UK Health Security Agency

Minimum calorie and nutritional requirements

A rapid evidence summary

Contents

Main messages 3
Purpose 4
Methods 4
Evidence 5
Guidance 7
Health inequalities 7
Limitations 8
Evidence gaps 8
Conclusion 8
Acknowledgments 9
Disclaimer 9
References 9
Annexe A. Protocol 10
About the UK Health Security Agency 16

Main messages

1. This rapid evidence summary (search up to 14 July 2023) identified and summarised evidence relating to minimum calorie or nutrition requirements for a person in the context of a national power outage or disaster (3 reviews and one primary study which also included a review of starvation literature (1 to 4)). Additionally, one guidance document on food and nutrition requirements in emergencies was identified through targeted searching (5).

2. The limited evidence included in this rapid evidence summary suggests that individuals can survive with zero or minimal calories for a short period of time encountering only minor negative symptoms. A narrative review found that some individuals on very low energy diets (200 to 800 kcal per day) suffered minor adverse effects (such as fatigue, dizziness and an increased risk of gallstones), though there were concerns of unspecified cardiac problems associated with very low energy diets (1). The timeframe for symptom development in this review was not reported. In the primary study of individuals (n=8) who participated in a hunger strike which lasted between 5 and 11 days, symptoms reported included fatigue, difficulty concentrating, depression and difficulty driving a car (2).

3. A small body of evidence was identified for the differing energy and nutritional needs of vulnerable groups (3 to 5). The World Health Organization (WHO) guidance stated that pregnant and lactating women were reported to require an additional daily 285 kcal and 500 kcal, respectively (3, 5). People diagnosed with human immunodeficiency virus were reported to require an additional 10% and 20-30% energy intake for asymptomatic and symptomatic individuals respectively compared to a healthy person (3).

4. WHO guidance stated that the ideal minimum calorie intake in the context of an emergency was reported to be an average of 2080 calories across all ages and both sexes, of which around 10% and 20% should be received from protein and fats respectively (5). This guidance document also provided details of recommended nutritional composition in 2,100 calorie ration packs.

5. Overall, there was limited evidence to specifically quantify the minimum calorie intake and nutritional needs for the average individual over a 7-day period, and less to clarify how this differs in vulnerable groups, although there was evidence that receiving no or minimal nutritional intake resulted in only minor side effects. The quality of reviews and risk of bias in the primary study was not assessed due to time constraints.

Purpose

The purpose of this rapid evidence summary was to identify and assess the available evidence that discussed minimum calorie (or nutrition more generally) requirements for a person in the context of a national power outage or disaster, with an additional focus on how those needs differ for vulnerable groups.

Methods

The review questions were:

1. What are the minimal nutritional needs (calories) for the average man, woman, and child over a 7-day period?
2. How do these requirements differ for vulnerable groups including pregnant women, older people, those with specific medical conditions and other disabilities?

Although the question is primarily interested in needs over a 7-day period, nutrition requirements for different time periods that can help inform this will also be of interest.

A rapid evidence summary was completed in July 2023, which identified evidence to answer the research question above. We searched Medline, Embase, and Web of Science and Web of Science Core Collection for relevant evidence published prior to 14 July 2023. Screening on title and abstracts was undertaken in duplicate by 2 reviewers for 20% of the potentially relevant studies, with the remainder completed by one reviewer. Screening on full text was undertaken by one reviewer and excludes were checked by a second reviewer. Disagreement was resolved by discussion.

We also searched the UN, WHO, and CDC websites for any other relevant evidence, and ran a targeted google search. Health risks included any short-term health complications from malnutrition, hospitalisation and mortality.

A protocol was produced before the literature search was conducted, including the review questions above, the eligibility criteria, and all other methods, see Annexe A. There were no deviations from the protocol.

