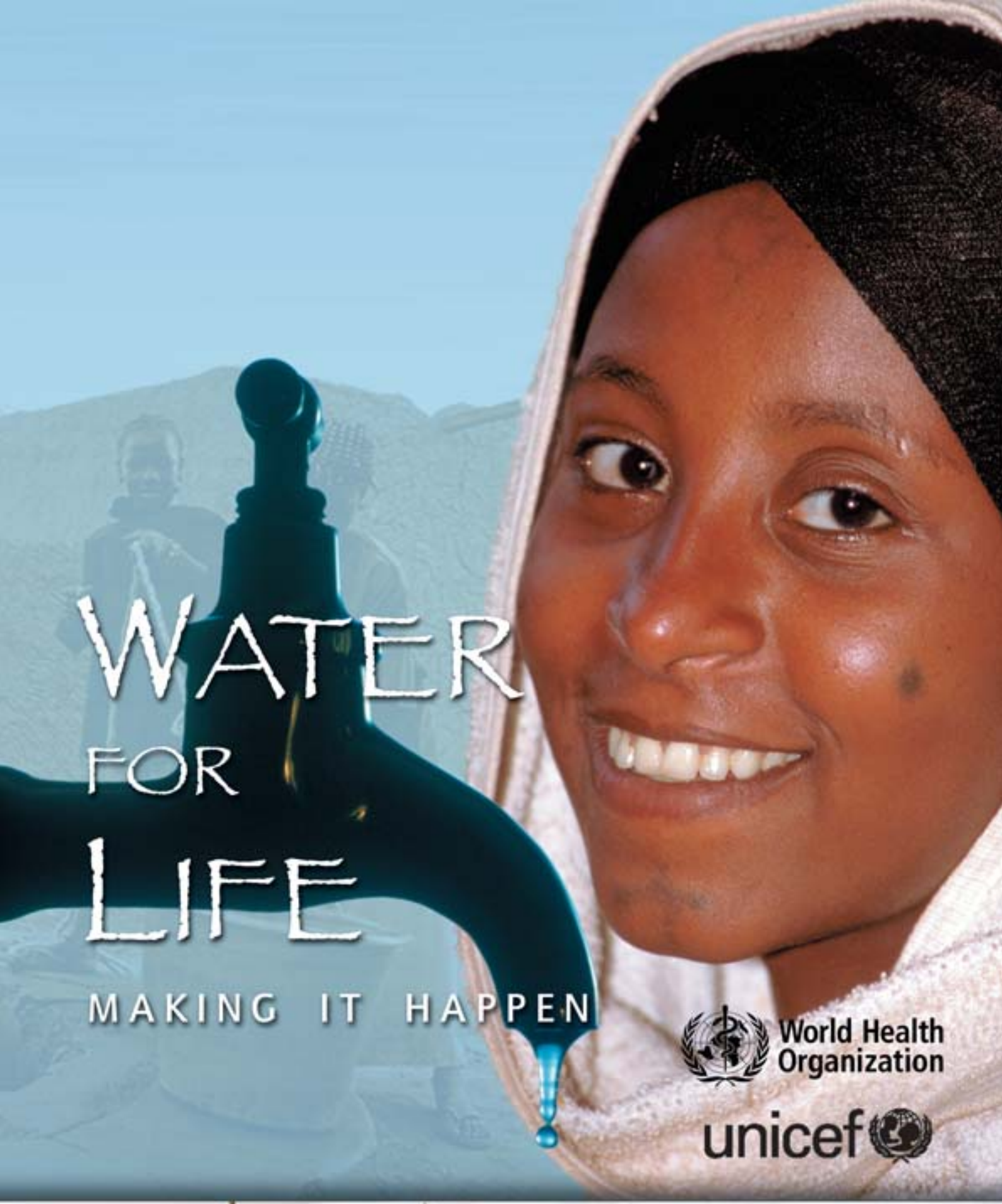
WATER FOR LIFE

MAKING IT HAPPEN



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WATER FOR LIFE MAKING IT HAPPEN

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FOREWORD

Every day, diarrhoeal diseases from easily preventable causes claim the lives of approximately 5 000 young children throughout the world. Sufficient and better quality drinking water and basic sanitation can cut this toll dramatically, and simple, low-cost household water treatment has the potential to save further lives.

As we enter the International Decade for Action Water for Life 2005–2015, this report makes clear that achieving the target of the Millennium Development Goals (MDGs) for access to safe drinking water and basic sanitation will bring a payback worth many times the investment involved. It will also bring health, dignity and transformed lives to many millions of the world's poorest people. The humanitarian case for action is blindingly apparent. The economic case is just as strong.

Improved water and sanitation will speed the achievement of all eight MDGs, helping to: eradicate extreme poverty and hunger; achieve universal primary education; promote gender equality and empower women; reduce child mortality; improve maternal health; combat HIV/AIDS, malaria and other diseases; ensure environmental sustainability; and develop a global partnership for development.

At US$11.3 billion a year, the dollar costs of achieving the MDG drinking water and sanitation target are affordable; the human costs of failing to do so are not. The International Decade for Action Water for Life provides the incentive for coordinated efforts to prevent the daily disaster of unnecessary deaths.

WELCOME TO THE ACTION DECADE

World Water Day, 22 March 2005, heralded the start of the International Decade for Action proclaimed by the United Nations General Assembly. Water for Life calls for a coordinated response from the whole United Nations system. The timing is significant: the end of the action decade in 2015 is the target date for achievement of many of the Millennium Development Goals (MDGs). Those goals were amplified by the 2002 World Summit on Sustainable Development in the Johannesburg Plan of Implementation, which set the following target.

HALVE, BY 2015, THE PROPORTION OF PEOPLE WITHOUT SUSTAINABLE ACCESS TO SAFE DRINKING WATER AND BASIC SANITATION.

It is not hard to see why providing access to safe drinking water and basic sanitation for the world's most deprived populations is moving up the political agenda. With 2.6 billion people recorded as lacking any improved sanitation facilities in 2002 and 1.1 billion of them without access to an improved drinking water source, the resulting squalor, poverty and disease hold back so many development efforts. Focusing efforts on achievement of the MDG drinking water and sanitation target will speed progress towards all eight goals.

