UNIT 2 DAMAGE ASSESSMENT

Structure

2.0 LEARNING OUTCOME

After reading this Unit, you will be able to:

- Explain the different types of sample surveys
- Discuss the need for Epidemiological Surveillance
- Examine the Nutrition Centred Health Assessment Process; and
- Throw light on the relevance of Remote Sensing and Aerial Photography to disaster management.

2.1 INTRQDUCTION

Damage assessment is a precondition for effective disaster management. Unless we are clear about the nature, extent and intensity of damage in the aftermath of a disaster, we can never plan out, implement or evaluate the disaster management plans and strategies. Over the years, many different methods and tools have been devised for collecting information about disasters. Many new techniques and equipment such as sample surveys, Epidemiological Surveillance, Nutrition Centred Health Assessment and Remote Sensing are also constantly being developed. In this Unit, we will discuss these developments and examine the different methods and techniques of damage assessment.

2.2 SAMPLE SURVEYS

A sample survey is the primary tool for needs assessment and is relevant for evaluation purposes in order to detect and monitor the disaster impact. A representative sample of a population is surveyed, from which valid estimates of the status of an entire target group are made. Even though it can never be a complete assessment, it could still provide a good indication of the rehabilitation needs and requirements.

Sampling will provide information on the entire range of problems and/or conditions facing the population. While it cannot be a complete assessment, it could still provide a good indication of the needs of the people. Sample surveys can be undertaken by administering questionnaires for collecting some of the required information like morbidity / mortality figures and statistical analysis for assessing the data collected. These surveys are used by both governmental and non-governmental organisations.

The advantage of a sample survey is that it enables the surveyor to gain a good amount of information about a population or situation without having to conduct a detailed survey of the entire population. When conducting a sample survey, however, attention must be given (in addition to appropriate assessment techniques) to developing a survey questionnaire appropriate for the target population, selecting sites that are statistically representative of the affected area, choosing the correct time period in which to conduct the survey; and structuring the questionnaires to get accurate information. It is also extremely important to determine as to how the persons or families will be selected in order to get information that is truly representative of the entire population. Several different methods can be used to conduct the sample survey. They include: simple random sampling, systematic sampling, cluster sampling; and stratified sampling. Let us discuss these methods now:

2.2.1 Simple Random Sampling

In cases where a complete list of all population elements already exists or can be readily constructed, simple random sampling could be employed. The procedures for simple random sampling are convenient and inexpensive; especially once a list on the basis of data collected has been assembled. A simple random sample is one in which every element in the population has an equal probability of being included in the sample (hence each one of all possible samples is also likely to be drawn equally).

Furthermore, sampling takes place at one stage, with elements of the sample selected independently of one another. **A** convenient and accurate procedure for obtaining a random sample is to use a table of random numbers. **A** table of random numbers contains a list of numbers that have been generated by an unbiased inechanised process, each number having an equal probability of being selected at any point in a sequence.

The first step in the sampling procedure is to assign a serial number to each unit or element in the population. A table of random numbers is then used to identify which serial nunibers are to be drawn from the desired sample. It is worth stressing that random sampling does not guarantee that any single sample will be representative of the population. However, in the long run, if random samples were drawn repeatedly from a population, on an average, all those samples would provide rather accurate estimates of the population. Moreover, for random sampling, the extent of variability or error can be estimated, since statistical tests ask for the probability of sampling errors. In practice, true simple random samples are almost never encountered, mostly because complete and accurate listing of the population under study is rare.

2.2.2 Systematic Sampling

An alternative random sainpling method, which is particularly useful for sampling from a very large listed population, is a systematic sample method, in which cases are selected at given intervals. For example, if 200 cases are to be selected from a listed population of 10,000, one can select every 50th case. It needs to be noted that the entire list does not need to be numbered. Along with a complete and accurate list, two additional things are required for systematic sampling: the 'sampling fraction' (or its inverse, the sampling interval) and a 'random start'.

The sampling fraction is simply the ratio of the desired sample size to the total number of elements in the population. The sampling interval is the ratio of the number of elements in the population to the sample size:

F = Sampling

Fraction = N/M

I = Sampling Interval = M/N

(N is the sample size and M is the population size).