Evidence

In total, 2,166 studies were screened on title and abstract, of which 31 studies were screened on full text, and 4 were included in this rapid evidence summary (1 to 4). An additional 8 studies were screened from other targeted searches and one further document met the inclusion criteria, which is discussed in the subsequent guidance section (5).

Of these, 3 were reviews with relevance to the review question: a review of public nutrition in complex emergencies (3), a review of dietary approaches to weight loss (1) and a review of dietary intake in dialysis patients (4). The final included publication was a qualitative survey of the experiences of students who participated in a hunger strike and review of starvation literature (2).

Evidence for the effect of zero to minimal calorie intake

Astrup and others conducted a narrative review of dietary approaches to weight loss including discussion of the negative effects of starvation (less than 200 kcal consumed per day) and very low energy diets (between 200 and 800 kcal consumed per day) (1). The authors reported that sustained starvation diets of less than 200 kcal per day result in serious medical complications, but do not provide specifics of health outcomes or the time period these negative outcomes take to manifest. Very low energy diets of between 200 and 800 kcal per day (supplemented by nutrition powders and vitamin enriched meals or drinks) were reported by the authors to cause rapid weight loss and several negative symptoms, which included fatigue, dizziness, muscle cramps, headache, gastrointestinal distress, cold intolerance, and increased risk of gallstones. Additionally, the authors reported concerns over the cardiac safety of very low energy diets, but specific details are not provided.

A study was conducted on the self-reported experiences of 8 students (87.5% female, age range: 18 to 22 years) who participated in a hunger strike in the United States in 1999 which lasted between 5 to 11 days (2). The students all reported abstaining from solid foods, but some did report ingesting sports drinks and fruit juices, therefore calorie intake was not zero in all students. Negative effects reported from fasting included fatigue (n=6, 75%), difficulty concentrating (n=6, 75%), depression (n=3, 38%), difficultly driving a car (n=2, 25%). After completion of the strike, 4 students (50%) reported difficulty returning to a normal diet, which lasted between 2 days and 2 weeks. This study also included a narrative review of starvation literature, reporting that tolerable duration of consuming zero calories ultimately depends on the amount of fat initially available, with 10 Irish prisoners on a hunger strike surviving between 45 to 61 days (Northern Ireland, 1981).

Evidence for the ideal daily minimal calorie intake in emergency contexts

Young and others conducted a narrative review published in 2004 of malnutrition in complex emergencies, including methods of nutritional assessment, ration distribution, prevention and treatment of malnutrition or nutrient deficiency diseases and nutritional support needs of vulnerable groups (3). The authors reported a recommended average daily calorie intake of around 2,100 calories and nutritional requirements which originated from a guidance document on food and nutrition requirements in emergencies, these are discussed in detail within the guidelines section below (5).

Evidence for the ideal daily minimal calorie intake in vulnerable groups

Young and others discuss that persons living with HIV are at increased risk of malnutrition due to malabsorption of nutrients and a higher metabolic rate, however the authors reported that there are presently no specific guidelines available on minimum calorie and nutrient requirements of HIV affected persons in the context of emergencies (3). More generally, the review reported that the World Health Organization recommends a 10% increased energy intake for people with asymptomatic HIV and a 20 to 30% increased energy intake for people with symptomatic HIV (3).

Therrien and others conducted a narrative review of dietary intake (energy and protein) studies in people on maintenance haemodialysis (search between 1984 and 2014), due to their increased risk of malnutrition and muscle wasting (4). The authors report that based on guidelines from the National Kidney Foundation's Kidney Disease Outcomes Quality Initiative and the European Best Practice Guidelines, people on maintenance haemodialysis should consume a daily protein intake of between 1.1 and 1.3g of protein per kilogram per day (protein/kg/day) and a daily energy intake of between 30 to 40 calories per kilogram per day (kcal/kg/day) of ideal body weight. The guidelines also recommend that people on peritoneal dialysis should consume a daily protein of 1.2 to 1.3 g/kg/day. The review included a prospective cohort study which reported that a reduced daily protein intake of less than 1.2g kcal/kg/day was a predictor of mortality in dialysis patients (follow up period: 38 months). Similarly, the review included a retrospective cohort study of nutritional markers and mortality which reported that weight adjusted daily energy intake was higher in survivors (mean = 27.4 kcal/kg/day, standard deviation: 8.9 kcal/kg/day) compared to non-survivors (mean = 23.5 kcal/kg/day, standard deviation: 7.4 kcal/kg/day, $p<0.001$). The follow up period for this study was 10 years and nutritional evaluation was performed before onset of 3 months of haemodialysis to assess nutritional parameters at the time of haemodialysis onset.