The increasing reliability of coverage data has enabled the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) and others to link access to improved drinking water sources and improved sanitation with health, economic and human development statistics. A growing portfolio of case studies from around the world helps to demonstrate the beneficial effects of improved drinking water and sanitation. Relating coverage and diarrhoeal disease prevalence shows that meeting the MDG target would avert 470 thousand deaths and result in an extra 320 million productive working days every year. Economic analyses are showing that the benefits on investment to achieve the target would be considerable. Depending on the region of the world, economic benefits can be valued to range from US$ 3 to US$ 34 for each dollar invested.

In the International Decade for Action, we need to find ways of replicating successful actions and instigating many more that will bring improved water and sanitation services to all those in need.

The first part of this report charts the effect that lack of drinking water and sanitation has on people's lives at different stages (childhood, adolescence, adulthood and old age), highlighting the gender divide and threat posed by HIV/AIDS. The second part looks at a range of interventions that are being advocated and analyses their potential impact on progress towards the MDG drinking water and sanitation target.

To help you to find out more about the action decade, the report lists web pages that provide background reference materials. There is also a list of the main agencies that provide advocacy and technical support in the water, sanitation and hygiene sector.

The report concludes with statistical tables showing the increase needed to achieve the MDG drinking water and sanitation target (Annex 1) and drinking water and sanitation coverage estimates at regional and global level (Annex 2).

INVESTING IN DRINKING WATER AND SANITATION

The estimated economic benefit comes in several forms:

- Health care savings of US$ **7 billion** a year for health agencies and US$ **340 million** for individuals.
- 320 million productive days gained each year in the 15–59 year age group, an extra 272 million school attendance days a year, and an added 1.5 billion healthy days for children under 5 years of age, together representing productivity gains of US$ **9.9 billion** a year.
- Time savings resulting from more convenient drinking water and sanitation services totalling 20 billion working days a year, giving a productivity payback of some **US$ 63 billion** a year.
- Value of deaths averted, based on discounted future earnings, amounting to US$ **3.6 billion** a year.

The WHO study from which these figures are taken shows a total payback of US$ **84 billion** a year from the US$11.3 billion a year investment needed to meet the MDG drinking water and sanitation target. It shows too some remarkable additional returns if simple household water treatment accompanies the drinking water and sanitation improvements.

Source: *Evaluation of the costs and benefits of water and sanitation improvements at the global level.* Geneva, World Health Organization, 2004.

THE EIGHT MILLENNIUM DEVELOPMENT GOALS

- Eradicate extreme hunger and poverty
- Achieve universal primary education
- Promote gender equality and empower women
- Reduce child mortality
- Improve maternal health
- Combat HIV/AIDS, malaria and other diseases
- Ensure environmental sustainability
- Develop a global partnership for development

DRINKING WATER AND SANITATION: A FORMIDABLE CHALLENGE

The charts of drinking water and sanitation coverage in Figures 1 and 2 remind us of the huge progress made from 1990 to 2002. They show also that too many people in the world still live in squalid, demeaning conditions that rob them of dignity and the means to escape from poverty.

In 2002, there were 2.6 billion people without even the most basic sanitation facilities. Providing improved sanitation for an additional 1.8 billion from 2002 to 2015 will achieve the MDG target to halve the proportion unserved by 2015. But, because of rising population, there will still be 1.8 billion people having to cope with unhygienic sanitation facilities at that time.

The population benefiting from improved sanitation went up by 87 million a year from 1990 to 2002.

An increase to 138 million a year from 2003 to 2015 is needed if the MDG sanitation target is to be met – a 58% acceleration. Sub-Saharan Africa will need almost to double the annual numbers of additional people served with drinking water and quadruplicate the additional numbers served with basic sanitation if the MDG target is to be reached. So, reaching the target means going faster and investing considerably more. That is being recognized by the world community in political proclamations and in increased commitments to the sector in some of the poorest countries. There is a strong case to do even more.

Lack of drinking water and sanitation kills about 4500 children a day and sentences their siblings, parents and neighbours to sickness, squalor and enduring poverty. Improvements bring immediate and lasting benefits in health, dignity, education, productivity and income generation.

Figure 1
Drinking water coverage by region in 1990 and 2002

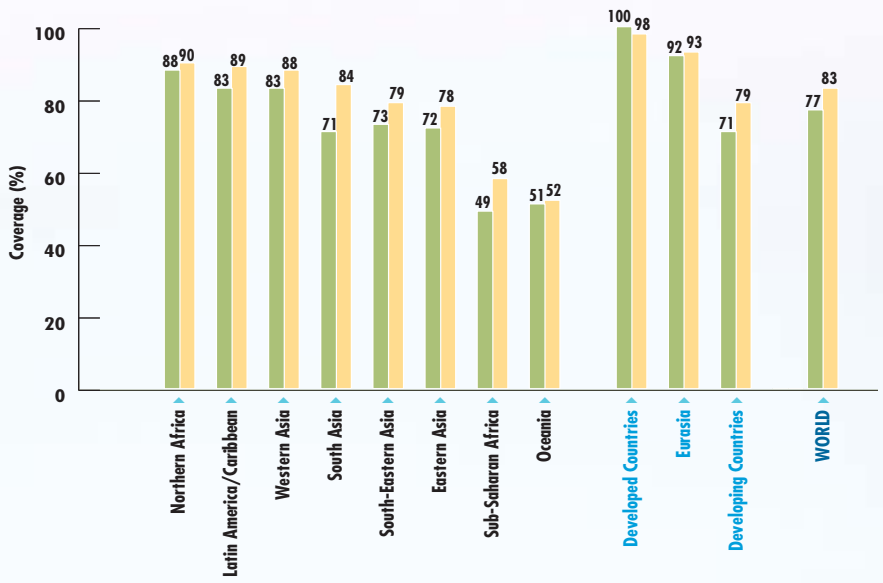
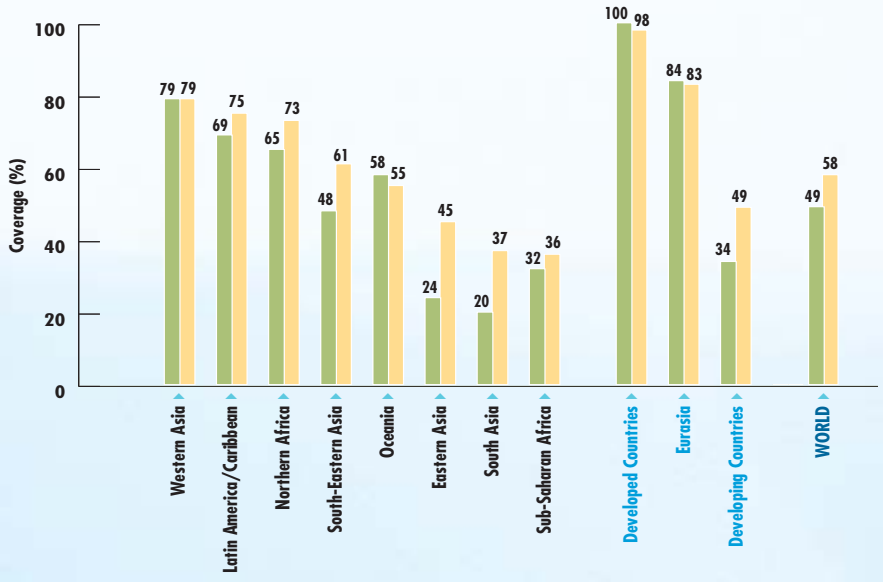


