

Emergency Food Security Assessments (EFSAs) Technical guidance sheet n°. 10

Using the Delphi method to estimate population size and demographics in emergency food security assessments (EFSAs)¹

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¹ This Technical Guidance Sheet was prepared by Alden Henderson, consultant (alden808@gmail.com). Guidance on the area method is available at www.wfp.org/food-security. The T-square method is explained in Technical Guidance Sheet No. 11 *T-Square Method to Estimate Population Size and Demographics in Emergency Food Security Assessments (EFSAs)*, WFP Food Security Analysis Service, 2009. Readers should also consult the desk review: *Estimating Population Size in Emergencies*, A. Henderson, WFP Emergency Needs Assessment Service (now Food Security Analysis Service), December 2006.

Using the Delphi method to estimate population size and demographics in emergency food security assessments (EFSAs)

This Technical Guidance Sheet explains when and how to use the Delphi method to estimate population size and demographic characteristics for a rapid EFSA. It complements other guidance on EFSAs in the second edition of the *EFSA Handbook*, particularly Part IV Section 3, Conducting a situation analysis, and Part IV Section 4, Conducting a forecast analysis.²

1. Why do population numbers and demographics change in a crisis situation?

A crisis often disrupts communities and their livelihoods, and makes an area less hospitable. The size and demographic characteristics of the affected population may therefore change because of illness, injuries and deaths from the crisis or because of migration from destroyed homes, infrastructure or livelihoods. Timely, accurate and reliable information on the numbers and locations of people affected by a crisis is needed for an effective and efficient humanitarian response.

2. What are the key elements of the Delphi method?

Anonymity, iteration and controlled feedback through summarizing responses from a panel of knowledgeable individuals – experts – are the three key elements of the Delphi method. These elements distinguish the method from a committee meeting or a conference call.

The Delphi method is a communication device that facilitates agreement among people by generating specific information while limiting behaviour that may hamper information exchange, the formation of opinions and the expression of individual responses

The Delphi method brings a group of experts together to reach a consensus opinion about a situation – in the case of an EFSA, about the numbers and locations of people affected by a crisis. WFP uses this information to guide the timing, amount and delivery of food aid. Although the Delphi method may sound like an average committee meeting or conference call, it uses a structured process systematically to collect and distill opinions from a group of experts. The process consists of anonymous responses to several rounds of questions, with controlled and structured feedback on each round. It offsets the problems of conventional meetings that pool opinions from group discussions, by avoiding the influence of dominant individuals, discussion on other topics and group pressure for conformity.

Anonymity decreases the effect of dominant personalities, individual and group interests, and group pressure to follow the majority opinion. Anonymity also reduces participants' unwillingness to abandon a position they have expressed in public, makes it easier for them to take a position on an issue before all the facts are known or a majority opinion has been formed, and reduces their fear of publicly contradicting individuals in higher positions or bringing up an idea that might turn out to be unreasonable or be viewed as foolish. When a small group of experts have sufficient time to consider and explore the issues, and are assured that their comments will be kept private, there are fewer obstacles to sharing, changing and formulating opinions.

In each question-and-answer round, each expert provides anonymous responses to a questionnaire, which are then summarized and shared with the group. A panel member can modify or, if necessary,

² See *EFSA Handbook*, Second Edition, WFP Food Security Analysis Service, 2009.

defend his/her response in the following rounds. Additional information useful to the task can be provided. Question-and-answer rounds continue until the responses converge. A wide spread of responses generally occurs in the first round, with the range becoming progressively narrower, and converging within three or four rounds.

After each round, each panelist receives a summary of all the responses, and sees how her/his responses compared with those of the rest of the group. Statistical analysis ensures that the summarizing and analysis of responses is impartial. This controlled feedback allows each expert's ideas to be represented and shared equally, and focuses the panelists on the goal of the Delphi exercise. Panelists are asked to justify any of their responses that fall outside the upper or lower quartiles.

The Delphi method has **four distinct phases**:

- Phase 1 explores the issue under discussion, with each individual contributing pertinent information and opinions.
- Phase 2 involves obtaining feedback on the issue and reaching an understanding of how the group views it – where the panel members agree or disagree.
- Phase 3 deals with disagreements and the underlying reasons for differences.
- Phase 4 occurs when the information is analyzed and there is a convergence of opinion.