Guidance

Although not specifically searched for, an official guidance document was found for food and nutrition needs in emergencies by the World Health Organization, United Nations High Commissioner for Refugees, United Nations Children's Fund and World Food Programme was identified through targeted searches (5).

The guideline recommends that the average ideal minimum requirement for persons in an emergency affected population is 2080 kcal per person per day, of which around 11% and around 20% of the energy should be sourced from protein and fat respectively. The guideline also recommends that an additional 285 and 500 calories are consumed daily by pregnant women and lactating women respectively. The average daily energy intake recommendations varied based on age:

- 1,290 calories recommended for children less than 4 years old
- 1,860 calories recommended for children between 5 and 9 years old
- 2,210 calories recommended for children between 10 and 14 years old
- 2,420 calories recommended for children between 15 and 19 years old
- 2,230 calories recommended for adults between 20 and 59 years old
- 1,890 calories recommended for adults more than 60 years old

The guideline also provided recommendations for daily vitamins and minerals which should be included within the 2,100 calorie ration in the context of an emergency, including Vitamin A (500µg), Thiamine (0.9mg), Riboflavin (1.4mg), Niacin (12mg), Folic acid (160µg), Vitamin C (28mg), Vitamin D (3.8µg), Iron (22mg) and Iodine (150µg).

Health inequalities

There was very limited evidence available on the minimum energy requirements of vulnerable groups, with the evidence limited to pregnant and lactating women, people with HIV and persons receiving haemodialysis. No data was available on the differences of energy requirements between ethnic and social groups.

Limitations

This rapid evidence summary used streamlined systematic methods to accelerate the review process. The search was restricted to published articles looking at emergency or disaster situations, which may have limited the sensitivity of the search for relevant evidence, although targeted searching was also used to find additional evidence.

With the exception of the study on dialysis patients, all articles and the guidance document included in this review were published before 2004 and the advice may therefore be out of date.

The quality of the reviews or risks of bias in each included study was not assessed due to time constraints of the review. The included study by Dixon (2) was a small study of self-reported outcomes and results were likely imprecise.

As with all reviews, the evidence identified may be subject to publication bias, whereby null or negative results are less likely to have been published by the authors.

Evidence gaps

As there was limited evidence to answer either review question, both review questions had substantial evidence gaps.

Conclusion

There was limited evidence to answer either review question, however the available evidence suggests that individuals can survive on zero or minimal calories with limited and minor side effects for a short time period. The ideal recommended daily calorie intake according to official food and nutrient requirement in emergency guidance is around 2,080 calories, of which around 10% and around 20% should come from protein and fats respectively. Limited information is available on how these needs differ for vulnerable groups; however, this rapid evidence summary was able to capture that pregnant and lactating women as well as individuals with both asymptomatic and symptomatic HIV require increased calorie intake. Individuals on maintenance haemodialysis receiving less than the recommended daily energy intake were reported by one view as less likely to survive in a study which followed patients for a period of 3 months. We did not assess quality of bias in either reviews or primary studies, and the primary study was small with imprecise results.

Acknowledgments

We would like to thank colleagues within the All Hazards Public Health Response division who either reviewed or input into aspects of the review. Search terms for power outage and power cuts were adapted from literature searches developed by Caroline De Brun, Knowledge and Evidence Specialist for UKHSA South West.