Figure 2
Sanitation coverage by region in 1990 and 2002



MONITORING WATER SUPPLY AND SANITATION

In its 2004 report, *Meeting the MDG drinking water and sanitation target: a mid-term assessment of progress*, the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) presented 2002 coverage data for most countries of the world. The figures revealed the glaring contrasts between rich and poor nations, and between rural and urban populations.

In this report, the JMP focuses on the changes that simple improvements in water and sanitation services can make to people's lifestyles, health and economic prospects – and the relatively small investments needed to make those improvements. In doing so, it exposes the cost of inaction.

Target 10 of the Millennium Development Goals (MDGs) is to halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.

The baseline for the target is estimated water and sanitation "coverage" in 1990. So, for example, Kenya, where 55% of the 24 million 1990 population were deemed to have no access to drinking water, will need to reduce that level to 27.5% of the much higher 2015 population, if it is to reach the MDG target.

The figures used to set the baseline and to monitor progress towards the MDGs are produced by the JMP.

The JMP has been assembling statistics on drinking water and sanitation coverage since 1990. Since 2000, the JMP has based its reporting on household surveys and on the classification of water sources and sanitation facilities as "improved" or "unimproved".

Household surveys used by the JMP include: USAID-supported Demographic and Health Surveys (DHS); UNICEF-supported Multiple Indicator Cluster Surveys (MICS); national census reports; WHO-supported World Health Surveys; and other reliable national surveys that allow data to be compared.

Earlier coverage data came from the water utilities and ministries in charge of drinking water and sanitation services. Definitions of "safe water" and "basic sanitation" differed widely from region to region and country to country. Commonly, too, a village water point was deemed to provide "coverage" for the whole village population, although in many cases quite a number of villagers did not use it for one reason or another.

From 2000, coverage assessments of the JMP, using population-based data gathered through household surveys and national censuses, give a much clearer comparison between countries, as they record the percentage of people using the improved facilities, as determined by face-to-face interviews and censuses. The 1990 coverage statistics have been recalculated according to the new criteria, so that the monitoring of progress truly compares like with like.

The JMP's web site (www.wssinfo.org) has an updated database of coverage statistics for most countries. The data are periodically analysed and presented in a global report. The 2004 report contained global data from surveys up to the end of 2002; those same figures are used to draw the conclusions presented in this report. A 2006 report will present revised coverage estimates to provide a baseline for the International Decade for Action Water for Life.

Alongside its compilation and analysis of coverage data, the JMP is trying to improve the definitions of "improved" and "unimproved" water and sanitation technologies. WHO and UNICEF are also working on nationally representative water-quality surveys

IMPROVED TECHNOLOGIES

Improved sources of drinking water
- Piped water into dwelling, yard or plot
- Public tap/standpipe
- Tubewell/borehole
- Protected dug well
- Protected spring
- Rainwater collection
- Bottled water*

Improved sanitation facilities
- Flush/pour-flush to:
  - piped sewer system
  - septic tank
  - pit (latrine)
- Ventilated improved pit latrine
- Pit latrine with slab
- Composting toilet

UNIMPROVED TECHNOLOGIES

Unimproved sources of drinking water
- Unprotected dug well
- Unprotected spring
- Vendor-provided water
- Tanker truck water
- Surface water (river, stream, dam, lake, pond, canal, irrigation channel)

Unimproved sanitation
- Public or shared latrine
- Pit latrine without slab or open pit
- Hanging toilet or hanging latrine
- Bucket latrine
- No facilities (so people use any area, for example a field)

* Bottled water is considered an "improved" source of drinking water only where there is a secondary source that is "improved".

that will help to identify more specifically the technologies likely to deliver safe water. The JMP has produced a new guide covering standard questions on water and sanitation to be included in current and future household surveys and national census questionnaires. The two main international household survey instruments (DHS and MICS) have already started using these standard questions and the suggested response categories.

Future challenges include developing appropriate indicators and mechanisms to collect information about disparities in access to services, the affordability of services, per capita water quantity use, and the sustainability and reliability of services. Efforts are currently under way to test field-based techniques to determine water safety that could be used cost-effectively alongside a household survey, as a cross-check on the safety of improved drinking water sources and on safety at point of use.

Progress in access to and use of drinking water and sanitation services, and the development of new technologies mean that JMP indicators will need to evolve. For example, vendor-supplied water is currently excluded from the category of improved sources, as the regulatory framework to ensure water safety from vendors is absent in most countries and no other guarantees can be given that the water purchased is from a safe source. In addition, the minimum quantities of water required for drinking and basic hygiene are often not affordable where vendors are the suppliers of water. If better regulation and the development of new partnerships bring the assurance of adequate quality, and sufficient quantity, this criterion will need to be modified.

THE RANGE OF WORK OF THE JMP

A major thrust of the JMP at present is to continue monitoring progress towards the MDG drinking water and sanitation target, providing governments, policy-makers and donor agencies with regular updates on the numbers of people benefiting from improved drinking water supply and sanitation facilities, and change over time. In addition to the coverage updates, the JMP will produce a series of reports addressing region-specific issues pertaining to progress in drinking water supply and sanitation. A report on monitoring access in urban slums will be prepared jointly with the United Nations Human Settlements Programme (UN-HABITAT), and another addressing the scale and impacts of poor wastewater treatment and disposal will be prepared jointly with the United Nations Environment Programme (UNEP).