3. When is it appropriate to use the Delphi method?

Several conditions are required to make the Delphi method suitable for estimating population size and demographics. If these conditions are not met, the method is likely to be inappropriately applied, and the process and results may be discredited.

The Delphi method is suitable when most of the following conditions are present. The first three must be present, and the remaining four are helpful but not essential. When mathematical methods are appropriate, an estimate can be calculated and there is no need for a Delphi exercise. If too few experts are available (see Section 5), the problem is simple, or direct communication is effective, a Delphi exercise will be not be useful.

- a) *Mathematical methods are inappropriate.* Statistical and forecasting models may provide more accurate estimates than human judgment. However, developing such models may be costly and take-consuming, require considerable expertise, and yield results that are difficult to interpret. In addition, the data for running the models may be unavailable, in the wrong format, or outdated.
- b) *An appropriate number of experts (see Section 5) are available.* A group of experts usually performs better than any one expert because the group possesses at least as much knowledge as its most knowledgeable member. Several experts on diverse topics should be involved in a Delphi exercise.
- c) *The situation is complex.* The issue should be complex enough to need more experts than can interact effectively in face-to-face exchange.
- d) *There are few data, or time is limited.* A Delphi exercise relies on the expertise and judgment of a panel, so could be conducted with no data. Using electronic communication and a dedicated support group, a Delphi exercise can be completed in a few days.
- e) *Time, cost and distance make face-to-face group meetings unfeasible.* The logistics and expense of bringing a group of experts together at the same time and place are avoided by a Delphi exercise.
- f) *Social, psychological and political differences may hinder effective communication and behaviour.* To ensure the validity of the estimate, participants must be free to express their thoughts and ideas. The quality of judgments and decisions may suffer from disagreements, personality clashes, power games and hidden agendas.

- g) *Experts on the panel have not previously worked with each other.* People have different perspectives, terminologies, frames of reference and approaches to working that may hinder effective communication through conventional channels.

4. What preparatory activities should be carried out prior to a Delphi exercise?

Once it has been decided to proceed with a Delphi exercise, a support group must be created to administer, monitor and guide the process. The support group typically consists of a facilitator, a researcher and an assistant. The exact composition is decided by the agency convening the exercise, in consultation with other stakeholders in the exercise. Staff availability also affects the size and composition of the group. The support group's main activities are to:

- a) formulate the goal of the exercise;
- b) convene the expert panel;
- c) develop the first-round Delphi questionnaire;
- d) pilot the questionnaire to check its wording is clear;
- e) explain the process to the panelists, and send out the first questionnaire;
- f) analyze the first round of responses;
- g) gather and provide additional information to panelists, if requested;
- h) prepare the second-round questionnaire;
- i) send the second-round questionnaire, the first-round summary and additional information to panelists;
- j) analyze the second-round responses.

Steps (f) to (i) are repeated until there is agreement or stability in the responses, then the support group:

