CHILDREN AGED 0-14 YEARS LIVING IN AREAS ENDEMIC FOR INSECT-BORNE DISEASES	
GENERAL CONSIDERATIONS	
Issues	Insect-borne diseases
Type of indicator	Exposure (proximal)
Rationale	Insect-borne diseases are a major source of both illness and death amongst children, especially in the developing world. These diseases take many different forms, are transmitted by a wide range of different carrier insects (including mosquitoes and flies), and are associated with a wide range of different environments (though most show a close affinity for water). Young children are especially at risk, because of their poorly developed immunity or defence mechanisms. This indicator is intended to give a measure of the numbers of children at risk on the basis of the population of children living in areas in which the insect vectors are endemic.
Issues in indicator design	This indicator requires the definition of areas in which insect-borne diseases are endemic (i.e. in which transmission is stable) and of the populations living in those regions. Both pose some problems. The areas in which insect vectors are endemic are not always clearly or precisely defined; and though national censuses generally provide relatively reliable measures of population numbers, they may give only partial and inaccurate information in areas subject to population displacement and rapid migration. An age range of 0-14 years is used for this indicator because overall risks to children are not strongly age-dependent.
SPECIFICATION	
Definition	Number of children aged 0-14 years living in areas endemic for insect-borne diseases.
Terms and concepts	***Insect-borne diseases:*** vector-borne diseases for which insects act as a primary agent of transmission; these include malaria, dengue, yellow fever, onchocerciasis, leishmaniasis and trypanosiamiasis. ***Areas endemic for insect-borne:*** geographic areas in which conditions exist to allow the stable transmission of these diseases, from year-to-year. ***Total number of children aged 0-14 years*:** total resident population of children aged 0-14 years at the time of survey.
Data needs	Extent of area endemic for insect-borne diseases. Distribution and number of children aged 0-14 years.
Data sources, availability and quality	Reliable data on the at-risk population are difficult to obtain, but estimates can be made by analysis of national census data and information on the extent of the vector-borne diseases of interest. Geographic information system (GIS) techniques might usefully be applied in order to estimate the number of people living in the endemic area (e.g. by overlaying boundaries of the infected area on population data). Where data on the extent of the endemic area are not directly available, estimates may be made on the basis of the distribution of potential vector habitats (e.g. using remotely sensed data). Alternatively, they can be modelled using information on climate, land cover and other determinants. In these cases, the endemic area may be defined by buffering around each potential habitat at an appropriate distance

	(depending on the parasite and vector concerned). Data on the total number of children aged 0-14 years can usually be obtained from national censuses and should be reliable. Estimates for inter-censual years (or where census data are not available) may be made using population models or from births and deaths data. In areas subject to major population movements or disruption, population estimates may be unreliable.
Level of spatial aggregation	Region
Averaging period	Annual or longer term
Computation	The indicator can be computed as the children of people living within endemic areas, or living within a specified distance of potential vector habitats. This is usually estimated by intersecting information on the extent of the endemic area for the vector-borne disease of interest, with information on population distribution. The population at risk is then calculated by areal-weighting of the areas of overlap. Thus the number at risk is computed as: *(Aibd / Atot) * Ctot* where: *Aibd* is the area of the study zone that is endemic for the insect-borne disease(s) of concern; *Atot* is the total area of the study zone; *Ctot* is the total number of children in the study zone .
Units of measurement	Number
Worked example	Assume that a vector-borne disease is endemic across an area of 64 000 km^2 within a region of 140 000 km2; assume also that the whole area includes a total of 87 150 children aged 0-14 years. In this case, the value of the indicator in that region is: (64 000 / 140 000) *87,140 = 39835
Interpretation	This indicator provides a general measure of the children at risk from insect-borne diseases: an increase in the numbers of children living in endemic areas may be taken to imply an increased risk, a reduction the reverse. Nevertheless, in interpreting the indicator it is important to take account both of the potential uncertainties in the data, and the possible complexities in the relationship between place of residence and risk. Data on the extent of the endemic area, for example, may be unreliable both because of omission (i.e. exclusion of unknown endemic areas) and commission (inclusion of non-endemic areas). These errors are likely to increase as the scale of mapping becomes smaller (i.e. less detailed). The actual risk across the population living within an endemic area is also likely to vary substantially, depending on local conditions (below the resolution of the available data), socio-economic status and family characteristics. There are, for example, important micro-epidemiological differences in malaria, so that even at the community level the disease may be clustered in certain families. It is also important to remember that children are not static, but move both within and through the area (especially during periods of migration – e.g. due to drought or war). Thus the at-risk population may change over time.
Variations and alternatives	This indicator may be developed either for insect-borne diseases in general or for individual (or specific groups of) insect-vectors and diseases. It can also be applied to other age ranges (e.g. 0-1 years, 0-4 years) and can be

	expressed as a percentage of all children in the country. Where data are available on vector density (e.g. based on field counts of infestations), then the indicator can be defined in terms of the infestation rate, either per unit area or per head of population.
Examples	WHO *Environmental health indicators: framework and methodologies* • **Population at risk from vector-borne diseases**
Useful references	WHO 1994 *Information systems for the evaluation of malaria control programmes, a practical guide.* AFRO/CTD/MAL/ 94.3. Brazzaville: World Health Organization Regional Office for Africa. WHO 1999 *Environmental health indicators: framework and methodologies.* Geneva: World Health Organization. (Available at http://www.who.int/docstore/peh/archives/EHIndicators.pdf)