While maintaining its global monitoring functions, the JMP will also work towards strengthening national-level monitoring. The JMP aims to support the establishment of a local knowledge base to help in monitoring and evaluating the effectiveness of national and local policies and sector strategies. This will help to identify sub-national disparities in access which do not currently emerge from the national-level household surveys on which the JMP relies for its global monitoring work.

MONITORING SANITATION AND POLICY DEVELOPMENT

A recent evaluation of definitions of "access to improved sanitation" in sub-Saharan Africa found that there were inconsistencies between definitions used in different surveys and different countries.

The anomalies came to light when data from subsequent surveys found discrepancies in access. In particular, traditional latrines were sometimes called open pits and other times latrines. While an open pit is clearly not improved, the JMP previously considered a latrine or traditional latrine as improved, without having sufficient evidence on how hygienic such a facility really was. As a result, the *Global water supply and sanitation assessment 2000 report* estimated that in 2000, about 2.4 billion people globally did not have access to improved sanitation, which was rather optimistic. The 2004 JMP report *Meeting the MDG drinking water and sanitation target – a mid-term assessment of progress* adjusted the estimate of the population without access to sanitation to 2.6 billion in 2002.

Monitoring policy development is a very difficult task. Plenty of high-level commitments and pledges have been made over the past years, but whether these will be attained remains to be seen. Surprisingly, the MDG water and sanitation target is not always reflected in Poverty Reduction Strategy Papers (PRSPs).

UN-WATER

Among United Nations entities, 24 have significant activities involving water (and often, but not always, sanitation and hygiene). Each agency has traditionally planned and implemented its own activities concerning water, with insufficient coordination with the other agencies. This has often resulted in the duplication of water-related activities and, in some cases, the development of contradictory information. UN-Water was created as a forum for sharing information and ensuring coherence and coordination between the different agencies to more effectively implement water-related programmes.

UN-Water has given the JMP the responsibility for monitoring progress towards MDGs related to drinking water and sanitation.

MONITORING FOR ACTION AND EFFECTIVENESS

Programme managers and administrative authorities should ensure data are regularly collected and analysed concerning the status of water supply systems, number of actual users versus planned figures, amount of water provided on a per capita basis, and the quality of the water, both chemical and microbial. Information on breakdowns and facilities in disrepair is vital, and should be acted upon by local authorities.

It is estimated that in Africa 30% of systems do not function properly; the estimate for Asia is around 20%. In some countries, the estimates of systems needing repair or replacement are as high as 50%. More effective monitoring at country level would help to identity systems that need to be repaired, rehabilitated or completely replaced.

Another issue that monitoring has brought to light is that the costs of installing water supply systems in sub-Saharan Africa are still far higher than is necessary. The lessons learned from other regions have not been adequately shared. The use of effective technologies and methods of work is essential if sustainable progress is to be made in the region that is furthest behind in providing safe water and basic sanitation to its people.

RAPID ASSESSMENT OF DRINKING WATER QUALITY

Deteriorating water quality threatens the gains that have been made in improving access to drinking water throughout the world. Although the greatest problem continues to be the microbial contamination of drinking water supplies (especially faecal contamination), chemical contaminants – notably fluoride and arsenic – are of increasing concern. Programme planners can no longer make assumptions about the initial safety of groundwater or any other water source without testing, and all sources must be adequately protected from subsequent contamination.

With the rapid increase in water quality problems, it is essential that all countries put in place simple and reliable water quality monitoring systems.

WHO and UNICEF are working together to develop a protocol for rapid assessment of water quality using field based sampling and analysis techniques. The protocol is designed to be used alongside a household survey. Countries can then examine areas and regions in more depth, and link water quality to different facility types, subsequently taking the necessary remedial actions to address the problem.

THE JOINT MONITORING PROGRAMME FOR WATER SUPPLY AND SANITATION

Established: 1990, at the end of the International Drinking Water Supply and Sanitation Decade.
Executing agencies: WHO and UNICEF.
Technical Advisory Group: individual experts from academic institutions and civil society, plus representatives of organizations involved in both water and sanitation and data collection, including UN-Habitat, ORC Macro International, United Nations Environment Programme, United States Agency for International Development, the World Bank, the Water Supply and Sanitation Collaborative Council, and the Millennium Project.
Funding support: United Kingdom's Department for International Development, Swiss Agency for Development and Cooperation, WHO and UNICEF.

PART 1 WATER FOR LIFE – AND FOR LIVING LIFELONG

Water for Life is a poignant title. It symbolizes not just that no one can survive without safe drinking-water, but that, in different ways at different ages, access to adequate water and sanitation services influences everybody's health, education, life expectancy, well-being and social development. That is the theme of Part 1 of this report. Based on statistics and expert opinions, we compare and contrast the lifestyles and expectations of those with very different levels of water and sanitation services in different age groups. Case studies illustrate how actions by communities, governments, nongovernmental organizations and the international community have transformed the lives of millions.

WATER FOR LIVING

AGE 0–4 YEARS
The cruel toll of child mortality

Over 90% of deaths from diarrhoeal diseases in the developing world today occur in children under 5 years old (see Figure 3). Improved drinking water and sanitation services and better hygiene behaviour especially by mothers are crucial in cutting child mortality.

AGE 5–14 YEARS
Lost schooling is a life sentence

Children, especially girls, mostly in Africa and Asia, are missing school because neither their homes nor their schools have adequate drinking water and sanitation facilities. Disease, domestic chores, and lack of separate school latrines for girls and boys, keep school attendance figures down and impair the absent pupils' future chances of escaping from their families' poverty.

AGE 15–59 YEARS
Productivity gains can more than pay for improved services

Hundreds of millions of African, Asian and Latin American families are paying every day in lost income for their lack of access to improved drinking water and sanitation services. Women's physical and financial burdens are often greater than men's. The good news is that community projects designed by women and men together bring economic returns far greater than the capital investment and recurrent costs.

AGE 60 YEARS AND OVER
People are living longer

The elderly are more susceptible to and more likely to die from diseases related to water, sanitation and hygiene than other adults. The numbers of elderly people in many populations are increasing, in both developed and developing countries. Countries making this transition will need to consider the special needs of the elderly when developing drinking water and sanitation programmes.

