

## REVIEW

# Malaria epidemiology and control in refugee camps and complex emergencies

By M. ROWLAND\*

*HealthNet International, Peshawar, Pakistan, and London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, U.K.*

AND F. NOSTEN

*Shoklo Malaria Research Unit, Wellcome–Mahidol University–Oxford Tropical Medicine Research Programme, Mae Sot, Thailand*

*Received 14 February 2001, Revised 3 October 2001,  
Accepted 5 October 2001*

---

Owing to the breakdown of health systems, mass population displacements, and resettlement of vulnerable refugees in camps or locations prone to vector breeding, malaria is often a major health problem during war and the aftermath of war. During the initial acute phase of the emergency, before health services become properly established, mortality rates may rise to alarming levels. Establishing good case management and effective malaria prevention are important priorities for international agencies responsible for emergency health services. The operational strategies and control methods used in peacetime must be adapted to emergency conditions, and should be regularly re-assessed as social, political and epidemiological conditions evolve. During the last decade, research on malaria in refugee camps on the Pakistan–Afghanistan and Thailand–Burma borders has led to new methods and strategies for malaria prevention and case management, and these are now being taken up by international health agencies. This experience has shown that integration of research within control programmes is an efficient and dynamic mode of working that can lead to innovation and hopefully sustainable malaria control. United Nations' humanitarian and non-governmental agencies can play a significant part in resolving the outstanding research issues in malaria control.

Over the last quarter of a century, the number of refugees that have fled war and conflict to seek shelter in neighbouring countries has risen from 4.6 million in 1978 to 18.2 million in 1993 (Najera, 1996). A further 24 million individuals were estimated to be internally displaced, often trapped by fighting and inaccessible to international help (Anon., 1995). During the 1970s and 1980s most conflicts occurred in regions that were subject to Cold-

War power struggles (e.g. South–east Asia, Afghanistan, the Horn of Africa and southern Africa). Since the end of the Cold War, civil conflicts have broken out in many countries around the world (e.g. in Tajikistan, Azerbaijan, Sierra Leone, Liberia, Somalia, Burundi, Rwanda and Sudan; Anon., 1997). Countries that host large population displacements rarely have the resources to support them. Responsibility for refugee welfare is shared between the national governments, the United Nations (UN) and non-governmental organizations (NGO). Mortality rates are always highest during the early acute phase of emergencies

\* Address for correspondence: London School of Hygiene and Tropical Medicine, Keppel Street, London, WC1E 7HT, U.K. E-mail: mark.rowland@lshtm.ac.uk; fax: + 44 (0)20 7580 9075.