

Estimating population size in emergencies

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One of the first challenges in a natural disaster or humanitarian emergency is to obtain accurate estimates of affected populations (1). In the aftermath of rapid-onset disasters such as the recent tsunami disaster in south Asia, there is frequently an absence of adequate baseline data against which to measure the impact of the disaster. Available population data vary widely in quality, and the movement of persons can result in inaccurate estimates. The population may be widely dispersed, highly mobile, or in refugee camps. Uncertainty over population figures and demographic information constitutes one of the main barriers to accurate needs assessment.

A basic problem faced by all humanitarian relief agencies in an emergency is that of counting the numbers of displaced persons and assessing their general well-being. The various methods of estimating population size in disasters have their advantages and disadvantages, and demographic techniques are continually being updated and improved.

Social scientists, epidemiologists and statisticians alike are familiar with the principles of sampling: selecting a subset of the population of interest in order to gain information about the entire population. A global positioning system (GPS — a system of satellites that provide precise location information that can be accessed using hand-held electronic units) is increasingly used to identify a sampling frame in the conflict setting. Alternatively, satellite imagery can be used to estimate population density and select a geographical area for sampling. Different techniques and types of samples need to be considered in crisis situations, so it is important to understand the limitations and potential weaknesses of the various methodologies.

Cluster sampling consists of assigning each member of the population to a group (cluster); clusters are randomly selected and all members of selected clusters are included in the sample (2). Spatial sampling — which is a variant of cluster sampling and is also known

as area probability sampling — is the use of geographical area and population density to estimate population size or proportions, often using hand-held GPS units or geographical information systems (GIS). This method can be used when maps and censuses of the geographical area under study do not exist. Epicentre introduced a method of sampling that is frequently used to estimate populations in acute emergency situations of disaster or forced migration, known as the quadrature method (4). There are many challenges with this method, including choosing the size of the blocks and the number of blocks to sample, and taking differing population densities into account. At the field level, these decisions are based mainly on common sense. Although the quadrature method is an important tool that can be used systematically at the beginning of a crisis, further research is needed to improve its statistical validity.

The French National Institute for Public Health Surveillance compared a method known as T-square estimation with the quadrature method, as a potential alternative. T-square estimation involves sampling a number of random points, measuring the distance between each point and the nearest household or family unit, and then measuring the distance between that household and the next closest one, as a way of estimating population density. This method was tested at a festival in France and the results were comparable with results obtained using the quadrature method and exhaustive entry registration (4). Many of us in the disaster relief field are optimistic about the potential of using the T-square method in future situations.

Although qualitative methods do not first come to mind when thinking about how to estimate populations in emergency settings, they can offer some important insights throughout the various phases of a crisis and they may be the only alternative where it is not possible to reach disaster-affected populations. There are a variety of qualitative techniques that can be quite useful in

emergency settings and refugee camps. For example, participatory mapping is a technique that has been used among refugees: houses are drawn on a map and the refugees are interviewed to learn more about each household, such as the age and sex of the household members. A walkabout is a simple observation method in which researchers walk around a camp to observe the layout and amenities; it can be used to confirm maps of uncertain accuracy.

In summary, the best sampling or estimation method for a given situation is context-specific: different methods and approaches are applied in different phases and in different types of emergencies. More important than the choice of sampling method is the need to recognize its potential biases and how these might limit its applicability. Aid workers often do not have sufficient skills to take a valid sample and analyse the results of a survey, which is why many initiatives to improve the quality of relief programmes have emphasized the importance of training relief workers in survey methodologies (5). ■

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