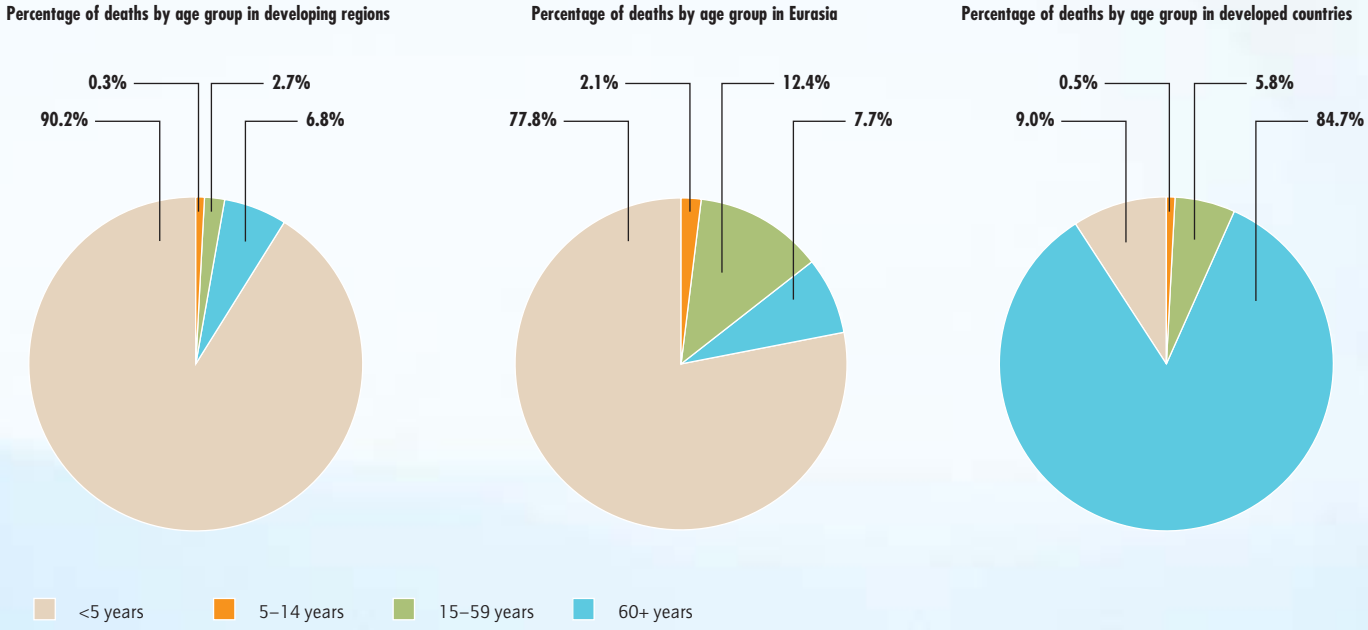
BEHIND THE STATISTICS – VILLAGE LIFE IN AFRICA AND ASIA

It is a tragedy that 42% of the world's population, or 2.6 billion people, live in families with no proper means of sanitation and 1.1 billion do not have access to improved drinking water, but somehow our consciousness is numbed by the very size of the numbers involved.

What then do the statistics mean for a typical village in Africa or South Asia with a population of around 1000 people of whom less than 400 have access to a latrine? They mean that diarrhoea is an important part of the day to day problems of the population. On any given day, 20 or more of the villagers will be suffering from it, about 15 of them being children under 5 years old. With so few families having access to a latrine or to water for hygiene, the living environment is filthy and the disease spreads rapidly.

Poor health robs the children of schooling and the adults of earning power, a situation aggravated for the women and girls by the daily chore of collecting water. For a family of six, collecting enough water for drinking, cooking and basic hygiene means hauling heavy water containers from a distant source for an average of three hours a day. All in all, the lack of water and sanitation affects every aspect of the family's life, and condemns people to a perpetual struggle to survive at subsistence level.

Figure 3 Deaths attributable to diarrhoea by age group and region in 2002



AGE 0–4 YEARS: IN DEVELOPING COUNTRIES, 90% OF ALL DEATHS ATTRIBUTABLE TO DIARRHOEAL DISEASES ARE OF CHILDREN UNDER 5 YEARS OLD

Infants and young children are the innocent victims of the worldwide failure to make safe drinking water and basic sanitation services available to impoverished people (see Figure 4). Their families' poverty, lack of basic services and the resulting filthy living environment mean that children under 5 years of age in particular are exposed to a multitude of health threats, without the physical or economic means to combat them. Malnutrition – particularly protein-energy malnutrition – stunts growth, impairs cognitive development and, crucially, lowers the children's resistance to a wide range of infections, including the water-related diarrhoeal diseases and malaria (see Figure 5). In developing countries, over 90% of all diarrhoeal deaths occur in children under 5 years of age (see Figure 3).

In sub-Saharan Africa alone, some 769 000 children under 5 years of age died annually from diarrhoeal diseases in 2000–2003. That is more than 2000 children's lives lost every day, in a region where just 36% of the population have access to hygienic means of sanitation. South Asia has a similarly low sanitation coverage. There too child mortality is very high. Some 683 000 children under 5 years of age die each year from diarrhoeal disease.

Compare that with the developed regions, where most mothers and babies benefit from safe drinking water in quantities that make hygiene behaviour easy, have access to safe, private sanitation, adequate nutrition, and many other prerequisites to health. Of the 57 million children under 5 years old in the developed regions, about 700 succumbed annually to diarrhoeal disease (according to statistics for 2000–2003). That means that the sub-Saharan baby has almost 520 times the chance of dying from diarrhoea compared with a baby born in Europe or the United States of America.

