Mapping nutrition and health data in conflict-affected countries

The use of spatial data and mapping has a long history in helping understand public health problems and design interventions.[1] Today, the ready availability of satellite imagery and online data, together with the increasing accessibility of geographic information system GIS software is enabling rapid innovation and progress.

The arrival of spatial analysis in human nutrition research and practice has, arguably, occurred relatively recently. However, recent advances include the spatial analysis of acute malnutrition in children,[2] haemoglobin concentration and anaemia,[3] iodine status and its association with ground water concentration,[4,5] and the mapping of risk factors for obesity.[6]

In humanitarian emergencies, the mapping of indicators for public health and nutrition is a common practice and essential to efficiently identify needs and target resources during a relief effort. One example is the use of mapping protocols by the Integrated Food Security Phase Classification system for categorisation of food-related crises and malnutrition.[7,8] Work by volunteer-powered organisations such as Missing Maps is facilitating the availability of updated maps from remote and inaccessible areas, and The Humanitarian Data Exchange is promoting the sharing of interoperable data. Maps are increasingly becoming the common vehicle for bringing together and understanding disparate sets of data.

The paper by Nadia Askeer and colleagues[9] contributes to the scientific literature on the spatial analysis of nutrition by modelling the distribution of malnutrition, in young children and women, in the conflict-affected country of Afghanistan. Using data from a 2013 nationwide survey, they applied Bayesian methods to generate small area statistics that allowed for the complete mapping of all districts in Afghanistan, including districts for which there were no available survey data.

Maps are undoubtedly a powerful way to analyse, understand, and present data on public health. However, some caution is required when interpreting and using maps. Data can be presented on thematic maps in different ways, including the commonly used choropleth maps (such as those used in Askeer and

colleagues' study), in which a defined area, such as an administrative district, is shaded or patterned to indicate a certain value. The advantage of the choropleth map is its simplicity for both analysis and interpretation. However, the stark colour differences that may appear between neighbouring areas on maps with this approach may be misleading and may potentially result in the presentation of an ecological fallacy—for example, by averaging malnutrition prevalence from different livelihood groups within the same administrative area of the map.

One of the alternatives ways of presenting survey data is the mapping of datapoints as dots, rather than modelling the expected value across a wider area. Dot maps are the most direct representation for many types of data, but they can be difficult to interpret and draw conclusions from.

However the data are presented, the hazards of extrapolating findings to areas where there are no data available need to be borne in mind. Public health practitioners are generally familiar with the use of confidence intervals to understand the precision of data used to make decisions. With maps, there is currently no commonly adopted visual communication protocol to indicate the precision of an estimate for a certain area; cartographic innovation is needed.

Whichever statistical approach is used to smooth over data gaps and allow a map to be presented as complete, the extent of data coverage needs to be acknowledged. The authors of the current study follow good practice by presenting, in the web annex, a map indicating the geographic areas where data were available and where they were not.

Conflict can affect the nutritional status of populations via different pathways. Recent work[10] has tried to isolate the effect of conflict by use of GIS approaches similar to those used in the study by Askeer and colleagues.[9] The current paper is another step forwards in the use of spatial epidemiology and mapping to enhance a shared understanding of who, where, when, and how people are affected by the nutritional consequences of poverty and conflict.

Andrew Seal

Institute for Global Health, University College London, WC1N 1EH
London, UK
a.seal@ucl.ac.uk

1   Krieger N. Place, space, and health: GIS and epidemiology. *Epidemiology* 2003; **14:** 384–85.

2   Kinyoki DK, Berkley JA, Moloney GM, Kandala NB, Noor AM. Predictors of the risk of malnutrition among children under the age of 5 years in Somalia. *Public Health Nutr* 2015; **18:** 3125–33.

3   Magalhaes RJS, Clements ACA. Mapping the risk of anaemia in preschool-age children: the contribution of malnutrition, malaria, and helminth infections in west Africa. *PLoS Med* 2011; **8:** 16.

4   Kassim IAR, Moloney G, Busili A, et al. Iodine intake in Somalia is excessive and associated with the source of household drinking water. *J Nutr* 2014; **144:** 375–81.

5   Voutchkova DD, Ernstsen V, Hansen B, Sorensen BL, Zhang CS, Kristiansen SM. Assessment of spatial variation in drinking water iodine and its implications for dietary intake: A new conceptual model for Denmark. *Sci Total Environ* 2014; **493:** 432–44.

6   Jia P, Cheng X, Xue H, Wang Y. Applications of geographic information systems (GIS) data and methods in obesity-related research. *Obes Rev* 2017; **18:** 400–11.

7   IPC Global Partners. Addendum to IPC Technical Manual Version 2.0 IPC: tools and procedures for classification of acute malnutrition. Rome: IPC Global Partners, 2016.

8   Partners IG. IPC Global Partners. Integrated Food Security Phase Classification Technical Manual Version 2. Rome: IPC Global Partners, 2008: 32.

9   Akseer N, Bhatti Z, Mashal T, et al. Geospatial inequalities and determinants of nutritional status among women and children in Afghanistan: an observational study. *Lancet Glob Health* 2018; published online Feb 14. http://dx.doi.org/10.1016/S2214-109X(18)30025-1.

10 Kinyoki DK, Moloney GM, Uthman OA, et al. Conflict in Somalia: impact on child undernutrition. *BMJ Global Health* 2017; **2:** e000262.