Disclaimer

UKHSA's rapid reviews and evidence summaries aim to provide the best available evidence to decision makers in a timely and accessible way, based on published peer-reviewed scientific papers, unpublished reports and papers on preprint servers. Please note that the reviews:

- use accelerated methods and may not be representative of the whole body of evidence publicly available
- have undergone an internal, but not independent, peer review
- are only valid as of the date stated on the review

In the event that this rapid evidence summary is shared externally, please note additionally, to the greatest extent possible under any applicable law, that UKHSA accepts no liability for any claim, loss or damage arising out of, or connected with the use of, this review by the recipient and/or any third party including that arising or resulting from any reliance placed on, or any conclusions drawn from, the review.

References

1. Astrup A. 'Dietary approaches to reducing body weight' Best Practice and Research Clinical Endocrinology and Metabolism 1999: volume 13, issue 1, pages 109 to 120
2. Dixon WC. 'Hunger strikes: preventing harm to students' Journal of American College Health 1999: volume 48, pages 87 to 90
3. Young H and others. 'Public nutrition in complex emergencies' Lancet 2004: volume 364, issue 9,448, pages 1,899 to 1,909
4. Therrien M and others. 'A review of dietary intake studies in maintenance dialysis patients' Journal of Renal Nutrition 2015: volume 25, issue 4, pages 329 to 338
5. Food and nutrition needs in emergencies' World Health Organization, United Nations High Commissioner for Refugees, United Nations Children's Fund, World Food Programme; 2004

Annexe A. Protocol

Review question

The review questions for this rapid evidence summary scoping are:

1. What are the minimal nutritional needs (calories) for the average man, average woman and children over a 7-day period?
2. How do these requirements differ for vulnerable groups including pregnant women, older people, those with specific medical conditions and other disabilities?

This rapid evidence summary will look for evidence that discussed minimum calorie (or nutrition more generally) requirements for a person in the context of a national power outage or disaster, with an additional focus on how those needs differ for vulnerable groups. Although the question is primarily interested in needs over a 7-day period, nutrition requirements for different time periods that can help inform this will also be of interest.

Eligibility criteria

	Included	**Excluded**
Population	Adults and children	Inpatients
Settings	All (except hospital)	Hospital
Context	National power outage or post-disaster (evidence from other settings that provide useful information may be included)	
Intervention or exposure	Calorie intake or nutrition from food	Optimal calorie or nutrition intake
Outcomes	• any health complications indicating malnutrition • death • hospitalisation	
Language	English language	Non-English language studies
Date of publication	Any	
Study design	• reviews (rapid, systematic or narrative) • primary studies (of any study design) if insufficient review-level evidence is found	• editorials • letters • opinion pieces

	Included	Excluded
Publication type	Published and pre-print	

Identification of studies

We will search Medline, Embase, and Web of Science Core Collection (editions: Science Citation Index Expanded (SCI-EXPANDED), Conference Proceedings Citation Index – Science (CPCI-S), Book Citation Index – Science (BKCI-S)) to identify any existing evidence related to the review question, published prior to 14 July 2023. See Search strategy below.

Screening on title and abstracts will be undertaken in duplicate by 2 reviewers for 20% of the potentially relevant studies, with the remainder completed by one reviewer. Screening on full text will be undertaken by one reviewer and checked by a second. Disagreement will be resolved by discussion.

An information specialist will also run targeted searches on the UN, WHO and Centers for Disease Control and Prevention (CDC) websites for any other relevant evidence not found in the literature search, as well as a google search.

Synthesis of evidence

If reviews providing evidence to answer the research question are identified, these will be summarised. If no reviews are identified, or if the identified reviews are insufficient to answer the review question, identified primary studies will be summarised. Data will be extracted straight into narrative summaries of included studies (reviews, or primary studies). All narrative summaries will be written by one reviewer and checked by a second.

