

WORKING PAPER (pre-peer review preprint)

Nutritional Assessment of Food Aid delivered to Gaza via Israel during the 'Swords of Iron' War

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Note: This paper has not yet undergone peer review. The findings are provisional and the conclusions may change

Abstract

Background: The 'Swords of Iron' War, following the Hamas attack on Israeli southern communities on October 7th 2023, has had a major impact on public health in both Israel and Gaza. International humanitarian agencies have warned of increasing risk for severe food insecurity and a threat of famine in Gaza. Contrary to claims that Israel has deliberately starved Gaza, Israel has gone to considerable lengths to facilitate food aid delivered to Gaza. We therefore aimed to ascertain the quantity and nutritional composition of the food aid delivered to Gaza, and assess its compliance with Sphere standards.

Methods: We obtained the registry of all aid delivered to Gaza via the Kerem Shalom and Nitzana land crossings between January - April 2024 from Israel's Coordinator of Government Activities in the Territories (COGAT). For every truck carrying food, each of the food items was categorized into food groups, quantified, and assessed for nutrient composition, according to food composition databases. We then summed the energy (kcal), protein (gram), fat (gram), and iron (mg) content of all shipments, and divided those sums by the estimated population size reported by the Gaza Central Bureau of Statistics. Finally, we compared the daily per capita supply to the Sphere standards and the age-specific Recommended Dietary Allowance (RDA), according to the age distribution of the population in Gaza.

Results: Between January and April 2024, COGAT facilitated the entry of 14,916 trucks conveying 227,854 tons of food into Gaza. On average, 3,729 food trucks entered Gaza per month (124 per day), with a continuous mean increase of 431 trucks per month. Between January and April, food shipments' weight (tons) grew by 53%, especially in the following food groups: nuts and seeds (2,917%), fruit (2,851%), vegetables (2,657%), Dairy and eggs (934%), Potatoes (662%), and chicken, fish, and meat (92%). The crude mean energy availability based on the analysis of the nutritional content of the food supply was 3,211 kcal per capita per day, 97.6 gr protein per capita per day (12.2% of energy), 29.5 gr fat per capita per day (3.7% of energy) and 16.7 mg iron per capita per day. The dietary energy and protein availability is well in keeping with Sphere standards, as well as the RDA for age-adjusted population dietary needs. The mean fat and iron supply rose steadily from January, reaching Sphere standards in April.

Conclusions: The quantity and quality of food delivered to Gaza have steadily improved and diversified since January 2024. The food supply contains sufficient energy and protein for the population's needs. Further studies should investigate food supply distribution and population access to humanitarian aid. Supporting these efforts with reliable data is vital to continue to improve results.

Introduction

The Iron Sword War began on October 7, 2023, after massive barrages of rockets were fired at civilian targets all over Israel, and Hamas attacked Israeli communities and a music festival near the Gaza border, murdering over 1,145 men, women, and children, and wounding roughly 1,800. Substantial evidence have also accumulated to extreme sexual violence against both male and female victims¹. That morning, they also brutally abducted 256 infants, children, women, elderly, and men. The destruction and burning left in the wake of the attack forced approximately 200,000 Israeli citizens from their homes.

Hamas as the authority in control in Gaza took no precautions to protect the population amongst whom they were densely embedded. The Israeli Defense Forces (IDF) pursuit of the terrorists in Gaza necessitated the demolition of rocket launchers, hundreds of miles of tunnels underlying civilian neighborhoods, and ammunition stored in hospitals, schools and mosques. This has displaced the civilian population, caused damage to infrastructure, and resulted in food insecurity and an increased risk of famine. It is important to note that the attacks did not end on October 7th. Thousands of rockets were launched against Israeli civilians for months, necessitating a robust Israeli defense and complicating early humanitarian efforts. Although 124 abducted people were released during a humanitarian pause in the fighting in November, 132 Israelis remain in captivity in Gaza and have yet to be released². Nevertheless, Israel's policy has been to make every reasonable effort to facilitate the delivery of humanitarian aid donated by allies, Arab countries and international humanitarian agencies, to the civilian population of Gaza. The coordination and facilitation of humanitarian aid is implemented by the Coordinator of the Government Activities in the Territories (COGAT)³. This is in Israel's strategic interests and in accord with international law⁴.

The Nitsana-Rafah land crossing opened on the 21st of October, and the Kerem Shalom land crossing opened on the 12th of December 2023, to increase food supply to the Gaza Strip. Many national and international partners provide food shipments, including United Nations (UN) agencies, Arab countries, international Non-governmental agencies (NGOs) and the private sector. Since that time determined efforts of Israel and its allies have progressively increased the influx of aid into Gaza, despite continued fighting and fraught negotiations to release Israeli hostages and bring about a cease-fire. Three additional land crossings have been opened to allow delivery of aid in Central and Northern Gaza, a pier has been built to permit delivery of aid by sea, and arrangements have been made to facilitate the inspection and shipment of humanitarian to Gaza via the Israeli port of Ashdod³.

