

Tools and Methods for Estimating Populations at Risk from Natural Disasters and Complex Humanitarian Crises

More accurate population data—based on census and other data that provide information such as peoples' ages, gender, ethnicity, and where they live—are needed to better plan for and respond to humanitarian crises. Such data illuminate exactly how much and what type of aid is needed and where. All nations should be enabled to conduct a nationwide census every ten years, and this information should be geographically referenced. Population data alone are not sufficient but must be accompanied by interagency coordination and training in the collection, use, and distribution of the data.

Each year, millions of people around the world are displaced by natural or human-induced disasters and social conflicts resulting in humanitarian crises. The South Asian earthquake and tsunami in 2004, Hurricane Katrina in 2005, and the ongoing conflict in Darfur are recent, highly publicized examples. The number, demographic characteristics, and locations of the populations at risk during events like these are often inaccurate or unknown, complicating or delaying response and relief efforts. Population data and the tools and people trained to analyze and use them are essential for effective humanitarian response to disasters, as well as for development and reconstruction programs.

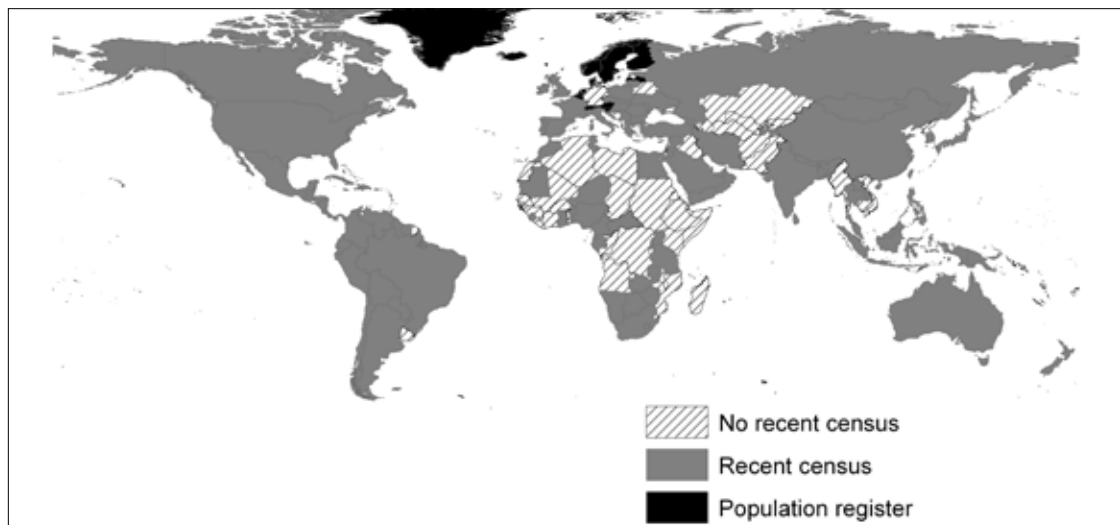


Figure 1. Censuses by country as of the year 2005 based on data back to the year 2000. Most countries have taken a census in 2000 or more recently. Many of the places without recent census data also have populations highly vulnerable to the impacts of natural and human-induced disasters. These ‘at-risk’ populations require good base census data and the tools, training, and an institutional framework in which the data can be used before and when disasters strike. Source: Courtesy of and adapted and updated from United Nations Statistics Division (2005).

Resource-poor nations are often the most vulnerable to the effects of a natural disasters or human-induced events, and are likely to require external assistance for the resulting humanitarian crisis. Those nations are also likely to have the greatest difficulty obtaining, maintaining, and distributing their population data for response efforts (see Figure 1). However, as demonstrated by Hurricane Katrina, even countries with adequate financial resources and good population data do not always effectively respond to a crisis. Such data need to be collected, analyzed and maintained in a coordinated way for seamless distribution to responders and development organizations at local, regional, national, and international levels.