Figure 4 Association between lack of improved sources of drinking water and sanitation facilities, and deaths attributable to diarrhoeal diseases

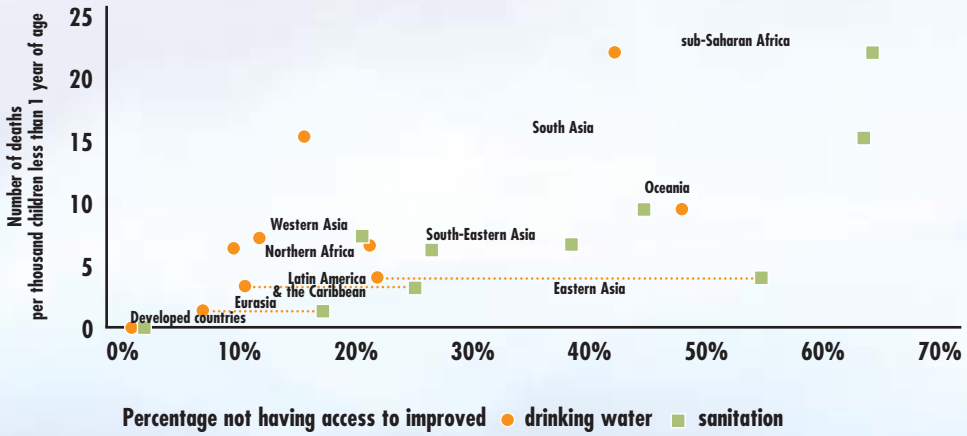
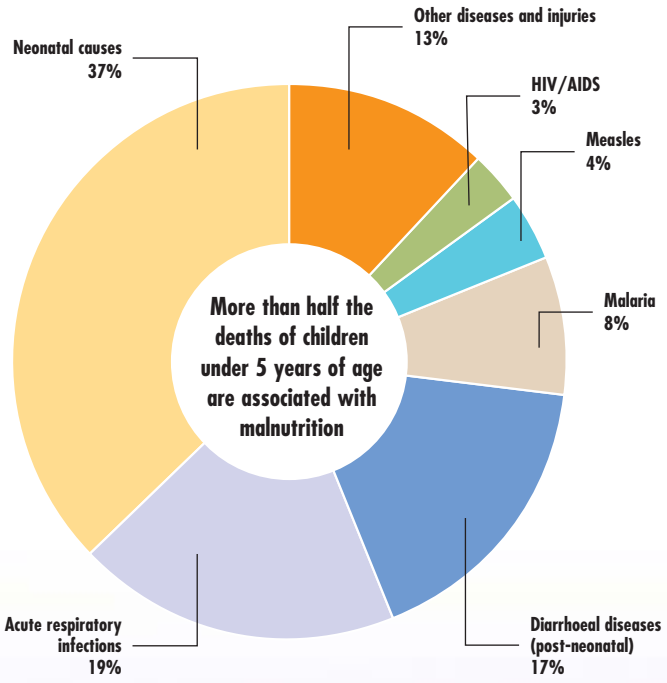


Figure 5 Causes of death among children under 5 years old worldwide, 2000–2003



Source: *The world health report 2005 – Make every mother and child count*. Geneva, World Health Organization, 2005.

HOW MUCH DOES IMPROVING DRINKING WATER REDUCE WATER-RELATED DISEASES?

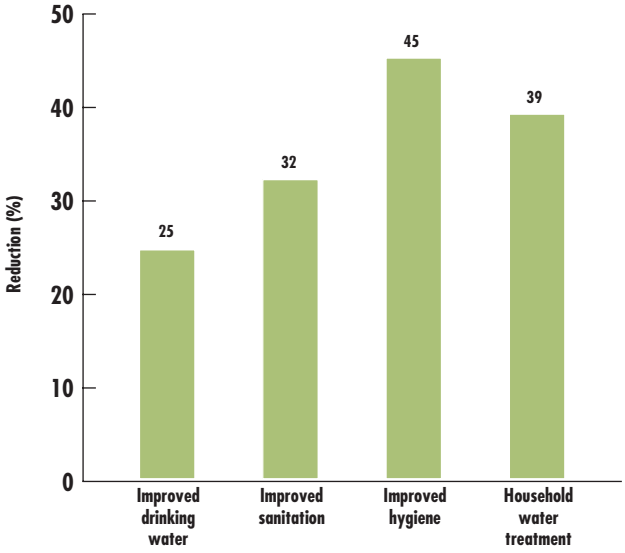
A recently published study estimates the following impacts:

- Improved water supply reduces diarrhoea morbidity by 25%, if severe outcomes (such as cholera) are included.
- Improved sanitation reduces diarrhoea morbidity by 32% on average.
- Hygiene interventions including hygiene education and promotion of hand washing leads to a reduction of diarrhoeal cases by 45%.
- Improvements in drinking-water quality through household water treatment, such as chlorination at point of use and adequate domestic storage, leads to a reduction of diarrhoea episodes by 39%.

It is important to highlight that the impact of an intervention depends on the local conditions.

Source: Fewtrell L et al. *Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: a systematic review and meta-analysis*. Lancet Infectious Diseases, 2005, 5(1):42-52.

Reduction in diarrhoeal diseases morbidity resulting from improvements in drinking water and sanitation services

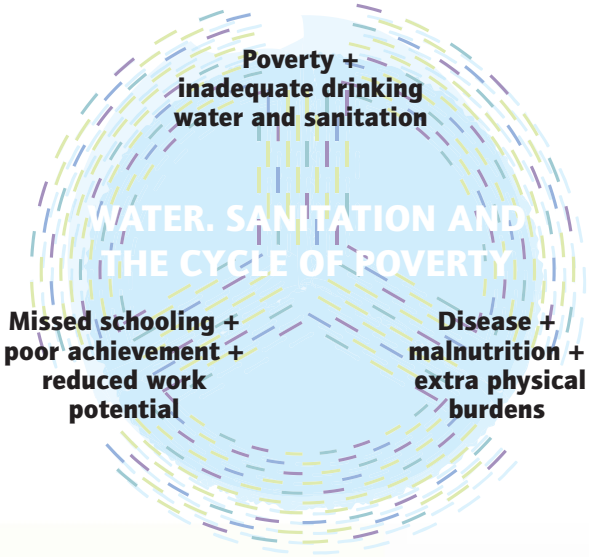


AGE 5–14 YEARS: UNSERVED MILLIONS PAY THE PRICE IN SCHOOL AND FOR LIFE

Diarrhoeal deaths strike mainly the young and the old. But lack of access to improved drinking water and sanitation afflicts people's lives at all ages. In 2002, more than 500 million school-age children lived in families without access to improved sanitation and 230 million were without an improved water supply. Sadly, schools may not have adequate sanitation facilities either.

The combination of poverty, poor health and lack of hygiene means that children from unserved homes miss school more frequently than those whose families do benefit from improved drinking water and sanitation services. The resulting lack of education and social development further marginalizes the children and reduces their future chances of self-improvement (see Figure 6).