As experts, educators, and practitioners committed to ensuring nutritional security to people wherever they may be, we undertook the present study with a sense of urgency following the publication of two Integrated Food Security Phase Classification (IPC) reports disparaging the humanitarian aid provided by Israel and warning of looming famine. Our study provides essential and verifiable data on the quantity and nutritional value of food items crossing the border into Gaza. Reliable representative data on food distribution and accessibility are not available since Hamas retains control of Gaza and its population.

Methods

We analyzed the food shipments delivered into the Gaza Strip by land between January to April 2024, as recorded by COGAT. These records list the date of shipment, the consignee, the weight and the content of trucks entering Gaza via the Nitzana and Kerem Shalom crossing points. Unlike the data posted by United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA)⁵, the COGAT data lists the gross weight of each consignment and its content. Also, it includes data of aid delivered from multiple sources and not only UN agencies, such as national and private sector donations.

We classified the food consignments listed for each truck into: 1. specific food commodities; 2. standardized food parcels containing the food items recommended by the UN humanitarian agencies and the International Federation of the Red Cross and Red Crescent Society (IFRC ICRC) ; 3. Non-standardized food parcels, calculated based on their documented content; 4. Mixed food parcels (with standard and non-food components and other aid such as medical and hygiene supply); 5. Cooked meals; and 6. Food items for infants (< 12 months of age) (Table 1). Food items were further categorized according to food groups (Supplementary Table 1). The proportional weight of each food item within ready meals and standardized parcels was also categorized by food groups.

The energy (kcal/ton) and protein (gm/ton), fat (gm/ton) and iron (mg/ton) content of each shipment was estimated according to the food composition values. (Supplementary table 1). The shipment weight was adjusted for each category. The weight of food in standardized food aid parcels was available, allowing us to calculate the non-food items (e.g., packages), and adjust the weight accordingly. In cases of mixed shipments including food, and other aid such as clothing, medical supplies, we adopted an extremely precautionary approach, adjusting the net weight of food as 50% of the consignment's weight. We adjusted the shipment weight for all other food items, decreasing the available weight by 15% (Table 1).

Table 1. Supply categories included in the analysis, data source, and nutritional value

Supply category	Calculations of nutritional value	The factor used for weight adjustment of shipment to available food	Protein (gr/100gr)	Energy (kcal/100gr)	Fat (gr/100 gr)	Iron (mg/100 gr)
Specific food commodities	Nutritional value was extracted from the USDA's comprehensive source of food composition data. Each food item was categorized into specific food group: grains and fortified grains, legumes, vegetables, potatoes, fruit, dairy products and eggs, meat, fish and poultry, oils, sweets, sugar-sweetened beverages, and others (Supplementary 1).	Adjustment for 15% loss ^a . 5	Please see supplementary table 1			
Standardized parcels	The IFRC food parcel as a reference for all standardized parcels. Each IFRC parcel contains 2 kg of grains (pasta and rice), 1 kg of legumes (beans), 790 gr oil (canola), 1 kg of sweets (sugar). Nutritional values for 100 gr are calculated according to food weight (app. 7 kg) (Supplementary 3).	Since the total parcel weight (including packaging) is reported as 12kg, we adjusted the parcel weight accordingly (=7/12) ^b .	7.8	331.6	1.1	1.5

Non-standardized parcels	The nutritional value was calculated as the weighted mean of nutritional values of all foods supplied in supply as specific food commodities (supplementary table 1).	Weight was adjusted by considering 15% loss ^a .	6.2	152.2	2.7	0.7
Standardized parcels (mixed)	We used the nutritional content of the standardized food parcel (Supplementary 4).	Measured food weight was assumed as 50% of the supply weight (while the rest is medical or other humanitarian supply). Further adjustment was made by 7/12 ^b .	7.8	331.6	15.4	2.6
Non-standardized parcels (mixed)	The nutritional value was calculated as the weighted mean of nutritional values of each of the food items in the parcels (supplementary table 1).	Measured food weight was assumed as 50% of supply weight (while the rest is medical or other humanitarian supply), with another adjustment 15% loss ^a .	6.2	152.2	0.33	0.70
Ready meals	The nutritional value of a standard main meal was used, including: 1 cup cooked	Weight was adjusted by	8.0	206.1	5.5	1.5

	grains (133 gr), 1 cup red meat in vegetable sauce (222 gr), pita bread (1 unit), vegetable-based spread (4tbs), tahini (2tbs), and dessert (3 Baklawa pieces). Nutritional values were calculated as assumed weight (after reducing 30% loss), and adjusted to parcel weight (truck weight) (Supplementary 2).	considering 15% loss ^a .				
Foods for infants						
Complementary food for infants >6 months of age (mashed vegetables)	Food labels provided by the commercial international brand.	Weight was adjusted by considering 15% loss ^a .	1.0	40.0	0	0.6
Infant nutritional supplementation (IFRC catalogue) ⁶	Food labels provided.		13.4	535.0	13	45
Infant formula for 6 months to one year of age	Food label of a commercial international brand		155.0	4260.0	11	10

^a Adjustment of food aid delivery weight was adjusted as acceptable by international aid agencies as 15%..

