DRINKING WATER SUPPLIES FAILING NATIONAL MICROBIOLOGICAL WATER QUALITY STANDARDS	
GENERAL CONSIDERATIONS	
Issues	Diarrhoeal diseases
Type of indicator	Exposure (distal/state) Can also be used as a measure of action in relation to policies on safe water supply.
Rationale	Access to safe and secure supplies of drinking water is an essential requirement for health. In many areas, however, contamination of water supplies by human and animal wastes means that the available supplies pose severe risks of diarrhoeal (as well as other waterborne) diseases. This indicator provides a measure of the microbiological quality of the available drinking water.
Issues in indicator design	The main problem in designing this indicator is the choice of parameter(s) to use as a basis for quality assessment. Many different microbiological contaminants may occur in drinking water, and these may vary in importance from one area to another, depending on the type of water source, the supply system, water storage facilities, treatment processes, climate and local systems of land management. For this reason, the indicator proposed here is not defined in terms of a specific set of parameters: instead, these should be identified as appropriate. Major differences in the number and significance of the determinants measured are also allowed for, by restricting the indicator to the three key microbiological parameters considered (locally or nationally) to be important for drinking water quality in terms of human health. Another problem is in defining standards against which to assess water quality. WHO have established guidelines for a wide range of parameters, but the relevance of these can vary substantially from one area to another. For this reason, the indicator proposed here used national standards. Variations of these standards from WHO guidelines need to be noted and recognized. A further problem is the availability of reliable data. In many areas, especially those relying on natural water sources, little or no monitoring may be undertaken. In these situations, this indicator cannot be applied; instead, it may be appropriate to develop a more qualitative indicator based on the type of water source (e.g. untreated surface waters, untreated groundwaters, treated waters). Even where water quality monitoring is undertaken on a regular basis, the range of contaminants measured, the measurement methods, and the sampling frequency and design may all vary considerably. This makes comparison of the indicator between countries, or in some cases even between different water companies, difficult. Information on sampling and measurement methods should always be examined, therefore, when constructing and interpreting the indicator.
SPECIFICATION	
Definition	Percentage (or number) of samples failing national drinking water quality standards for the three key microbiological determinants.

Terms and concepts	***Determinant:*** a parameter that is measured as a basis for assessing water quality. ***Three key determinants:*** the three main microbiological determinants considered to be indicative of risks for diarrhoeal diseases on the basis of local conditions. ***National drinking water quality standard:*** a nationally agreed standard for a specified water quality parameter (determinant). Where possible, these should comply with internationally agreed standards and measurement methods (e.g. as recommended by WHO). ***Sample failure:*** a test analysis of a water sample, at the point of delivery (e.g. well, tap) that fails the national drinking water quality standard.
Data needs	National water quality standards for key microbiological drinking water quality parameters. Numbers of samples tested for each parameter. Number of samples failing national drinking water quality standard by parameter.
Data sources, availability and quality	Data on drinking water quality standards on results of testing regimes can usually be obtained from the organizations responsible for drinking water supply. The quality, completeness and availability of test data may be variable and wherever possible information should also be collected on the protocols used for sampling and analysis.
Level of spatial aggregation	Water supply zone
Averaging period	Annual
Computation	Selection of the three determinants to be used as a basis for the indicator should be made in consultation with relevant health and water experts. The indicator can be computed as the average percentage of samples failing the national water quality standards for the selected parameters as follows: $100 * \Sigma (Sfail / Stot) / Ndet$ where: *Sfail* is the number of samples failing national water quality standards for a specified determinant; *Stot* is the total number of samples analysed for that determinant. *Ndet* is the number of determinants (default = 3)
Units of measurement	Percentage or number
Worked example	Assume that for the three determinants selected, the number of failures (and total number of samples analysed) are as follows: A – 85 failures (from 260 samples); B – 31 failures (from 240 samples); C – 2 failures (from 120 samples). In this case, the value of the indicator is calculated as: 100 * [(85/260) + (31/240) + (2/120)] / 3 = 15.7%
Interpretation	This indicator provides a measure of the general quality of drinking water supplies. As such, an increase in the indicator can be interpreted to imply a worsening of drinking water quality and thus increased risks for children's health; a reduction implies an improvement in water quality and a reduced risk to health. Caution is needed in interpretation, however, because of the inherent uncertainties and inconsistencies that exist in the data, and possible variations or biases in the sampling regime. The range of parameters selected for inclusion in the indicator should, therefore, always examined and reported. Marked differences in sampling intensity should also be noted.

Variations and alternatives	Many variations on this indicator are possible – for example, by adjusting the number and range of determinants measured, or the computational procedure. One alternative would be to frame the indicator in terms of a single, predefined parameter, such as BOD or total coliforms. The disadvantage of this is that it is likely to limit the relevance of the indicator, and bias it towards specific types of risk. Another alternative would be to adjust it to reflect the number of children served by water of different quality – e.g. by weighting the indicator by the population of children aged 0-5 years in each area. This would have the advantage of making it a more explicit measure of exposure, but difficulties often arise in computing the numbers of children using different sources. Where quantitative measurements are not available, a more qualitative measure can be used, for example by assessing the number of people with access to safe water supplies. This requires the ability to identify 'access' to water, as well as the quality (and continuity) of the supply. A distance of 1000 metres is proposed by the WHO/UNICEF Global water supply and sanitation assessment 2000. However, shorter distances may be more appropriate in many cases.
Examples	UN *Indicators of sustainable development* • **Access to safe drinking water** UNCHS (Habitat) *Urban indicators programme* • **Household connection levels** • **Access to potable water** WHO *Environmental health indicators: framework and methodologies* • **Access to safe and reliable supplies of drinking water** WHO *Catalogue of health indicators* • **Access to safe drinking water** • **WHO Environmental health indicators for the European region** • **Access to drinking water complying with WHO guidelines** • **Access to safe drinking water**
Useful references	UN 1996 *Indicators of sustainable development. Framework and methodologies*. New York: United Nations. UNCHS(Habitat) 1997 M*onitoring human settlements with urban indicators*. Nairobi: United Nations Centre for Human Settlements. WHO 1982 National and global monitoring of water supply and sanitation. CWS series of Cooperative Action for the decade, No.2. WHO 1996 *Catalogue of health indicators: a selection of health indicators recommended by WHO programmes*. Geneva: World Health Organization (under revision). WHO 1997 *Guidelines for drinking water quality. Vols 1-3.* Geneva: World Health Organization. (Available at http://www.who.int/water_sanitation_health/dwq/en/) WHO 1999 *Environmental health indicators: framework and methodologies.* Geneva: World Health Organization. (Available at http://www.who.int/docstore/peh/archives/EHIndicators.pdf)

	WHO 2002 Water quality - guidelines, standards and health: assessment of risk and risk management for water-related infectious disease. Geneva: World Health Organization. (Available at: http://www.who.int/water_sanitation_health/Documents/IWA/iwabooktoc.htm) WHO 2002 *Environmental health indicators: development of a methodology for the WHO European region.* Bonn: World Health Organization. WHO/UNICEF 2000 Water supply and sanitation sector monitoring report 2000. World Health Organization/UNICEF Joint Monitoring Programme.