Variations across populations and subgroups, for example cultural variations or differences between ethnic or social groups will be considered, where evidence is available.

Search strategy

Database: Ovid MEDLINE(R) ALL <1946 to 13 July 2023>

1. hypocalori*.tw,kf. (2,053)
2. ((calori* or energy or kcal* or kilocal*) adj3 intake*).ti,kf. or ((calori* or energy or kcal* or kilocal*) adj3 intake*).ab. /freq=2 (18,218)
3. ((calori* or energy or kcal* or kilocal*) adj3 restrict*).ti,kf. or ((calori* or energy or kcal* or kilocal*) adj3 restrict*).ab. /freq=2 (7,225)
4. *Caloric Restriction/ (4,396)
5. *Energy Intake/ (14,938)
6. ((calor* or food* or kcal* or kilocal* or energy) adj3 ration*).tw,kf. (1,519)
7. (minim* adj3 (calor* or kcal* or kilocal* or energy or food*) adj3 (need* or requirement*)).tw,kf. (294)
8. (minim* adj3 (calor* or kcal* or kilocal* or energy or food*) adj3 (recommend* or guideline*)).tw,kf. (34)
9. *Recommended Dietary Allowances/ (575)
10. feeding threshold*.tw,kf. (25)
11. (emergency ration* or food aid*).tw,kf. (391)
12. or/1-11 (39,162)
13. (survive* or survival or surviving).tw,kf. (1,316,363)
14. mortalit*.ti,kf. or mortalit*.ab. /freq=3 (307,796)
15. death*.ti,kf. or death*.ab. /freq=3 (278,585)
16. dying.tw,kf. (40,588)
17. fatal*.tw,kf. (180,319)
18. *Survival/ (1,248)
19. exp *Survival Analysis/ (5,429)
20. Survival Rate/ (189,795)
21. exp *Mortality/ (71,407)
22. (starving or starvation or starve*).tw,kf. (42,825)
23. exp *Malnutrition/ (99,380)
24. (malnourish* or malnutrition).tw,kf. (56,019)
25. (hospitalisation or hospitalization or hospitalised or hospitalized).tw,kf. (306,841)
26. *Hospitalization/ (46,440)
27. or/13-26 (2,407,660)
28. Electric Power Supplies/ (8,917)
29. Electricity/ (19,755)
30. 28 or 29 (28,036)
31. (failure* or supply or supplies or cut or cuts or outage* or insecurity or instability or unstable or limited).tw,kf. (2,441,766)
32. 30 and 31 (2,676)
33. (blackout* or ((electric* or power) adj3 (cut* or outage* or failure* or suppl* or insecurity or loss))).tw,kf. (11,306)
34. 32 or 33 (13,144)

35. exp *Disasters/ (56,218)
36. ((disaster* or emergency or emergencies) adj5 (plan* or mitigat* or prepar* or stockpil*)).tw,kf. (14,762)
37. (drought* or hurricane* or flood* or forest fire*).tw,kf. (59,064)
38. Geological Phenomena/ or Avalanches/ or Earthquakes/ or Landslides/ or Tidal Waves/ or Tsunamis/ or Volcanic Eruptions/ or Wildfires/ (11,716)
39. (tidal wave* or volcanic eruption* or tsunami* or landslide* or avalanche* or earthquake* or Storm* or wildfire* or Snowstorm* or heat wave* or coldwave* or land fire* or Sandstorm* or cyclone* or typhoon* or extreme heat* or extreme cold* or extreme temperature*).tw,kf. (54,043)
40. (Camp or camps or refugee* or internal* displac*).tw,kf. (110,168)
41. Refugees/ (13,215)
42. Emergency Shelter/ (307)
43. emergency shelter*.tw,kf. (283)
44. 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 (282,159)
45. 27 or 44 (2,668,029)
46. 12 and 45 (4,362)
47. limit 46 to "reviews (best balance of sensitivity and specificity)" (718)
48. limit 46 to "systematic review" (114)
49. 47 or 48 (722)