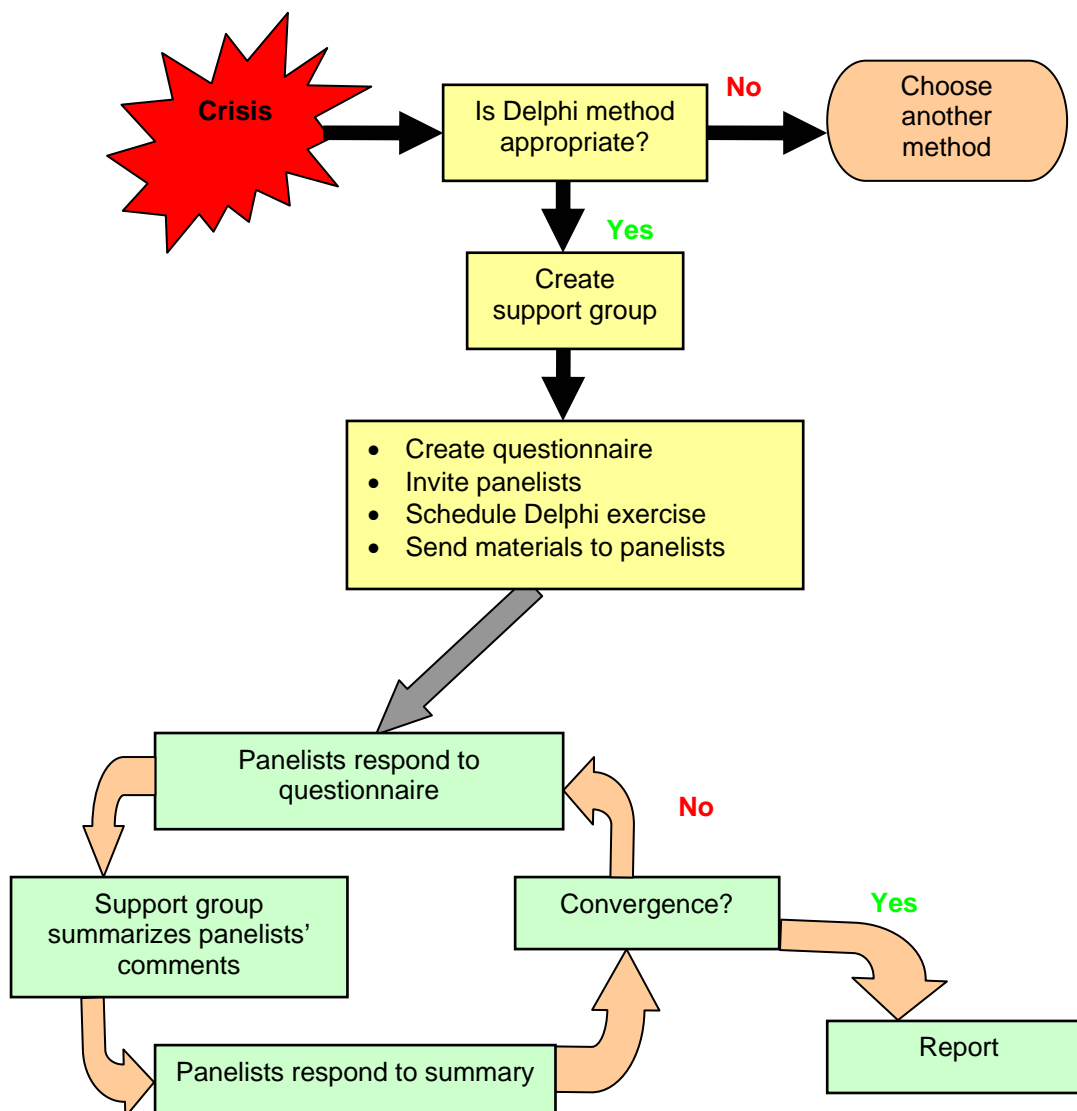
- k) prepares a final report and sends the results to the panelists and decision-makers.

The support group facilitator identifies and recruits the experts, reviews and summarizes the responses of the panel, and writes the report. The researcher searches recent media coverage of the crisis event, and identifies and obtains relevant available databases, reports and surveys of the area or population. The assistant ensures that all panelists receive the materials on time and send back their responses, and that the responses are complete. The support group also encourages the panelists to participate in the Delphi exercise.

5. How to conduct a Delphi exercise to estimate population size and demographics

- a) **A decision is made to conduct a Delphi exercise.** The guidance in Section 3 is used to decide whether to proceed with a Delphi exercise or use another method to estimate the population size.
- b) **A support group is created to administer the Delphi exercise.** Section 4 provides guidance on the support group's composition and activities.
- c) **The support group selects and invites experts.** The goal is to have about *15 to 20 experts* on the Delphi panel. More experts can be invited to compensate for those who decline the invitation or drop out of the exercise.

Figure 1. Flow chart of a Delphi exercise



- The combined knowledge and expertise of the panel experts should be wide-ranging enough to tackle the full scope of the issue to be addressed. There is no available guidance on the exact criteria for selecting Delphi panelists, but satisfactory panelists are people who have experience of population forecasting, can provide insight on the situation, and are able to follow the procedure for the Delphi exercise. Although experts should be well-informed on the topic, a high degree of expertise is not necessary. A group of general experts is favoured over specialists. For example, the panel can include management decision-makers, professional staff such as demographers, behavioural scientists, emergency responders and nutritionists, people with knowledge of the affected area, and those who know the culture and behaviour of the affected people, such as key informants at the regional, national or provincial level.
 - Experts can be well-known and respected individuals from relevant fields, authors of publications on the topics discussed, and professors who teach and conduct research in the subjects.
- d) The support group informs the expert panel** of the reason for conducting the Delphi exercise, the intended outcome, the schedule, and how the information will be used. Box 1 provides an example.