This report provides a framework for making better estimates of populations at risk and neces-

sary actions at the institutional level to improve the ability to use georeferenced population data to conduct timely, effective disaster relief, response, and recovery work.

Why Population Data Should Be Linked To Location

It is not uncommon for humanitarian or emergency response teams to be deployed without even rough estimates of the number and location, let alone ages and gender, of the people in the vicinity of the disaster. Even low tech maps—drawn with pen and paper—that show location of homes, streets, and other information can be life-saving tools in an emergency. Figure 2 is a hand-drawn map of a coastal village in India reconstructed by a first responder to the area after the Indian Ocean tsunami struck. The map and data were based on field observations and interviews with villagers. In today’s world of Google Earth and global position-

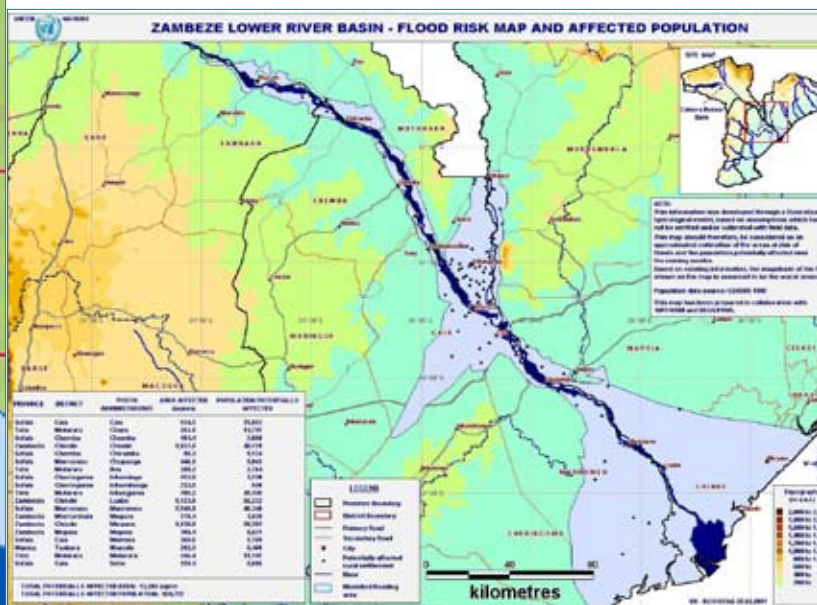


Figure 2 (above left). Despite an enormous contribution of international relief aid to areas affected by the Indian Ocean earthquake and tsunami, and the advanced technology available to some responders, immediate relief efforts often relied on hand-drawn maps such as the one of the Kameswaram village in India. The map, which was derived from information collected from villagers, contains population data relevant to assistance providers, demonstrating that adequate aid does not necessarily require advanced technology—rather advanced technology requires appropriate and timely input of data. Source: Courtesy of Abbiah Subramanian, Madras Christian College, India.

Figure 3 (above right). Although hand-drawn maps like that in Figure 2 are practical and accurate, digital maps that incorporate census data are most desirable because the digitally referenced data can be updated quickly and potentially distributed widely to responders and emergency managers, if the appropriate hardware and power or electrical requirements can be assured. This map of flood-affected populations in Mozambique contains geographically referenced population data from the Mozambique census together with geographically referenced data including the location of the Zambezi River, shelters, cities, potentially affected settlements, primary and secondary roads and modeled flood areas. Source: UN Resident Coordinator/OCHA.

ing systems (GPS), population data can be woven together with geographic information systems (GIS) to generate technically advanced, accurate maps as shown in Figure 3. These types of digital maps can be updated in real time and can potentially be more easily transmitted to responders. Unfortunately, this digital marriage of data and maps is not yet routinely carried out.