Database: Embase <1974 to 13 July 2023>

1. hypocalori*.tw,kf. (2,910)
2. ((calori* or energy or kcal* or kilocal*) adj3 intake*).ti,kf. or ((calori* or energy or kcal* or kilocal*) adj3 intake*).ab. /freq=2 (24,572)
3. ((calori* or energy or kcal* or kilocal*) adj3 restrict*).ti,kf. or ((calori* or energy or kcal* or kilocal*) adj3 restrict*).ab. /freq=2 (9,748)
4. *diet restriction/ or *caloric restriction/ or exp *fasting/ or *protein restriction/ (28,657)
5. *dietary intake/ or *caloric density/ or *caloric intake/ or exp *carbohydrate intake/ or *estimated daily intake/ or exp *food deprivation/ or *tolerable daily intake/ (51,583)
6. ((calor* or food* or kcal* or kilocal* or energy) adj3 ration*).tw,kf. (2,189)
7. (minim* adj3 (calor* or kcal* or kilocal* or energy or food*) adj3 (need* or requirement*)).tw,kf. (321)
8. (minim* adj3 (calor* or kcal* or kilocal* or energy or food*) adj3 (recommend* or guideline*)).tw,kf. (48)
9. *dietary reference intake/ (566)
10. feeding threshold*.tw,kf. (25)
11. (emergency ration* or food aid*).tw,kf. (432)
12. or/1-11 (104,840)
13. (survive* or survival or surviving).tw,kf. (1,961,157)
14. mortalit*.ti,kf. or mortalit*.ab. /freq=3 (450,691)
15. death*.ti,kf. or death*.ab. /freq=3 (359,516)
16. dying.tw,kf. (53,937)

17. fatal*.tw,kf. (243,281)
18. *survival/ or *overall survival/ or *short term survival/ or *survival index/ or exp *survival time/ (66,826)
19. *survival analysis/ (3,398)
20. *survival rate/ (9,531)
21. *mortality/ or *all cause mortality/ or *death toll/ or *excess mortality/ or *fetus mortality/ or *infant mortality/ or exp *mortality rate/ or *standardized mortality ratio/ (148,279)
22. (starving or starvation or starve*).tw,kf. (47,822)
23. exp *malnutrition/ (82,750)
24. (malnourish* or malnutrition).tw,kf. (79,189)
25. (hospitalisation or hospitalization or hospitalised or hospitalized).tw,kf. (510,870)
26. *hospitalization/ (47,126)
27. or/13-26 (3,355,932)
28. power supply/ (10,430)
29. electricity/ (36,278)
30. 28 or 29 (45,798)
31. (failure* or supply or supplies or cut or cuts or outage* or insecurity or instability or unstable or limited).tw,kf. (3,438,593)
32. 30 and 31 (6,207)
33. (blackout* or ((electric* or power) adj3 (cut* or outage* or failure* or suppl* or insecurity or loss))).tw,kf. (13,150)
34. 32 or 33 (16,633)
35. exp *disaster/ (19,079)
36. exp *disaster planning/ (9,147)
37. ((disaster* or emergency or emergencies) adj5 (plan* or mitigat* or prepar* or stockpil*)).tw,kf. (18,149)
38. (drought* or hurricane* or flood* or forest fire*).tw,kf. (58,295)
39. *"geographic and geological phenomena"/ or *avalanche/ or *earthquake/ or *landslide/ or *storm surge/ or *tsunami/ or *volcanic ash/ or *volcano/ or exp *wildfire/ (12,996)
40. (tidal wave* or volcanic eruption* or tsunami* or landslide* or avalanche* or earthquake* or Storm* or wildfire* or Snowstorm* or heat wave* or coldwave* or land fire* or Sandstorm* or cyclone* or typhoon* or extreme heat* or extreme cold* or extreme temperature*).tw,kf. (64,509)
41. (Camp or camps or refugee* or internal* displac*).tw,kf. (130,521)
42. *refugee camp/ or exp *forced migrant/ (10,479)
43. emergency shelter*.tw,kf. (307)
44. evacuation shelter*.tw,kf. (81)
45. emergency shelter/ (634)
46. 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 (299,899)
47. 27 or 46 (3,631,480)
48. 12 and 47 (16,015)
49. limit 48 to "reviews (best balance of sensitivity and specificity)" (1,374)