Figure 6 Water, sanitation and the cycle of poverty



For girls, it is not just sickness that costs them their schooling. The burden borne by women of hauling water from distant sources is often shared by her young daughters, leaving them with neither the time nor the energy for schooling. All in all, inadequate drinking water and sanitation services rob poor families of opportunities to improve their livelihoods.

In all regions, only a small proportion of deaths from diarrhoeal diseases occur among children aged 5–15 years. Figure 3 illustrates an important point, while in developed countries, 90.5% of diarrhoea-related deaths occur at ages above 15 years, in developing countries 90.5% of all deaths occur at ages below 15 years.

EDUCATION, AND WATER AND SANITATION GOALS ARE MUTUALLY REINFORCING

The target of the Millennium Development Goal for education reads:

ENSURE THAT, BY 2015, CHILDREN EVERYWHERE, BOYS AND GIRLS ALIKE, WILL BE ABLE TO COMPLETE A FULL COURSE OF PRIMARY SCHOOLING.

UNICEF's latest statistics, based on surveys over the period 1998–2003 show that worldwide only 76% of boys and 72% of girls attended primary school. For the least developed countries, the figures are 61% of boys and 56% of girls.

Improvements in community water supplies, sanitation and hygiene have a mutually reinforcing relationship with improved school attendance. Better sanitation facilities in schools encourage higher attendance; and the improved hygiene behaviour and knowledge of schoolchildren has a lasting impact on hygiene practices in their homes and communities.

UNICEF and its partners have worked hard in recent years to make the most of this synergistic relationship. The School Sanitation and Hygiene Education (SSHE) programme blends improved school water and sanitation facilities (hardware) with school curricula that involve children in all aspects of hygiene behaviour. Documented successes (see http://www.unicef.org/wes/index_schools.html) include the pro-active children's Health and Hygiene Committees in Gujarat, India, and the Child-Friendly Schools initiative in Nigeria. In Nigeria, efforts to change the classroom environment have included training teachers in life-skills education, involving parents, encouraging village artisans to participate in hygiene and sanitation projects, and forming children's hygiene and child rights clubs. The result has been a 20% increase in school enrolment, and a 77% decrease in dracunculiasis (guinea-worm disease).

On World Water Day 2003, UNICEF joined with the Water Supply and Sanitation Collaborative Council in launching the WASH in Schools campaign. Like SSHE, WASH in Schools presses for rights-based, child-friendly schools with safe, hygienic environments.

WORMING AWAY ACADEMIC ATTAINMENT

Diarrhoea is not the only water-related disease that can impair children's development. Poor sanitation and hygiene are prime contributors to the spread of schistosomiasis and soil-transmitted helminthiasis (worms). School-age children are especially prone to worm infections because their high level of activity brings them into regular contact with contaminated water and soil. As well as having debilitating effects, these infections have also been shown to impair the child's ability to undertake cognitive tasks. Hookworm can result in iron-deficiency anaemia, which has adverse consequences for childhood growth and school performance.

One study on Jamaican children aged 9–12 years highlighted the debilitating nature of trichuriasis (whipworm). Treatment of infected children was followed by immediate improvements in short-term and long-term memory. School attendance was significantly higher for uninfected children; in some cases, infected children attended for only half the time of their uninfected friends.

Source: *Prevention and control of schistosomiasis and soil-transmitted helminthiasis. Report of a WHO Expert Committee.* Geneva, World Health Organization, 2002. (WHO Technical Report Series, No. 912).

AGE 15–59 YEARS: PRODUCTIVITY GAINS MAKE DRINKING WATER AND SANITATION INVESTMENTS HIGHLY COST-EFFECTIVE

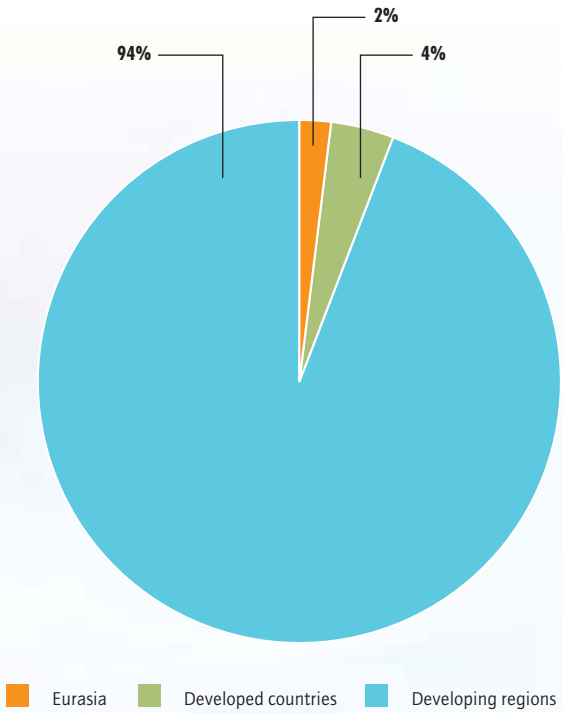
Hundreds of millions of African, Asian and Latin American families are paying every day in lost income for their lack of access to satisfactory drinking water and sanitation services. Sick people cannot work, while the hours of drudgery collecting buckets of water from distant sources means sapped energy and lost productivity for so many of the world's poor.

Every year, diarrhoeal diseases in the working-age population cost the economies of Eastern Asia more than 250 000 "disability-adjusted life years" (DALYs)[1]. The figure may be dwarfed by the 25 million DALYs associated with childhood diarrhoea in sub-Saharan Africa, for example, but it serves to show that there are substantial gains to be made in providing the improved drinking water and sanitation services that will improve the health of both children and adults throughout the developing world.

Globally, WHO has estimated that productivity gains from diarrhoeal disease reductions if the MDG drinking water and sanitation target is reached will exceed US$ 700 million a year. The income earned by those saved from premature death attributable to diarrhoeal disease, discounted to account for long-term earnings, adds another US$ 3.6 billion a year. There are gains too for health-care services in treating fewer patients, and for the patients themselves in direct costs of medication and transport. These gains add US$ 7.3 billion a year to the benefit side of the equation, and mean that the overall reduction in diarrhoeal disease episodes (10% of all cases) that meeting the MDG target would bring about yields economic benefits close to US$ 12 billion a year.