^b IFRC ICRC catalogue <https://itemscatalogue.redcross.int/relief--4/food--5/food-parcels--40/food-parcels--KRELFOPA01P.aspx>

Finally, we summed the contribution of energy (kcal), protein (grams, and % of kcal), fat (gr, and % of kcal), and iron (mg) delivered per month to the Gaza Strip. Based on Gazan population size, as reported by the Gaza Central Bureau of Statistics (n= 2,028,761 excluding infants <12 months)⁷, nutritional availability per capita per day was calculated (Supplementary table 4).

Food availability comparison to dietary needs of the population: the nutritional availability (kcal, protein, fat, iron) of shipments was compared to two estimates of the needs of the Gazan population:

- a. Sphere Standards "Essential concepts in food security and nutrition" guidelines⁸.
- b. The USA Recommended Dietary Allowance (RDA)⁹ (Supplementary table 4), used to assess age-adjusted population dietary needs.

Results

Data from 14,916 trucks weighing 227,853.8 tons of food items, which were recorded in the COGAT database, were analyzed. The mean number of trucks crossing was 3729 per month (124.3 per day), with a mean increase of 430.6 trucks per month during the past three months. About 47% of the trucks were delivered from UN aid agencies, and 32.6% from other international aid agencies and private sectors.

The proportional weight of shipments indicated that most food supply can be attributed to standardized food parcels, and specific food commodities (Table 2).

Table 2. Amounts (tons) of food supplied to the Gaza Strip, by supply category, between January-April

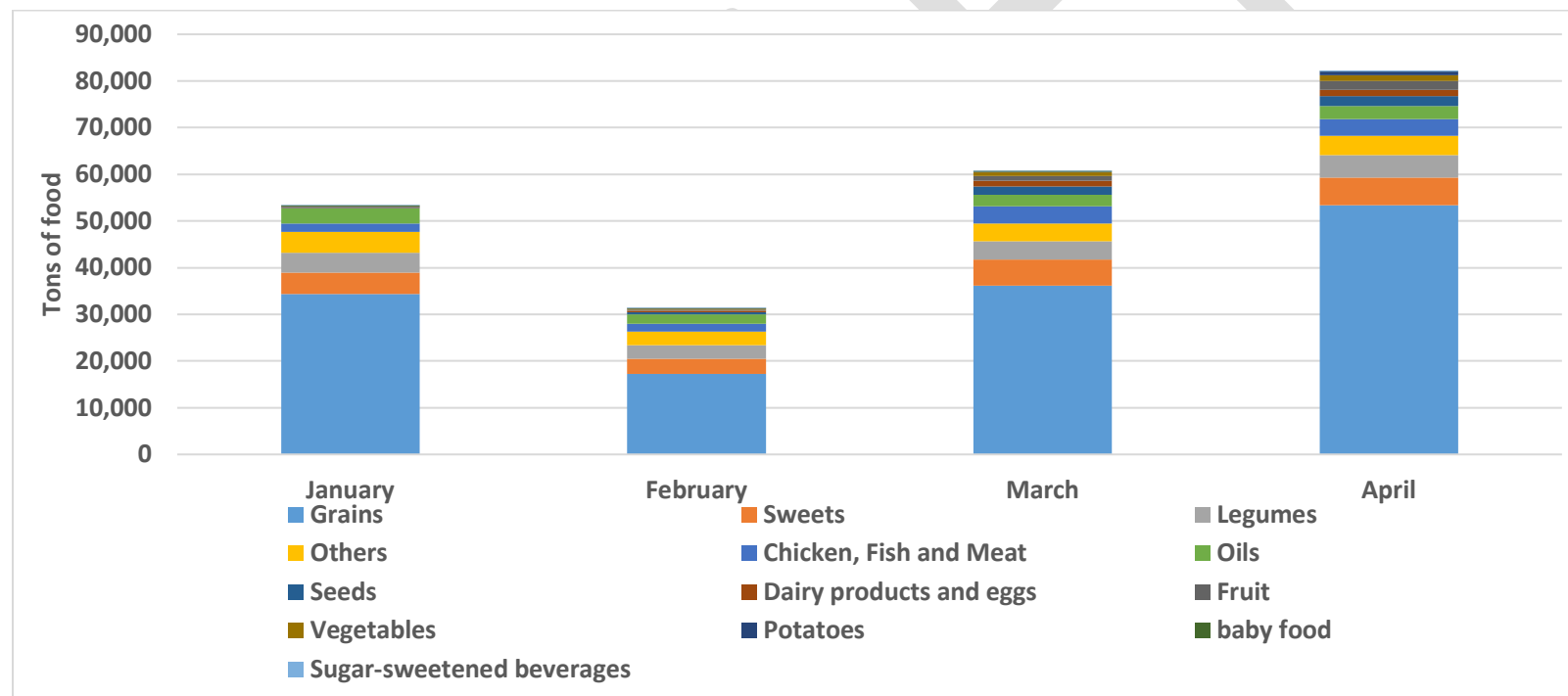
	January	February	March	April	Total weight ^a (Tons)	Proportional weight (%) of all shipments
Specific food commodities	27,238	14,706	39,264	56,105	137,314	60.26
Standardized food parcels	23,759	15,044	17,608	21,002	77,414	33.98
Cooked meals	327	217	2,422	2,639	5,606	2.46
Standardized food parcels (Mixed)	1,396	1,300	968	654	4,318	1.90
Non-standardized food parcels	523	83	348	1,679	2,633	1.16
Infant food ^b	259	29	119	59	467	0.20
Non-standardized food parcels (mixed)	6	0	19	76	102	0.04
Total weight (Tons)	53,509	31,381	60,748	82,215	227,854	