Box 1. Example of terms of reference for a Delphi exercise to estimate population numbers

A group of experts is being convened to help WFP estimate how many and what kind of people live in a crisis-affected area. This information will be used as the basis for estimating the number of people requiring assistance. The crisis has significantly changed the population distribution and profile in the area, and previous estimates of population size and demographics are unreliable. The group of experts is asked to estimate the current population size, despite having imprecise and insufficient data, by providing their opinions on how the crisis is likely to have affected the number and demographic profile of the population in the affected area. WFP will provide a support group to assist the experts, who can reach support group members at (telephone) (e-mail) if necessary.

Since timeliness is a key factor in an appropriate response, please adhere to the following schedule for the Delphi exercise:

- a) **Day 1:** Panel members write their responses to questions and send them to WFP. Please include any requests for additional information.
- b) **Day 2:** WFP compiles these inputs and sends a summary to the experts. If asked, please justify your responses and send your justifications to WFP with your responses to the second questionnaire.
- c) **Day 3:** Panel members respond to the second questionnaire, which is based on day 2 feedback, and send their inputs to WFP.
- d) **Day 4:** WFP compiles this second round of inputs and sends a summary to the experts. If asked, please justify your responses and send your justifications to WFP on the same day (day 4).
- e) **Day 5:** WFP compiles the comments and sends a summary to the experts.

The cycle of inputs-summary-inputs will be repeated until convergence occurs – usually in three to four rounds. Convergence is considered to be achieved when the estimate of each expert is within 20 percent of the average.³

- e) **The support group drafts and tests the questionnaire.** The questionnaire is the fundamental element of the Delphi exercise, and serves as medium for communication among panelists. Several WFP staff members should be involved in creating and piloting the questionnaire to check for clarity and the usefulness of responses to the questions. WFP staff should also recommend which supporting materials to send to the Delphi panel. See Annex 1 for a sample questionnaire, which should be adjusted to each situation as required.

- f) **The support group distributes the materials for the first-round questionnaire to the panelists.**

These materials consist of terms of reference, the schedule, the first-round questionnaire, this Technical Guidance Sheet on the Delphi method, and documents that describe the crisis and the people and locations affected. In the first round, panelists have the opportunity to estimate the population size and demographics without explaining their projections.

³ This 20 percent convergence is based on the acceptable margin of error discussed in the desk review: *Estimating Population Size in Emergencies*, A. Henderson, WFP Emergency Needs Assessment Service (now Food Security Analysis Service), December 2006.

The background material on the crisis should describe:

i. The crisis:

- where and when it occurred, the severity and the number of fatalities;
- collected news reports, information on security and transportation availability;
- descriptions of past crises in the area and how the population was affected;
- descriptions of similar crises in other countries, and how these changed the population – for example, how tsunamis affected low-lying areas near the coast, or how typhoons affected those in their path.

ii. The people in the crisis area:

- descriptions of previous population movements in the area;
- the most up-to-date figures and surveys on population size and demographics in the target area.

iii. The crisis location:

- maps of topography, land use, population density, roads, jurisdictions, etc.

- g) The support group analyses the first-round responses.** Panelists send their estimates to the support group, which follows up to obtain late-arriving answers and then reports the range, mode, mean, and upper and lower quartiles of numerical estimates. Each estimate has equal weight, so the support group must be sure that the composition of the expert panel is not unbalanced towards people with any kind of bias, in which case giving equal weight to all would provide inaccurate results. Frequencies are calculated for non-numerical responses. No finds, omissions and ignored items are also reported. Panelists with estimates that fall outside the upper or lower quartiles are asked to justify their projections anonymously – there are always a few panelists who need to justify their estimates. Panelists may also request more information or interaction to progress to agreement over a number. The facilitator may use this information to modify the questionnaire, by including questions that respond to the panelists' comments.