To obtain a random start, a table of random numbers is used to select a number between F (sampling fraction) and I (sampling interval). This ensures that every element in the population has an equal chance of selection. It avoids the small bias that could be introduced if the first or the last element in the population were always selected as starting points. Systematic sampling is commonly used when choosing a sample from pre-existing but unnumbered lists. The procedure might amount to taking every 4th page and the 10th entry down. One has to, thus, know how many pages the list contains and how many entries are there per page.

The most serious problem of systematic sampling occurs when the list is arranged in an order that coincides with the sampling interval. The result is a biased sample. For example, in some cities or towns, it is often the case that corner houses are more expensive and thus stronger. In selecting a systematic sample of houses from maps (e.g., every 10th house), the sampling interval might coincide with or oversample corner houses. An evaluation study of damages to houses would thus underestimate damages. Therefore, lists have to be carefully inspected prior to choosing systematic sainpling rather than simple random sampling.

2.2.3 Cluster Sampling

For most disaster assessment problems, the target population is unlisted and usually widely dispersed. In case the lists do not exist and cannot be readily constructed, the researchers take advantage of the fact that most of the target population clusters in one-way or another. People, for example, cluster-in villages, towns or cities, blocks, neighbourhoods and so on; and while it is very difficult to prepare a list of all the people in an area, a complete and accurate listing of the towns in which they live is not so hard to come by, In cluster sampling, then, one reduces the listing problem to manageable proportions by first sampling a set of clusters which contain the population, and then listing the population elements in those clusters, followed by drawing sample set of elements from these lists.

Since lists of clusters can be easily constructed, it is possible to employ the techniques of simple random sampling or systematic sampling to such lists. If clusters rather than individuals are sampled, then data-gathering costs are reduced. Individuals or units within clusters are obviously much less desired than if they are sampled randomly from the entire population. Therefore, travel time for interviewing is greatly reduced.

In the simplest cluster design (single-stage), clusters are randomly selected, and then every individual or unit within each cluster is studied. For example, to estimate the casualty rate after an earthquake in a large city for which current maps are available and from which it is possible to create sampling clusters such as blocks, we could draw a random sample of city blocks and then interview all the families in each block.

But, cluster sampling is more useful when multi-stage sampling is used. For example, to determine malnutrition rates in a large community, a random sample of blocks can be drawn and the housing units in each block listed. Then a random sample of housing units within blocks. can be drawn. After this, within the households, a random sample of children under 5 age group could be screened.

Thus, cluster sampling essentially involves simple random sampling in stages. Lists are constructed at every sampling stage, but the costs of enumeration are reduced because the entire list of elements in the population is not required, only lists of elements within sampled clusters are needed. If the clusters are geographic, cluster sampling is also known as area sampling. It could prove to be the most efficient method for obtaining national or regional samples of households or families commonly used for sample surveys.

2.2.4 Stratified Sampling

In stratified sampling, the researcher divides the population into groups or categories called 'strata', and then independent random samples are drawn from each group or 'stratum'. Stratification is appropriate when the sample is used to do more than one job: to make estimates or comparisons for sub-groups of the population as well as for the entire population. Depending on the distribution of sub-groups within the population, a simple random sample of the population may not include a sufficient number of cases from the relevant categories, which need to be compared, For example, a single survey might be used to address two separate questions related to disaster impact after a cyclone: What percentage of the population lost their houses? and how does the percentage of loss for upper income families compare with that of lower income families?

A simple random sample of families would be the ideal sample for the purposes of the first question, but the simple random sample might not produce'enough cases to provide a reliable estimate for the second query. In this case, the researcher might therefore want to over-sample one group to the proportion in which they are present in the population. When adjustments of this sort are undertaken, the result is called a stratified sample. In general, stratified sampling is used whenever a simple random sample is unlikely to produce enough cases of a certain type to support the intended analyses.

Stratification criteria commonly used in social research include geographic location or region, city or community size, individual characteristics such as race, ethnicity, age and so on. For disaster impact studies, it may be important to compare the impact of an intervention on individuals who vary in some significant way such as employment status, education, family size or age. Two types of stratified samples are possible: proportional or disproportional, depending on the sampling fractions used within strata and the purposes to be served by the sample. In 'proportional sampling', the sampling fractions for each status in the population are equal. Whereas in 'disproportional stratified sampling', the surveyor needs to select more units from the smaller proportion of the population.

