit	370	7	18.9	2.76	Sweets	1,778	0.54
Rahat Lukum dessert	448	9	24	0	Sweets	20	0.01
Jams and preserves	278	0.37	0.07	0.49	Sweets	80	0.02
Sugars, granulated	387	0	0	0.05	Sweets	9,990	3.02
Honey	304	0.3	0	0.42	Sweets	176	0.05
Snacks, potato chips, plain, salted	532	6.39	34	1.28	Snacks	400	0.12
Snack, peanut butter	534	17	30	8	Snacks	40	0.01
Cheese, pasteurized processed cheese	310	15.6	23.9	1.3	Dairy products and eggs	2,155	0.65
Milk, fluid, 3% fat, without added vitamin A and vitamin D	42	3.37	3	0.03	Dairy products and eggs	4,325	1.31

Dairy products (Non specified) <sup>b</sup>	152.75	6.22	11.86	0.36	Dairy products and eggs	820	0.25
Sour cream, regular	198	2.44	19.35	0.07	Dairy products and eggs	80	0.02
Butter, without salt	717	0.85	81.1	0.02	Dairy products and eggs	60	0.02
Commercial powdered milk	500	26	26	0.0	Dairy products and eggs	240	0.07
Yogurt, plain, whole milk	61	3.47	3.25	0.05	Dairy products and eggs	255	0.08
Chocolate-flavor beverage mix for milk, powder	89	3.27	3.17	0.03	Dairy products and eggs	160	0.05
Dates, medjool	277	1.81	0.15	0.9	Fruit	2,250	0.68
Oranges, raw, with peel	63	1.3	0.3	0.8	Fruit	480	0.15
Clementine, raw	47	0.85	0.15	0.14	Fruit	240	0.07
Fruit (Non specified) <sup>b</sup>	104.45	1.31	0.37	0.50	Fruit	12,684	3.84
Lemon peel, raw	47	1.5	0.3	0.8	Fruit	495	0.15
Melons, cantaloupe, raw	38	0.82	0.18	0.38	Fruit	160	0.05
Apple, raw	52	0.26	0.17	0.12	Fruit	355	0.11
Bananas, ripe and slightly ripe, raw	98	0.74	0.29	0.4	Fruit	80	0.02

Pomegranates, raw	83	1.67	1.17	0.3	Fruit	60	0.02
Watermelon, raw	30	0.61	0.15	0.24	Fruit	700	0.21
Bananas, raw	89	1.09	0.33	0.26	Fruit	420	0.13
Guavas, raw	68	2.55	0.95	0.26	Fruit	20	0.01
Avocados, raw	160	2	14.7	0.55	Fruit	60	0.02
Tomato, raw	22	0.7	0.42	0.1	Vegetables	20	0.01
Onions, raw	40	1.1	0.1	0.21	Vegetables	2,434	0.74
Carrots, raw	41	0.93	0.24	0.3	Vegetables	120	0.04
Vegetables (Non specified) <sup>b</sup>	40.5	1.01	0.17	0.25	Vegetables	17,030	5.15
Garlic, raw	149	6.36	0.5	1.7	Vegetables	160	0.05
Potatoes, raw	58	2.57	0.1	3.24	Potatoes	4,935	1.49
Pickles, cucumber	14	0.48	0.43	0.23	Vegetables	100	0.03
Egg, whole, raw, fresh	143	12.6	9.51	1.75	Dairy products and eggs	4,065	1.23
Syrup, fruit flavored	261	0	0.02	0.03	Sugar sweetened beverages	40	0.01
Orange juice	47	0.73	0.32	0.06	Sugar sweetened beverages	498	0.15
Cola Beverages	42	0	0.25	0.02	Sugar sweetened beverages	100	0.03
Sugar sweetened beverages (Non specified) <sup>b</sup>	44.5	0.36	0.28	0.04	Sugar sweetened beverages	535	0.16
Tomato products, canned, sauce	24	1.2	0.3	0.96	Vegetables	705	0.21

Instant soup, noodle	25	1.03	0.44	0.16	Others	620	0.19
Soup, beef broth or bouillon, powder, dry	213	16	8.89	1	Others	40	0.01
Coffee					Others	1,835	0.56
Tea					Others	235	0.07
Multivitamin					Others	416	0.13
Salt					Others	1,980	0.6
Seasoning agents					Others	1,015	0.44

Nutritional values of foods were obtained from the USDA database: <https://fdc.nal.usda.gov>

<sup>a</sup> Nutritional values were obtained from the ICRC catalogue of food aid: <https://itemscatalogue.redcross.int/relief--4/food--5/nutrition-specialised-products--86/super-cereal-plus--FNUTSUPC01.aspx>, <https://itemscatalogue.redcross.int/relief--4/food--5/nutrition-specialised-products--86/emergency-food-ration-bar--FNUTEFRA01.aspx>, <https://itemscatalogue.redcross.int/relief--4/food--5/canned-food--15/ready-meal-canned--FCANMENU.aspx>

<sup>b</sup> Nutritional values calculated as mean values of all other foods in the food group