^a Total weight is the sum of food weight across 4 months, adjusted to losses as depicted in Table 1: specific food commodities, cooked meals, non-standardized parcels, and infant food were adjusted by 15%, standardized food aid parcels were adjusted by 42%. In addition, mixed shipments were regarded the weight of food as 50%.

^b Infant food includes complementary infant food, infant nutritional supplements and Infant formula for six months of age and older

Calculating the weight in tons of food items and food groups from all categories, it is apparent that shipments delivered a wide variety of foods (Supplementary table 2), and these increased each month (Figure 1). Compared to January, by April, the amount of foods grew by 53%, especially in the following food groups: nuts and seeds (2,917%), fruit (2,851%), vegetables (2,657%), Dairy and eggs (934%), Potatoes (662%), and chicken, fish, and meat (92%). The highest amounts of food delivered to the Gaza Strip was shown in March and even more so in April.

Figure 1. The amounts (tons) of food, by food groups, between January-April



Nutrient availability in food shipments have increased by month, with the highest availability of nutrients shown in April. The mean energy availability across 4 months was 3,163 kcal per capita per day, after adjusting for packaging and other non-food weight. Protein availability amounted to 103.7 gr per capita per day, with a mean of 13% of the energy intake. Mean fat availability was 29.5gr per capita per day (3.7% of daily kcal), and mean iron availability was 16.7 mg per capita per day (Table 3).

Table 3. Mean nutrient availability from food supplies to the Gaza Strip, between January-April

	January	February	March	April	Total Nutrients ^a
Energy (kcal) per month	187,220,674,602	105,937,613,646	209,760,241,172	278,762,565,734	781,681,095,153
kcal per capita per day ^b	3,076	1,741	3,446	4,580	3,211
Protein (gr) per month	5,734,007,281	3,086,758,983	6,328,115,224	8,603,470,909	23,752,352,397
gr protein per capita per day ^b	94.2	50.7	104.0	141.4	97.6
% of kcal from protein per capita per day ^b	12.3	11.7	12.1	12.3	12.2
Fat (gr) per month	523,941,019	762,729,386	2,690,313,907	3,192,973,979	7,169,958,291
gr fat per capita per day ^b	8.6	12.5	44.2	52.5	29.5
% of kcal from fat per capita per day ^b	1.1	2.9	5.1	4.6	3.7
Iron (mg) per month	900,272,010.6	433,788,359.6	1,095,412,082.1	1,635,934,948.2	4,065,407,400.6
Mg iron per capita per day ^b	14.8	7.1	18.0	26.9	16.7

^a Total nutrients is the sum of nutrients across 4 months, calculated according to the nutritional value of each food/supply category and adjusted weight adjusted as depicted in Table 1

^b Per capita per day analysis was performed by dividing the total amount of each nutrient by Gaza population size (2,028,762 people), and the number of days (30 days per month analysis and 120 days per 4-month period).

Compared to the Sphere guidelines and to population age-adjusted dietary needs, it is apparent that both the amounts of food and their nutritional values of energy and protein closely approximate the recommendations of Sphere guidelines and population age-adjusted dietary needs. The amount of dietary fat and iron are lower than recommended values (Table 4).