A wide spread of estimates usually emerges in the first round. Estimates will progressively narrow and converge during subsequent rounds and feedback. In most Delphi exercises, convergence arises in three or four rounds. Holding more than four rounds does not usually lead to more accurate estimates, and may result in panelists dropping out of the exercise. As mentioned in Box 1, convergence of responses is reached when the estimate from each expert is within 20 percent of the average. Although rare, convergence may occur around two different numbers.

- h) The support group sends the summary of the first round to the panelists.** In this step, the panelists compare their projections with those of other panelists. The basis for panelists changing their estimates in the second round relies on sharing the first-round outcome and any additional information on the crisis. The panelists send their second-round estimates, and those whose estimates fall outside the upper or lower quartiles are asked to justify them.
- i) The support group analyses the second-round responses and comments, as described in step g.** The process is repeated until convergence is reached. Although rare, convergence can emerge around two different estimates.
- j) When convergence is reached, the support group prepares and sends a report to the panelists and decision-makers.** In most Delphi exercises, convergence occurs over a single number; when it occurs over two different numbers, both are reported.

6. What are the limitations of a Delphi exercise?

The following are some common causes of failure of a Delphi exercise:

- a)** The facilitator/support group imposes his/her/its views and preconceptions regarding the issue and does not allow panelists to suggest alternative approaches for estimating population size and demographics. This can happen when the Delphi method has been used

several times, and a pattern has emerged in how it is run. The facilitator should welcome alternative ideas and approaches.

- b)** Disagreements are ignored and not explored, leading discouraged dissenters to drop out. In a Delphi exercise, each person's opinion carries equal weight, and when somebody drops out, the result becomes biased.
- c)** The demands of a Delphi exercise are underestimated, and panelists become fatigued or overwhelmed by the process.
- d)** There is a tendency to downplay future events. The panelists may not factor in future political, social or environmental changes that affect their projections of the population size and demographics.
- e)** Some experts end up being unable to provide an estimate of population numbers, or have a hidden agenda, such as political motives for inflating or decreasing numbers.
- f)** The Delphi exercise is poorly executed, when experts feel rushed to make projections or the facilitator writes poor summaries of the responses from each round.
- g)** The support group alters the responses to expedite convergence.
- h)** Low response rates lower the quality of the information.
- i)** Panelists are solicited for their expert judgments, rather than being surveyed about their limited knowledge.

Other potential weaknesses in a Delphi exercise are the procedure for choosing experts for the panel, bias in the support group, and the unscientific and inaccurate nature of the method. Despite these limitations, however, the Delphi method can be useful for answering one, specific, single-dimensional question, such as estimating population size and demographics after a crisis. Decision-makers must remember that the outcome of a Delphi exercise is an expert *opinion*, which is only as valid as the judgment of the experts who made up the panel and the process that led to the results.

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Annex 1

Sample Delphi exercise questionnaire for estimating population size and demographics in EFSAs

On/during (dates), a (describe crisis) occurred in (place) that affected (summary of the main impact of the crisis on the housing and population). The latest census figures from (date) estimated that (number) people were living in the area. This Delphi exercise is designed to estimate how many people currently live in the affected area.

The questionnaire consists of three parts:

Part I asks each expert on the Delphi panel to indicate whether a list of conditions explain why the population size and demographics have changed/will change in the geographical areas of interest.⁴ Please indicate your opinion regarding the degree to which each condition may have changed the population size and demographic characteristics. In question 2, please consider demographics to be the age, sex, race, religion, income, employment status, etc. of the population in the target area, and specify the characteristics of the demographic groups that were/will be affected by the crisis.

Part II asks each expert about the direct and indirect causes that she/he believes have affected/will affect the population size and demographic characteristics. This part aims to identify the factors that you believe have changed/will change (or perhaps did not/will not change) the population size and demographics in the target area. You may attribute the change to one or several of the possible factors.

Part III deals with the desired outcome – numerical estimates of current and future population size and demographics in the affected area. Based on your experience and available information, please fill in the empty cells in the table with your numerical projections. The acceptable margin of error is 20 percent. Please include two significant digits in your estimate: for example, 420,000; 1,200,000, etc.

Part I: Changes in population size and demographics

Please circle one symbol to indicate the extent to which each factor **is expected to have affected/be able to affect** (in the future, at a specific time) the population in the area of interest.