**Supplementary table 2. Nutritional composition of Standardized food parcels**

<b>Food content per parcel</b>	<b>Weight (gr)</b>	<b>Energy (kcal)</b>	<b>Protein (gr)</b>	<b>Fat (gr)</b>	<b>Iron (mg)</b>
<b>IFRC food parcel</b>					
SUGAR, white, 1kg	1,000	3,870	0	0	0
SALT, iodized edible, 1kg	1,000	0	0	0	0
YEAST, dried, package 11 gr	88	0	0	0	0
FISH, canned, sardines, veg oil, 150g	300	594	87	24.6	4.1
PASTA, durum wheat meal, 1kg	1,000	3,710	130	15.1	13
RICE, white, long grain, irri6/2, 1kg	1,000	3,590	70	15.1	13
OIL, rapeseed, 1liter	790	6,983.6	0	790	0
BEANS, white, small, 1kg	1,000	3,330	234	8.5	104
<b>Values per 100 gr parcel <sup>a</sup></b>		<b>357.3</b>	<b>8.4</b>	<b>13.8</b>	<b>2.18</b>
<b>WFP Parcels</b>					
Canned Chickpeas/Chickpea Paste (400 g x10) 4.00	4000	15120	820	241.6	172.4
Canned Fava Beans	2800	8316	153.16	6.16	28
Canned Chicken/ Beef (Only halal)	3520	8800	950.4	524.48	73.216
Canned Vegetables (Peas)	4400	10604	140.36	13.2	44.88
Halawa (30gx50) 1.50	1500	7035	187.5	322.5	67.95
<b>Values per 100 gr parcel <sup>a</sup></b>		<b>307.49</b>	<b>13.88</b>	<b>6.83</b>	<b>2.38</b>

UNRWA Food Parcel					
Beans Can 380g	760	2530.8	177.84	6.46	79.04
Banda Vita cheese 250g	750	1425	97.5	105	0
Saj Zlom Sauce 140 g	280	67.2	3.36	0.84	2.688
Vegetable Oil 700 ml	1400	12376	0	1400	0
Pasta 350 g	1400	5194	182	21.14	18.2
rice 1 kg	2000	7180	140	30.2	26
salt 750 g	750	0	0	0	0
Milk Powder 300g	300	1500	78	78	0
Chocolate 300 g	600	3210	45.9	178.2	14.1
White Beans 1 kg	1000	3330	234	8.5	104
sugar 1kg	1000	3870	0	0	0.5
Grits 500g	500	1855	44	6	5
Hummus l kg	1000	3780	205	60.4	43.1
<b>Values per 100 gr parcel <sup>a</sup></b>		<b>394.5</b>	<b>10.29</b>	<b>16.14</b>	<b>2.49</b>
OXFAM Food Parcel					

Ful with tomato and oil, ready to eat (400g) easy open	3200	10656	748.8	27.2	332.8
Hummus (chickpeas) 400g easy open	3200	12096	656	193.28	137.92
Cooked White Beans Can (400g) easy open	3200	10656	748.8	27.2	332.8
Green Olives Can (640g) Pitted.	640	928	6.592	98.048	3.136
Olives ,black, can 350 g, Pitted.	350	406	2.94	38.15	21.98
Luncheon Beef Can (340g)	2720	6800	734.4	405.28	56.576
Tahini 700) g(	700	4144	121.8	371	30.94
Honey 500 g	500	1520	1.5	2.1	0
date syrup - 500g	500	1665	0	0	5
high energy biscuits Box of 50pcs	10000	44000	1600	1500	900
Tea bags (200g)	200	0	0	0	0
Zaatar - Thyme (1000 g)	1000	0	0	0	0
Halawa (700 g) (two pcs of 350g)	700	3283	87.5	150.5	31.71
Dates Pitted500 - g package	500	1385	9.05	0.75	4.5
Apricots ,dried (500 g)	500	1205	16.95	2.55	13.3
Raisins ,dried (500 g)	500	1495	16.5	1.25	8.95

Sardines ,tinned (125g) easy open	750	1485	218.25	61.575	10.425
Tuna ,canned (170 g) easy open	1020	2019.6	296.82	83.742	14.178
Peas380 g , cooked canned easy open	2280	8299.2	526.68	88.692	107.844
Salt ,iodized (700g)	700	0	0	0	0
<b>Values per 100 gr parcel <sup>a</sup></b>		<b>265.7</b>	<b>13.7</b>	<b>7.24</b>	<b>4.77</b>
<b>WCK 2 day (A) Food Parcel</b>					
Honey	400	1216	1.2	0	1.68
Canned fava beans	800	568	43.76	1.76	8
Canned chickpea paste	660	2494.8	135.3	39.864	28.446
Canned sweet corn	800	512	15.6	4	3.28
Canned tuna fish	340	673.2	98.94	27.914	4.726
Canned beef	340	850	91.8	50.66	7.072
Fruit puree for kids (squeezezy)	800	488	5.6	1.6	0
Dates	700	1939	12.67	1.05	6.3
White cream cheese	460	1444.4	92	119.6	0
Toast	660	1914	59.4	26.4	21.978



Zaatar	50	0	0	0	0
Tahini	400	2368	69.6	212	17.68
<b>Values per 100 gr parcel <sup>a</sup></b>		<b>225.7</b>	<b>9.7</b>	<b>7.5</b>	<b>1.5</b>

The content of food parcels were obtained from different humanitarian aid organizations. The nutritional contribution of each food item in the parcels was calculated based on the USDA database, in adjustment to it's weight in the parcel.