Table 4. Comparison between foods supplied to the Gaza strip, Sphere guidelines for humanitarian aid supply to conflict affected populations, and age-adjusted population dietary needs

	Analysis of food supplied to the Gaza strip	Sphere guidelines for humanitarian food supply ^a	Age-adjusted population dietary needs ^b
Energy (kcal)			
Population needs (per month)	781,681,095,153	4,406,616,900	122,638,281,600
Mean personal need (Kcal per day)	3,211	2100	1,898
Protein (gr)			
Population needs (per month)	23,752,352,397	111,214,617	2,772,647,322
Mean personal need (gr, % of kcal per day)	97.6, 12.2%	53, 10%	43
Fat (gr)			
Population needs (per month)	7,169,958,291	83,935,560	
Mean personal need (gr, % of kcal per day)	29.5, 3.7%	40, 17%	20-35%
Iron (mg)			
Population needs (per month)	3,493,038,397	67,148,448	724,704,318
Mean personal need (mg per day)	14.3	32	11

^a Population dietary needs according to Sphere recommendations were calculated by multiplying Sphere personal needs, with Gaza population size in 2023 (2,098,389 people).

^b Age-adjusted population dietary needs – calculated according to age group distribution of the population of Gaza in 2023, and age-specific Recommended Dietary Allowance (RDA) (Supplementary table 4). Personal dietary needs were calculated by dividing population needs by population size (2,098,389 people).

Sensitivity analysis

We performed two sensitivity analysis in order to validate our results and assess their consistency. Both calculations aimed to analyze nutrient availability after adopting a more stringent precautionary approach to our assumptions in data analysis. In the first, the estimated nutritional content of food deliveries accounted for major food loss – 30% of truck weight (as opposed to the acceptable 15%), and the second analysis excluded baby food of any kind. Both analysis yielded similar results, compliant with Sphere standards (Table 5).

Table 5. Mean nutrient availability from food supplies to the Gaza Strip, between January-April (sensitivity analysis)

	January	February	March	April	Total Nutrients ^a
Analysis 1. Estimating 30% food loss, among total population, n=2,098,389					
Energy (kcal) per month	187,246,638,670	105,205,638,075	203,988,053,449	273,550,123,197	769,990,453,391
kcal per capita per day ^b	3,077	1,729	3,352	4,495	3,163
Protein (gr) per month	6,142,946,037.7	3,254,412,352.9	6,650,168,926.1	9,206,561,177.1	25,254,088,493.8
gr protein per capita per day ^b	100.9	53.5	109.3	151.3	103.7
% of kcal from protein per capita per day ^b	13.1	12.4	13.0	13.5	13.1
Analysis 2. Excluding infant food among children, adolescents and adults, n=2,080,982					
Energy (kcal) per month	187,220,674,602	105,937,613,646	209,760,241,172	278,762,565,734	781,681,095,153
kcal per capita per day ^b	2,999	1,697	3,360	4,465	3,130
Protein (gr) per month	5,734,007,281	3,086,758,983	6,328,115,224	8,603,470,909	23,752,352,397

gr protein per capita per day ^b	92	49	101	138	95
% of kcal from protein per capita per day ^b	12.3	11.7	12.1	12.3	12.2

^a Total nutrients is the sum of nutrients across 4 months, calculated according to the nutritional value of each food/supply category and adjusted weight adjusted as depicted in Table 1

^b Per capita per day analysis was performed by dividing the total amount of each nutrient by a subsample of the Gaza population size (2,080,982 people), and the number of days (30 days per month analysis and 120 days per 4-month period).

Discussion:

This in-depth analysis highlights the fact that the amount of food delivered per capita should be sufficient for the entire Gazan population, and meets Sphere humanitarian recommendations for food aid delivery to conflict affected populations, during the period examined. The food content of the shipments is diverse, and grows by month in amounts and nutritional values. The highest amounts of food, nutritional diversity and nutrient availability was seen in April, projecting towards the potential following months of war. Our analysis had consistent results, even after applying the most stringent assumptions of food loss and exclusion.

We note that the supply of dietary fat and iron per capita did not reach the standards, and therefore recommend that the Nutrition and the Food Security Clusters encourage humanitarian aid organizations to improve the supply of fat and iron-rich foods. It is important to note that nutritional supplements, which were not accounted for in this analysis, could have increased the supply of iron. It is also important to note that in April, food supply was at its peak, achieving the nutritional goals for fat and iron. Our nutritional assessment also shows relatively low amounts of fruit and vegetables, which may indicate the low availability of other micronutrients. Further investigation is needed regarding the availability of these food groups in Gaza. However, the analysis presented here is based only on food consignments arriving in Gaza through the Israeli checkpoints. Additional sources of food aid provided by air, sea, and via the Egyptian border were not taken into account. Therefore, our results do not represent the entire food supply available to the population, which may have more fruit and vegetables.