Regular Censuses and Training Are Priorities

National census data are the foundation for measuring populations at risk from disasters. All countries' national statistical offices should be provided with the resources and training to conduct a nationwide census every ten years. Efforts should be made to improve the ability of census-poor countries to administer their own censuses through training and technical assistance programs initiated

and supported internationally. This type of investment should reduce the possibility of misapplied humanitarian and development aid. The work of national statistical offices, which collect and analyze population data, should also be better integrated with relief organizations who are using the data "on the ground."

Censuses should have minimum standards for the release, availability, and archiving of data. The report recommends:

- Developing a template of minimum acceptable population and other geospatial data sets that are required by disaster responders. Data sets should be updated at least mid-decade if not more frequently. This could be done with surveys and ancillary data.
- Setting standards for the types and amount of information that countries should share with emergency responders and relief agencies.

Methods for Estimating and Characterizing Populations

The quality and level of population data will have a direct effect on the quality of the response and the number of lives saved. Decision makers often lack the population data for the affected area, including the total number of people and their characteristics, density, and vital statistics. The following are several ways to collect population data.

- **Census:** provides information about the number of people in an area and population characteristics such as age, gender, or race/ethnicity, economic status, and housing statistics; measures people based on their place of residence only; in most industrialized countries, censuses are conducted once every 10 years with intercensal updates provided by a variety of surveys.
- **Population surveys:** local, national and international actors involved in development and humanitarian activities carry out surveys on a regular basis to scope information on health, nutrition, access to water, housing, poverty eradication, etc.; surveys produce baseline population data and indicators relevant for risk and vulnerability assessment and identify specific characteristics of subnational groups; these can be used to update census data.
- **Population projections:** mathematical projections use available data and formulas that incorporate predictions of mortality, birth rates, health and education status to estimate the growth of various parts of a population over time; often used for countries where no recent, reliable population data exist.
- **National and global population databases:** global spatial databases of population applied to identify populations at risk; use models to allocate national-level population data to a global grid consisting of quadrilateral areas of specified size; capture total population size in the grid but not demographic information; supplementary source for population size and distribution where little reliable information exists, or is not available.
- **Proxy measures:** remotely sensed imagery serves as a supplementary source for population size and distribution and improves population estimates and locations for areas where little reliable information exists, or is not available. Determining any personal information about individuals directly from remotely sensed imagery is nearly impossible, although the social status of residents in an area by interpreting characteristics such as building size and shape and amenities such as vegetation and road networks may be indirectly inferred.

- Establishing a central, worldwide archive for local and regional population data using templates available through existing archives to help authorities deal more effectively with humanitarian crises. The archive would serve as a repository for shared local data, and would disseminate data during a disaster to the appropriate response communities.

Research to Identify At-risk Populations

There are various approaches for estimating population size and understanding the vulnerability of groups. To better identify at-risk populations, the following research is needed to determine which approaches would be most helpful:

- Test the accuracy of estimates of population size and distribution based on remotely sensed imagery, particularly in rural and urban areas of countries with spatially, demographically and temporally inadequate census data.
- Improve analyses of vulnerability to natural disasters and conflict in order to define hazard zones or exposures where routine, periodic data collection could occur.

Developing georeferenced vulnerability analyses could help provide accountability to decision makers in preparedness and prevention and establish priorities for risk reduction investments by all stakeholders.

Improving U.S. Response Efforts

In order to improve coordination of U.S. efforts involving the use, access, and distribution of population data for disaster and development responses, one federal agency should be given this responsibility and the appropriate resources to fulfill it. Because of its expertise in population studies, demography and geospatial work, the U.S. Census Bureau could function in this role to improve statistical estimates of at-risk global populations, which would improve the quality of data used for humanitarian responses and reconstruction programs. In addition to enhancing the U.S. government's global relief work, the Census Bureau could train geographers and foreign demographers to improve data collection, analysis, and distribution in their own countries. Maintaining an active research program at the Census Bureau in estimating populations at risk would be an integral part of this set of duties.

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