There are many instances in which stratified sampling is necessary or desirable, However, for the stratified sampling to be feasible, considerable data about the population is required, an which the stratification is to be based e.g., age, ethnicity, employment status or occupation.

Stratification by more than one variable is possible, although seldom is it done for more than two or three variables at a time. Table 2.1 summarises the different types of sample surveys that can be used for disaster assessment, and describes the advantages and disadvantages of each:

Table 2.1: Types of Sample Surveys

Sample Method	Usage	Advantages	Disadvantages
Simple Random Sample	Nutritional Assessment Housing Damage Surveys Health Surveys Needs Surveys	Sampling error can be estimated	Interviews are dispersed and full list is rare
Systematic Sample	Nutritional Assessment Damage Assessment Casualty Estimates Needs Surveys Health Surveys	Convenient to administer	Biased Sample due to coinciding of Sampling List with Sampling Interval
Cluster Sample	Damage Assessment Nutritional Assessment Needs Surveys	Decreased costs Useful when little is known about the target population	Increased error in single-stage samplings
Multi-stage Cluster or Area Sample Survey	Damage Assessment Nutritional Assessment Needs Assessment	Lower costs than Simple Random Sample Useful in cases of large population Lower error than Cluster Sample Useful when little is known about target population	Higher error than Simple Random Sample Higher costs
Stratified Sample Survey	Impact Surveys Needs Surveys Health Assessment	Guarantees adequate representation of small groups Usually diminishes error	Sometimes requires weighing the responses Requires extensive data about population

2.3 EPIDEMIOLOGICAL SURVEILLANCE

Epidemiological Surveillance (ES) is the collection and interpretation of data on the risk or actual occurrence of communicable diseases and other health problems. As an assessment tool, epidemiological surveillance is most important in slow-onset and continuing disasters, especially where changes in living patterns occur such as the relief camps of disaster victims. These changes rarely occur after rapid onset disasters. However, because fear of disease is always prevalent after any major disaster, health status assessment and disease surveillance should be carried out as a guide for planning and management of health interventions, especially as a tool for quality control, and as a means of controlling rumours and reassuring the victims. Epidemiological Surveillance should be carried out by government health authorities after cataclysmic disasters, but it may also involve voluntary agencies and inter-governmental organisations during famines, especially those involved in health and feeding programmes.

Surveillance procedures are aimed at detecting changes in disease occurrence. To detect an increase in the incidence of disease caused by a disaster (or by relief activities), pre-emergency baseline data must be available. If it is not, an immediate baseline survey should be undertaken. While changes over the pre-disaster norm rnay not be easy to detect, changes in relation to the baseline can be noted. In long-term disasters, the assessment or surveillance team should set up a simple record- keeping system that can provide the necessary data to determine changes,

In a rapid-onset disaster, such as an earthquake or cyclone, ES cannot be used as an initial assessment tool unless baseline information about the affected population and disease occurrence can be obtained, It should be recognised that some data is always available. However, cataclysmic disasters rarely produce abrupt changes in the incidence of an infectious disease. In fact, ES carried out with the assistance of the U.S. Centre for Disease Control following earthquakes in Managua, Nicaragua (1972) and Guatemala (1976) failed to demonstrate an increase in the number of diagnosed cases of communicable diseases in the wake of earthquakes.

Fear of diseases such as typhus, typhoid, hepatitis etc., is normally caused by people's ignorance about certain basic facts. They feel that the water supply gets contaminated on account of unattended corpses and sewage. People living outside the damaged houses, it is feared, are more susceptible to communicable diseases. The vast majority of these fears are unfounded, but in some situations an increase in endemic diseases and diseases such as tetanus, malaria, leptospirosis and rabies has been observed. Should changes take place, they are not likely to occur in the immediate aftermath, and will also be localised and progressive. Thus, any survey data developed immediately after the impact could serve as a baseline.