For purposes of comparison, the United Nation Office for the Coordination of Humanitarian Affairs' (OCHA) online dashboard¹⁰ 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 dashboard⁵, which provides partial information, the average daily rate of trucks carrying food into Gaza 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). In other words, the amount of food passing into Gaza at present is significantly greater than before October 7th 2023. Israel's policy, articulated and implemented by COGAT, clearly states that there are no restrictions on the admission of humanitarian aid into the Gaza Strip, provided it is coordinated in advance with the Israeli authorities and passes through security screening. So far, 98.7% of all aid trucks sent were approved and entered the Gaza Strip. Only 1.3% of the trucks (307 trucks) were rejected or sent for repackaging, as they carried unauthorized dual-use items that can be reprocessed for warfare and terrorist activities³. We note that food items account for only 63% of the total aid entering the Gaza Strip through the Israeli checkpoints. The other supplies include tents and shelters (15%), medical supplies (8%), bottled water, and various other mixed goods (7%)³.

Among numerous reports warning of decreasing nutritional security, imminent hunger, and famine two stand out. The report by the Integrated Food Security Phase Classification (IPC) Famine Review Committee (FRC) food insecurity analysis conducted in December 2023¹¹, and the report by the Global Nutrition Cluster Nutrition Vulnerability and Situation Analysis/Gaza published in February 2024¹². Both relied on essentially the same set of data. The IPC report warned of a high risk of famine in Gaza between mid-March and mid-July in projections of a worst-case scenario. Although the reports admittedly rely on scant and methodologically limited data, we take this warning seriously.

Several key factors hinder and delay Israel's ability to increase the amount of aid reaching civilians in the Gaza Strip, and these must be addressed. Theft, looting, and hoarding of food and other supplies, and the limited capabilities of international organizations operating inside Gaza to ensure access of the conflict-affected populations to adequate food baskets clearly interfere with regular and equitable distribution that is essential during a crisis. Hamas must be held accountable for its failure to ensure the well-being of Gaza's civilian population. Its military activities are

prioritized and it intentionally interrupts humanitarian efforts. They fire rockets from within, nearby, and even towards humanitarian zones and other such critical infrastructures such as a desalination plant funded by the international community, and at IDF forces protecting humanitarian corridors. In the last week alone Kerem Shalom, a major crossing point for humanitarian aid trucks, endured three mortar rounds (8.5.24), and 16 rocket attacks (5.5.14, 7.5.24), while the northern pier and humanitarian corridor endured fire and rocket attacks for several days (3-6.5.24)^{13,14}.

Most of this study's limitations stem from the fact that it is an ecological study with data and analysis limited to the first pillar of food security, namely, food availability. To avoid overestimating the available food per capita per day, we used stringent adjustment factors to arrive at the net weight. We tried to avoid further bias by comparing the calculated content of the available food to the Sphere standards and to the US RDA. As these standards focus on population- and individual-based consumption, our findings do not reflect the actual food consumption of the conflict affected people in Gaza. It must also be noted that the ecological data utilized is aggregated over time. We consider that the day-to-day variability is not critical if the extra food provided is stored in adequate warehouses, ready to supply the delivered items, as needed.

While the continuing Gaza-Israel war imposes tremendous suffering on citizens on both sides of the border, it is the civilian population in Gaza that is at the most severe and immediate risk of food and nutrition insecurity. Our data shows that the food items entering Gaza meet or exceed the calories and protein level depicted in the Sphere standards. Nevertheless, nutritional security cannot be met without ensured access, utilization, and stability. To effectively address the food needs in Gaza will require a thorough assessment "from border to consumption" a project that would require cooperation between Israeli, Palestinian, and international agencies, health practitioners and researchers united in an effort to ensure the nutritional security of the citizens of Gaza. Supporting these efforts with reliable data will be vital to continue to improve results.

International partners should continue to strengthen constructive dialogue and collaboration with Israel and with Palestinian civil society to improve and secure the civilian population's access to food, until a ceasefire can be reached, and our communities rebuilt. Tendentious reports that ignore or disparage Israel's humanitarian efforts and which vilify Israel and fail to acknowledge Hamas' role in obstructing aid will only promote ignorance and hatred and distance the possibility of cooperation and peace. Historically, Israeli and Palestinian health and nutrition professionals cooperated to improve the well-being of both peoples^{15,16}. If health professionals from all sides work together, we can mitigate suffering even before "the day after" and provide a bridge to a more secure shared future.

Declarations:

- Ethics approval and consent to participate –This study analyzed logistic 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 - none
- Funding - none
- Authors' contributions –
 - NFI – data analysis, manuscript draft writing.
 - DNK, AMT, RE, MBM – analysis supervision, critical review of manuscript.
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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