<sup>a</sup> Nutritional values per 100gr were calculated for brutto dry food weight.

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**Supplementary table 3. Nutritional values assigned to cooked meals**

<b>Estimated cooked meal composition</b>	<b>Weight (gr)</b>	<b>Energy (kcal)</b>	<b>Protein (gr)</b>	<b>Fat (gr)</b>	<b>Iron (mg)</b>
White rice, cooked (1 cup)	133	231.4	5.1	4.2	0.6
Stewed, seasoned, beef with vegetables and potatoes (1 cup)	222	304.1	23.1	17.5	3.1
Matbuha, vegetable-based spread (4tbls)	30	20.1	0.0	1.0	0.4
Tahini (2tbls)	30	178.5	5.1	16.1	2.7
Pitta bread (1unit)	60	165.0	5.5	0.7	0.8
Baklawa (3 pieces)	33	139.9	2.0	3.0	0.0
<b>Values per 100 gr <sup>a</sup></b>		<b>204.5</b>	<b>8.0</b>	<b>8.4</b>	<b>1.5</b>

The content of the cooked meals in deliveries were estimated based on prior knowledge of the Ramadan evening meal, since most meals were donated during the month of Ramadan. The nutritional contribution of each food item in the parcels was calculated based on the USDA database, in adjustment to it's weight in the parcel.

<sup>a</sup> Nutritional values were calculated per 100gr brutto dry food weight.

Supplementary table 4. Proportional weight of each food group within ready meals and food parcels	Ready meals	WFP Parcels	WCK Food Parcel	UNRWA Food Parcel	OXFAM Food Parcel	The IFRC food parcel	Standardized food parcel (all other donors) <sup>a</sup>	Non- standardized parcels	Standardized parcels (mixed shipments)	Non- standardized parcels (mixed shipments)
Grains	26%		23%	33%		32%	16%	68%	16%	68%
Fortified Grains	12%						2%	0%	2%	0%
Ready meals										
Legumes		64%	23%	24%	28%	16%	28%	2%	28%	2%
Oils				2%	2%	13%	1%	2%	1%	2%
Seeds	6%		6%		2%		3%	0%	3%	0%
Chicken, Fish and Meat	44%		11%		11%	5%	13%	4%	13%	4%
Sweets	6%	9%	6%	14%	27%	16%	12%	5%	12%	5%
Snacks								0%		0%
Dairy products and eggs			7%	9%			3%	4%	3%	4%
Fruit			23%		5%		6%	5%	6%	5%
Vegetables	6%	27%		12%			9%	6%	9%	6%
Potatoes								1%		1%
Sugar sweetened beverages										
Others			1%	6%	26%	18%	7%	2%	7%	2%

<sup>a</sup> Standardized food parcels from all other donors, besides those specified

**Supplementary table 4. Gaza population size, 2023 size (Gazan CBS) and calculated dietary allowance**

Age group	Population size, 2023	Daily RDA per person <sup>a</sup>			Daily nutrient supply requirements		
		Kcal	Protein	Iron	Kcal	Protein	Iron
0-3	237,398	1000	13	7	237,398,000	3,086,174	1,661,786
4-8	296,036	1400	19	10	414,450,400	5,624,684	2,960,360
9-13	292,800	1700	34	8	497,760,000	9,955,200	2,342,400
14-18	279,248	2000	59	13	558,496,000	16,475,632	3,630,224
19-45	644,599	2200	51	13	1,418,117,250	32,874,536	8,379,784
19-45 pregnant/lactating women <sup>b</sup>	214,866	2500	55	18	537,165,625	11,817,644	3,867,593
46+	265,056	1900	51	8	503,606,400	13,517,856	2,120,448
<b>Total population</b>	<b>2,230,003</b>						
Theoretical daily nutrient supply required by a healthy population with the Gazan age distribution		Per total population			4,166,993,675	93,351,726	24,962,594
		Per capita			125,009,810,250	2,800,551,780	748,877,828
		Per capita, accounting for 30% food loss			1,934	43	12

<sup>a</sup> RDA's were obtained from "Dietary Reference Intakes: Applications in Dietary Planning, Institute of Medicine of the National Academies, Washington DC, 2003;p 22"(23). These estimates are not appropriate for individuals or groups who are ill or for repletion of deficient individuals. Actual dietary needs are likely to be higher.

<sup>b</sup> The number of pregnant and lactating women were added to the population size, calculated as the number of children aged 0-1 years

Supplementary figure 1. Distribution of food aid source by month