Web of Science Core Collection (editions: Science Citation Index Expanded (SCI-EXPANDED), Conference Proceedings Citation Index – Science (CPCI-S), Book Citation Index – Science (BKCI-S))

TS=(hypocalori*) OR TI=((calori* or energy or kcal* or kilocal*) NEAR/2 intake*) OR KP=((calori* or energy or kcal* or kilocal*) NEAR/2 intake*) OR TI=((calori* or energy or kcal* or kilocal*) NEAR/2 restrict*) OR KP=((calori* or energy or kcal* or kilocal*) NEAR/2 restrict*) OR TS=((calor* or food* or kcal* or kilocal* or energy) NEAR/2 ration*) OR TS=((minim* NEAR/2 (calor* or kcal* or kilocal* or energy or food*) NEAR/2 (need* or requirement*))) OR TS=((minim* NEAR/2 (calor* or kcal* or kilocal* or energy or food*) NEAR/2 (recommend* or guideline*))) OR TS=("feeding threshold*") OR TS=(("emergency ration*" or "food aid*"))

AND

(TS=((survive* or survival or surviving)) OR TI=(mortalit*) OR KP=(mortalit*) OR TI=(death*) OR KP=(death*) OR TS=(dying) OR TS=(fatal*) OR TS=((starving or starvation or starve*)) OR TS=((malnourish* or malnutrition)) OR TS=((hospitalisation or hospitalization or hospitalised or hospitalized)) OR TS=((blackout* or ((electric* or power) NEAR/2 (cut* or outage* or failure* or suppl* or insecurity or loss or instability or unstable or limited)))) OR TS=(((disaster* or emergency or emergencies) NEAR/4 (plan* or mitigat* or prepar* or stockpil*))) OR TS=((drought* or hurricane* or flood* or "forest fire*")) OR TS=(("tidal wave*" or "volcanic eruption*" or tsunami* or landslide* or avalanche* or earthquake* or Storm* or wildfire* or Snowstorm* or "heat wave*" or coldwave* or "land fire*" or Sandstorm* or cyclone* or typhoon* or "extreme heat*" or "extreme cold*" or "extreme temperature*")) OR TS=((Camp or camps or refugee* or "internal* displac*")) OR TS=("emergency shelter*") OR TS=("evacuation shelter*"))

Limited to publication type: Review articles: 784 results

About the UK Health Security Agency

UKHSA is responsible for protecting every member of every community from the impact of infectious diseases, chemical, biological, radiological and nuclear incidents and other health threats. We provide intellectual, scientific and operational leadership at national and local level, as well as on the global stage, to make the nation heath secure.

UKHSA is an executive agency, sponsored by the Department of Health and Social Care.

Prepared by Katie Kerr, Sean Harrison, Jennifer Hill, Elizabeth Kumah, Maheen Qureshi, Caroline De Brun and Serena Carville, July 2023.

For queries relating to this document, contact enquiries@ukhsa.gov.uk

Published: December 2025
Publishing reference: GOV-16953 (CPHR010e)

Suggested citation: Kerr K, Harrison S, Hill J, Kumah E, Qureshi M, De Brun C, Carville S. Minimum calorie and nutritional requirements: a rapid evidence summary. UKHSA; 2025.