IFRC ICRC - International Federation of the Red Cross and Red Crescent Society

USDA – United states department of Agriculture

RDA - Recommended Dietary Allowance

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Supplementary material

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

Food name	Food group	Energy (kcal/100 gr)	Protein (gr/100 gr)	Fat (gr/100 gr)	Iron (mg/100 gr)	Estimated food weight (Tons)	Proportional weight (%) of all shipments
Flour, enriched	Grains	370	15.1	2.73	3.44	96670.7	0.7696
Rice, white, unenriched, raw	Grains	359	7	1.03	0.14	2069.9	0.0165
Pasta, dry, unenriched	Grains	371	13	1.51	1.30	1109.5	0.0088
Bread, pita, white, unenriched	Grains	275	9	1.2	1.40	248.5	0.0020
Crackers, wheat, regular	Grains	455	7.3	16.4	2.64	36.4	0.0003
Buckwheat groats, roasted, dry	Grains	692	23.4	2.71	2.47	70	0.0006
Corn, canned, solids and liquids	Grains	61	2	0.77	0.36	45.5	0.0004
Cereals, Oat Bran, dry	Grains	728	34	7.97	8.07	14	0.0001
Semolina, unenriched	Grains	720	26	1.05	1.23	70	0.0006
Burgul, unenriched	Grains	720	26			14	0.0001
High Energy bars ^a	Grains	440	16			73.5	0.0006
Legumes, mixed ^b	Legumes	354	23	2.9	6.8	25.2	0.0002
Beans, white, mature seeds, raw	Legumes	333	23.4	0.85	10.4	526.4	0.0042
Lentils, raw	Legumes	352	24.6	1.06	6.51	850.5	0.0068
Chickpeas (garbanzo beans, bengal gram), mature seeds, raw	Legumes	378	20.5	6.04	4.31	913.5	0.0073
Peas, green, split, mature seeds, raw	Legumes	364	23.1	3.89	4.73	171.5	0.0014

Food name	Food group	Energy (kcal/100 gr)	Protein (gr/100 gr)	Fat (gr/100 gr)	Iron (mg/100 gr)	Estimated food weight (Tons)	Proportional weight (%) of all shipments
Seeds, sesame butter, tahini, type of kernels unspecified	Seeds and nuts	592	17.4	53	4.42	70	0.0006
Peanuts, all types, raw	Seeds and nuts	567	25.8	49.2	4.58	154	0.0012
Seeds, sesame seeds, whole, dried	Seeds and nuts	573	17.7	49.7	14.6	14	0.0001
Oil, canola	Oil	884	0	100	0	3262	0.0260
Chicken, meat and skin, raw	Meat, poultry and fish	215	18.6	15.1	0.9	2068.85	0.0165
Beef, canned	Meat, poultry and fish	250	27	14.9	2.08	559.0494	0.0045
Fish, Pacific	Meat, poultry and fish	69	15.3	0.41	0.16	786.45	0.0063
Fish, tuna, light, canned in oil	Meat, poultry and fish	198	29.1	8.21	1.39	395.5	0.0031
Beef, variety meats and by-products, raw	Meat, poultry and fish	276	15	23.5	5.67	290.5	0.0023
Cookies, butter, commercially prepared, unenriched	Sweets	467	6.1	18.8	0.29	887.6	0.0071
Cake, sponge, commercially prepared	Sweets	290	5.5	2.7	2.72	784	0.0062
Halavah, plain	Sweets	469	12.5	21.5	4.53	219.8	0.0017
Sweets, mixed ^b	Sweets	355.1667	6.458333	15.26667	2.108333	21	0.0002
Biscuit, commercially prepared	Sweets	370	7	18.9	2.76	1041.6	0.0083
Jams and preserves	Sweets	278	0.37	0.07	0.49	42	0.0003
Sugars, granulated	Sweets	387	0	0	0.05	2072	0.0165

Food name	Food group	Energy (kcal/100 gr)	Protein (gr/100 gr)	Fat (gr/100 gr)	Iron (mg/100 gr)	Estimated food weight (Tons)	Proportional weight (%) of all shipments
Honey	Sweets	304	0.3	0	0.42	95.2	0.0008
Cheese, pasteurized processed cheese	Dairy and eggs	310	15.6	23.9	1.3	1228.5	0.0098
Milk,without added vitamin A and vitamin D	Dairy and eggs	42	3.37	0.97	0.03	668.5	0.0053
Dairy, mixed ^b	Dairy and eggs	152.75	6.22	11.8675	0.3625	238	0.0019
Sour cream, regular	Dairy and eggs	198	2.44	19.35	0.07	56	0.0004
Butter, without salt	Dairy and eggs	717	0.85	81.1	0.02	42	0.0003
Comercial powdered milk	Dairy and eggs	500	26	26		140	0.0011
Yogurt, plain, whole milk	Dairy and eggs	61	3.47	3.25	0.05	234.5	0.0019
Dates, medjool	Fruit	277	1.81	0.15	0.9	1288	0.0103
Oranges, raw, with peel	Fruit	63	1.3	0.3	0.8	196	0.0016
Frit, mixed ^b	Fruit	104.4545	1.31	0.373636	0.506364	660.8	0.0053
Lemon raw	Fruit	47	1.5	0.3	0.8	220.5	0.0018
Melons, cantaloupe, raw	Fruit	38	0.82	0.18	0.38	14	0.0001
Apple, raw	Fruit	52	0.26	0.17	0.12	220.5	0.0018
Bananas, ripe and slightly ripe, raw	Fruit	98	0.74	0.29	0.4	14	0.0001
Pomegranates, raw	Fruit	83	1.67	1.17	0.3	42	0.0003
Watermelon, raw	Fruit	30	0.61	0.15	0.24	42	0.0003
Bananas, raw	Fruit	89	1.09	0.33	0.26	14	0.0001
Guavas, raw	Fruit	68	2.55	0.95	0.26	14	0.0001
Onions, raw	Fruit	40	1.1	0.1	0.21	723.8	0.0058
Carrots, raw	Vegetables	41	0.93	0.24	0.3	14	0.0001
Vegetables, mixed ^b	Vegetables	40.5	1.015	0.17	0.255	252	0.0020
Garlic, raw	Vegetables	149	6.36	0.5	1.7	84	0.0007