*** Key (coding):**

- = large decrease, more than 50 percent
- = small decrease, less than 50 percent
- 0 = no change
- + = small increase, less than 50 percent
- ++ = large increase, more than 50 percent
- N = unable to estimate

	Currently	In () months
1. Has the crisis changed population size in the area?		
	--- 0 + ++ N	--- 0 + ++ N
2. Has the crisis changed demographics in the area? <i>Please specify the demographic group(s) of concern: children, elderly, men, women, according to religion, tribe, etc.</i>		
a) ()	--- 0 + ++ N	--- 0 + ++ N
b) ()	--- 0 + ++ N	--- 0 + ++ N
c) ()	--- 0 + ++ N	--- 0 + ++ N
d) ()	--- 0 + ++ N	--- 0 + ++ N

⁴ Depending on the circumstances, a separate questionnaire may need to be filled in for each geographical area of concern.

Part II: Direct/indirect causes of the changes in population size and demographics

Please check **all** direct and indirect factors that are likely to have affected/to affect the population size and demographics of people in the area of interest, to clarify the nature of the crisis and its impact.

*** Key (coding):**

- = large positive impact
- = small positive impact
- 0 = no change
- + = small negative impact
- ++ = large negative impact
- N = unable to estimate

	Currently	In () months
3. How large is the change due to the following direct and indirect causes?		
a) Politics	--- 0 + ++ N	--- 0 + ++ N
b) Armed conflict	--- 0 + ++ N	--- 0 + ++ N
c) Land that is not useable	--- 0 + ++ N	--- 0 + ++ N
d) Migration	--- 0 + ++ N	--- 0 + ++ N
e) Destruction of		
i) housing	--- 0 + ++ N	--- 0 + ++ N
ii) water sources	--- 0 + ++ N	--- 0 + ++ N
iii) roads	--- 0 + ++ N	--- 0 + ++ N
iv) food sources	--- 0 + ++ N	--- 0 + ++ N
v) livelihood assets	--- 0 + ++ N	--- 0 + ++ N
f) Illness/injuries/deaths		
i) illness (due to)	--- 0 + ++ N	--- 0 + ++ N
ii) injuries (due to)	--- 0 + ++ N	--- 0 + ++ N
iii) deaths (due to)	--- 0 + ++ N	--- 0 + ++ N

Part III: Estimates of population size and demographics

This exercise deals with the desired outcome – numerical estimates of current and future population size and demographics in the affected area. Based on your experience and available information, please fill in the empty cells in the following table with your numerical projections. The acceptable margin of error is 20 percent. Please include two significant digits in each estimate: for example, 420,000; 1,200,000, etc.

1. Population size

	Latest census figures (year)	Figures from other surveys	Did crisis change figures? (Yes/no)	Estimated size	Will estimate change in (time)? (Yes/no)	Estimated size
Country	x,x00,000	x,x00,000				
Region A	x,x00,000	x,x00,000				
Region B	x,x00,000	x,x00,000				
Region C	x,x00,000	x,x00,000				
City a	x,x00,000	x,x00,000				
City b	x,x00,000	x,x00,000				
City c	x,x00,000	x,x00,000				

2. Demographics (specify area from above)

1) Region A

	Latest census figures (year)	Figures from other surveys	Did crisis change figures? (Yes/no)	Estimated size	Will estimate change in (time)? (Yes/no)	Estimated size
Age	x,x00,000	x,x00,000				
< 1 yr	x,x00,000	x,x00,000				
1–5 yrs	x,x00,000	x,x00,000				
6–15 yrs	x,x00,000	x,x00,000				
16–55 yrs	x,x00,000	x,x00,000				
+ 56 yrs	x,x00,000	x,x00,000				
Sex						
Females	x,x00,000	x,x00,000				
Nursing	x,x00,000	x,x00,000				
Females 15–45yrs	x,x00,000	x,x00,000				
Males	x,x00,000	x,x00,000				
Livelihood						
Farming	x,x00,000	x,x00,000				
Pastoral	x,x00,000	x,x00,000				
Other	x,x00,000	x,x00,000				

2) (Continue for other specific areas of interest)

These Technical Guidance Sheets, the EFSA Handbook and other related resources are available at:

www.wfp.org/food-security