Since the actual chances of the incidence of increase in communicable diseases in the aftermath of a rapid-onset disaster are comparatively low, most ES activities serve to measure the effectiveness of health care activities, determine priorities of required actions, artd dispel public fears and consequent inappropriate responses. For example, data may be useful for keeping over-zealous relief organisations from conducting costly and unneeded mass immunisation campaigns. We have focused on Epidemiological Surveillance in the Unit 17 of MPA-004 also. Over here, the emphasis on ES is in context of disaster aftermath.

In slow-onset or continuing disasters, and in the case of floods, the threat of communicable disease is much higher; here ES is a major disaster management tool as well as a necessary long-term monitoring technique, and surveillance activities must be initiated following the initial disaster impact assessment. Occurrence of diseases is of greater concern in long-term disasters because food supplies are often disrupted and lack of sanitation becomes an uncontrollable problem, increasing the incidence of malnutrition.

This makes people (especially small children, pregnant and lactating women) more susceptible to both acquiring the disease and succumbing to it. Moreover, the convergence of people in search of food in urban areas and relief camps increases the likelihood of the spread of communicable diseases. Of special concern are 'childhood diseases' such as measles, chicken pox, malaria, encephalitis and diarrhoea, which can sweep through a concentrated population causing large numbers of deaths among small children. Other diseases of concern include dysentery, cholera, typhoid and specific nutritional deficiencies.

Traditional Epidemiological Surveillance or ES primarily focuses on major health problems and infectious diseases. Data are collected by medical teams operating in the affected areas or by health surveys among the target population. The three principal surveillance techniques are:

- Systematic reporting of confirmed cases of predominant diseases
- Systematic reporting of symptoms that could indicate major diseases of concern; and

- Rapid field investigation of any reports or rumours of an abnormal increase in the incidence of disease.

In slow-onset and continuing disasters, the major health issues are diseases that are caused and spread due to poor sanitation, environmental health hazards and malnutrition as well as related health problems. For this reason, in recent years another method of surveillance that permits broader assessment and monitoring has been developed; this is called 'Nutrition Centred Health Assessment.' Let us now discuss its role in the aftermath of disaster.

2.4 NUTRITION CENTRED HEALTH ASSESSMENT

Nutrition Centred Health Assessment (NCHA) evaluates the health and nutritional status of children under the age of five (i.e., 12 months to 5 years) as the 'point of contact' to detect and assess a full range of health problems. The method is used for: initial assessment of health and nutritional status, long-term surveillance of disease, malnutrition and death as well as long-term monitoring of food supplies, logistics, water and food quality.

NCHA was first developed as a means of analysing the plight of refugees and displaced persons; later it was adapted for use in context of drought and famine victims. Most recently, it has come to be used in a situation where people live in camps or concentrations and their daily requirements are supplied wholly or in large part by relief agencies. The system works well in both urban and rural environment or in virtually any type of climate. NCHA uses children (1 to 5 years of age) as the focal point for assessment because their health and nutritional status necessarily reflects what is happening to the whole population. Pregnant and lactating women, and children under 5 years are known as 'vulnerable groups' because their needs of food and proper nutrition are greater than other population groups. Also, for a variety of health and social reasons, illness and death affect this vulnerable group first.

On the basis of health and nutritional data about this group, the planners can determine indicators of many problems. For example, if a large number of malnourished children are detected; several problems such as food shortages or illness may be present. By cross-checking food supplies, medical records and water supplies, the contributing factors can be traced. When remedial measures are instituted, such as supplementary feeding for women and small children, NCHA becomes a tool for monitoring the programme. Suppose even after several weeks of feeding, children still show no improvement, problems in water supply or hygiene could be suspected and traced by determining the number of children who have diarrhoea. If water is not found to be a problem, illnesses symptomatic of diarrhoea would then be assumed.

A skilled surveillance team, using NCHA methods, could conceivably detect:

- Food shortages due to problems of logistics
- Food distribution problems, such as unequal distribution to certain areas or groups
- Intra-family food distribution problems (food being given/taken by working males)
- Problems in diet (in terms of nutritional content of relief foods)
- Illnesses
- Water shortages
- Water contamination
- Problems of personal hygiene; and
- Psychological problems among vulnerable groups.