Food name	Food group	Energy (kcal/100 gr)	Protein (gr/100 gr)	Fat (gr/100 gr)	Iron (mg/100 gr)	Estimated food weight (Tons)	Proportional weight (%) of all shipments
Potatoes, raw	Potato	58	2.57	0.1	3.24	1144.5	0.0091
Egg, whole	Dairy and eggs	143	12.6	9.51	1.75	521.5	0.0042
Orange juice, from concentrate	Sugar sweetened beverages	47	0.73	0.32	0.06	306.6	0.0024
Beverages, carbonated, cola, regular	Sugar sweetened beverages	42	0	0.25	0.02	56	0.0004
Sugar sweetened beverages, mixed ^b	Sugar sweetened beverages	44.5	0.365	0.285	0.04	14	0.0001
Tomato sauce, canned	Vegetables	24	1.2	0.3	0.96	465.5	0.0037
Coffe	Other			0	0	122.5	0.0010
Tea	Other			0	0	66.5	0.0005
Multivitamin	Other			0	0	291.2	0.0023
Salt	Other			0	0	339.5	0.0027
Seasoning agents	Other			0	0	206.5	0.0016

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

^a 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>

^b Nutritional values calculated as mean values of all other foods in the food group

Supplementary table 2. Nutritional composition of Standardized food parcels

Food content per parcel	Weight (gr)	Energy (kcal/100gr)	Protein (gr/100gr)	Fat (gr/100 gr)	Iron (mg/100gr)
SUGAR, white, 1kg	1000	3870	0		
SALT, iodized edible, 1kg	1000	0	0		
YEAST, dried, package 11 gr	88	0	0		
FISH, canned, sardines, veg oil, 150g	300	594	87	24.6	4.2
PASTA, durum wheat meal, 1kg	1000	4081	150	39.0	33.6
RICE, white, long grain, irri6/2, 1kg	1000	2200	52	20.6	2.8
OIL, rapeseed, 1liter	790	6984	0	790.0	0.0
BEANS, white, small, 1kg	1000	2760	193	17.0	208.0
Total (dry food, parcel weight 16kg))	6178	20489	482	891.2	248.6
Values per 100 gr parcel		128.05625	3.0125	5.6	1.6

Supplementary table 3. Nutritional values assigned to cooked meals

Estimated cooked meal composition	Protein (gr/100gr)	Energy (kcal/100gr)
White rice, cooked (1 cup)	5.11	231
Stewed, seasoned, beef with vegetables and potatoes (1 cup)	23.1	304
Matbuha, vegetable-based spread (4tbls)	0	40
Tahini (2tbls)	5	167
Pitta bread (1unit)	5.5	165
Baklawa (3 pieces)	2	140
Total (food weight)	40.71	1047
Values per 100 gr	8.01	206.1

Supplementary table 4. Gaza population size, 2023 size (Gazan CBS) and calculated nutritional needs

Age group	Population size, 2023	Daily RDA per person			Daily dietary needs per population size		
		Kcal	Protein	Iron	Kcal	Protein	Iron
0-3	167,107	1,000	13	7	167,106,600	2,172,386	1,169,746
4-8	278,940	1,400	19	10	390,515,720	5,299,856	2,789,398
9-13	275,404	1,700	34	8	468,186,460	9,363,729	2,203,230
14-18	259,412	2,000	59	13	518,824,400	15,305,320	3,372,359
19-45	824,441	2,200	51	13	1,813,769,320	42,046,471	10,717,728
19-45 pregnant/lactating women ^a	111,404	2,500	55	18	278,511,000	6,127,242	2,005,279
46+	237,384	1,900	51	8	451,029,220	12,106,574	1,899,070
Total population	2,154,091						
		Daily dietary needs (total population)			4,087,942,720	92,421,577	24,156,811
		Daily dietary needs per capita			1,898	43	11

^a The number of pregnant and lactating women were added to the population size, calculated as the number of children aged 0-1 years