2.5 REMOTE SENSING AND AERIAL PHOTOGRAPHY

Remote Sensing is the acquisition of information on disaster related subjects. Weather radar, weather satellite, seismographs and videotape are examples of Remote Sensing systems. Remote Sensing information can be valuable in determining the extent of cataclysinic disasters and monitoring slow-onset disasters such as environmental degradation and droughts. These tools also offer the possibility of acquiring data over remote regions or areas made inaccessible by disruption of normal transportation and communication systems. However, both tools require that ground studies (known as ground-truth studies) be carried out to verify and adjust and/or calibrate the data obtained from air or space, and be made available in time for emergency responses.

Aerial Photography is a form of Remote Sensing. In disaster management, however, it refers to the use of satellite with imaging systems that produce computer generated images. Small Format Aerial Photography (SFAP) is being used to take the aerial photographs. Aerial photography is a valuable tool for disaster managers. Possible uses of aerial photography include hazard analysis and mapping, vulnerability analysis, disaster assessment and reconstruction planning. Remote Sensing and Aerial Photography by aircraft and satellites are valuable information-gathering tools for damage assessment after earthquakes, cyclones and floods. These are also used for monitoring droughts and desertification, as well as ascertaining progress of counter disaster measures. Remote Sensing and Aerial Photography can provide a comprehensive view of a large area over a short period of time.

Requisition and interpretation of Remote Sensing and Aerial Photography would require trained specialists. The main users of Remote Sensing and Aerial Photography are governments and inter-governmental organisations. This is due to both the costs and the nature of the imagery obtained. The things that can be observed (such as damage to public facilities, lifelines, forests, agriculture etc.), however, are of immense concern to governmental and non-governmental agencies. We have read about Remote Sensing in Unit 12 of MPA-004 Course and will read more about it in Unit 4 of this Course.

2.6 CONCLUSION

Sample surveys are the primary tools for needs assessment and are important in evaluation to detect and monitor the impact of catastrophes. A representative sample of a population is surveyed, from which valid estimates of the status of an entire target group can be made. Sampling can provide information on the entire range of problems and/or conditions lacing the population. While not a complete assessment, it can still provide a good indication of the needs of the target group. Sample surveys make use of questionnaires for collecting some of the required information like morbidity/mortality figures. Statistical analyses based on sample surveys are useful for assessing the data collected.

Sample surveys are used by both governmental and non-governmental organisations. Besides surveys that make available impact information, Epidemiological Surveillance for monitoring purposes is a very useful tool, primarily for health related impacts. There are also Remote Sensing and Aerial Photography that are information system management tools and modern methods for assessing and analysing clisustcr impact. In any given situation, it is a combination of tools that may be most appropriately used, depending on the situational context. This Unit explained the different types of sample surveys and other tools that could be used to ascertain the impact of disasters in order to facilitate rehabilitation and recovery.

2.7 KEY CONCEPTS

Sampling Fraction
The Sampling Fraction is simply the ratio of the desired sample size to the total number of elements in the population. The Sampling Fraction (F) is derived by dividing rhe Sample Size. (N) by the Population Size (M) i.e., F = N/M

Sampling Interval
The Sampling Interval is the ratio of the number of elements in the population to the sample size.. Sampling Interval (I) is derived by dividing Population Size (M) by the Sample Size (N) i.e., I = M/N

Target Group
For any type of programme e.g., disaster management programme or a poverty alleviation programme, a target group is identified. The target group is specially identified keeping in view the poverty levels, vulnerability conditions, infrastructure availability and coping capacity of the population to which the programme attempts to cater. The programme is designed with the target group in mind so that maximum benefits could accrue to the targeted population.

2.8 REFERENCES AND FURTHER READING

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2.9 ACTIVITIES

1) Try to carry out a random sample survey of your neighbourhood to determine the impact of any recent major problem faced by the residents (e.g., water shortage, epidemic, water logging etc.)

2) On the basis of Activity One, attempt to determine if the neighbourhood needs to prepare itself for any kind of emergency in the future.Pen down your observations.

3) Go through the newspaper reports on the Gujarat Earthquake of 2001 or the Bhuj Earthquake of 2003 or the Muzaffarabad Earthquake of 2005. Study the reports thoroughly and suggest the best form of sample survey that could be used to assess the impact of the earthquake on houses in the affected area. Try to develop a questionnaire needed to carry out your survey,