That is argument enough for the US$ 11.3 billion a year investment estimated to be needed to provide the improved drinking water and sanitation services. However, it is only part of the gain. By far the biggest economic benefit comes from valuing the time saved when people currently with inadequate services gain access to nearby water and sanitation facilities. Assuming that the average one hour per day saved by each household member can be used to earn the minimum daily wage, the saved time is worth a staggering US$ 63 billion.

Figure 7 Proportion of disability-adjusted life years (DALYs) attributable to diarrhoeal disease among the age group 15–59 years in developed countries, developing regions and Eurasia, 2002



Source: WHO

[1] The DALY has become the accepted way of measuring the burden of disease on a nation or community. It uses epidemiological, actuarial and judgemental criteria to express premature death and different degrees of morbidity or disability at different ages as a single indicator of the amount of healthy life lost. The same measure can be used to assess the gains in health that can be expected from any particular intervention.

FLUORIDE

Fluoride is a desirable substance: it can prevent or reduce dental decay and strengthen bones, thus preventing bone fractures in older people. Where the fluoride level is naturally low, studies have shown higher levels of both dental caries (tooth decay) and fractures. Because of its positive effect, fluoride is added to water during treatment in some areas with low levels. But you can have too much of a good thing; and in the case of fluoride, water levels above 1.5mg/litre may have long-term undesirable effects. Much depends on whether other sources also have high levels. The risk of toxic effect rises with the concentration. It only becomes obvious at much higher levels than 1.5mg/litre. The natural level can be as high as 95mg/litre in some waters, such as in the United Repulic of Tanzania where the rocks are rich in fluoride-containing minerals. Severe effects of excess fluoride have been reported in China and Assam, India.

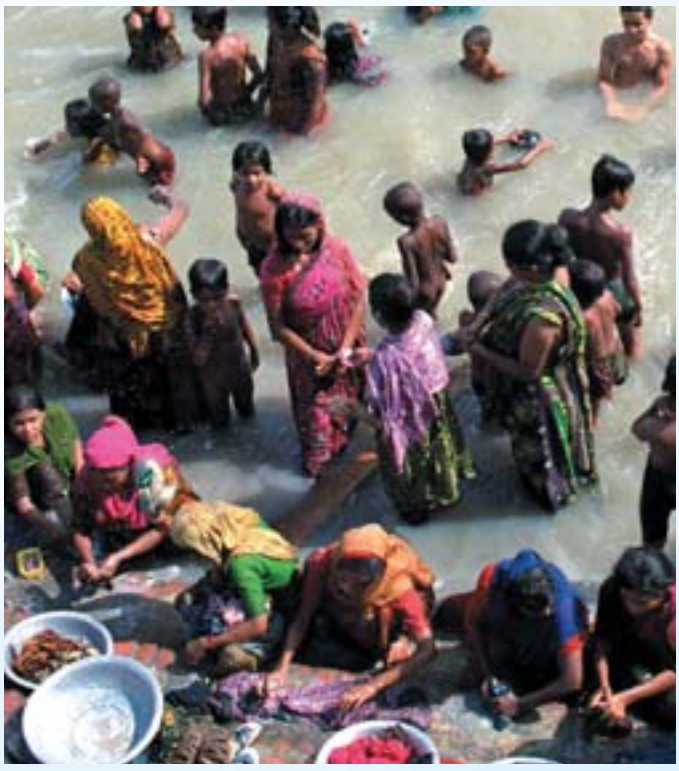
Nearly 100 000 villagers in the remote Karbi Anglong district in the north-eastern state of Assam were reported in June 2000 to be affected by excessive fluoride levels in groundwater. Many people have been crippled for life. The victims suffer from severe anaemia, stiff joints, painful and restricted movement, mottled teeth and kidney failure. The first fluorosis cases were discovered in the middle of 1999 in the Tekelangiun area of Karbi Anglong. Fluoride levels in the area vary in the range 5–23mg/litre, while the permissible limit in India is 1.2mg/litre. Local authorities launched a scheme for the supply of fluoride-free water and painted polluted tube-wells red: they also put up notice boards warning people not to drink the water from these wells.

Source: *Naturally occurring hazards.* World Health Organization, Geneva. Available on the internet at: (http://www.who.int/water_sanitation_health/naturalhazards/en/index2.html, accessed 20 March 2005.

TRACHOMA

Trachoma is an eye infection caused by *Chlamydia trachomatis* which can lead to blindness after repeated infections. It spreads easily from one family member to another by ocular and respiratory secretions. Flies can also transmit the infection. WHO estimates that 146 million people worldwide currently suffer from trachoma and related infections -- primarily among the poorest rural communities in developing countries. Approximately 6 million people are blind or severely visually impaired because of trachoma. Central to controlling trachoma is easy access to sufficient quantities of safe water and better hygiene. Improving access to safe water sources and better hygiene practices can reduce trachoma morbidity by 27%.

Source: UNESCO-WWAP. *Water for people: water for life, The United Nations World Water Development Report.* Barcelona, UNESCO and Berghahn Books, 2003.



AGE 60 YEARS AND OVER: PEOPLE ARE LIVING LONGER

In many countries, people aged 60 years and over make up an increasingly large proportion of the population. More than one billion people will be 60 years old or older by 2025 (see Figure 8). By 2050 it is estimated that 5 countries will have more than 50 million people aged 60 years and over: China (437 million), India (324 million), the United States of America (107 million), Indonesia (70 million) and Brazil (58 million). In more economically developed countries, people aged 60 years and over are more likely to die from diarrhoea than the 0–5 year age group. This is the opposite of what occurs in less-developed countries (see Figure 3).

Older people are more susceptible to diseases transmitted through poor hygiene, inadequate sanitation and unsafe water for a number of reasons including the following.

Individual factors

As the body ages, barriers to infectious diseases such as the skin and mucus membranes become less effective. Stomach acid production, and the number and effectiveness of immune cells change and become less protective.

Chronic diseases

The elderly suffer from more chronic illnesses, which may reduce their overall immune function or make them particularly susceptible to specific diseases. For example, hardening of the arteries reduces blood circulation throughout the body and thus slows the body's response to illnesses, including waterborne diseases.

Undernutrition

The elderly are particularly susceptible to undernutrition because of decreased absorptive capacity or insufficient intake of nutrient-rich foods.

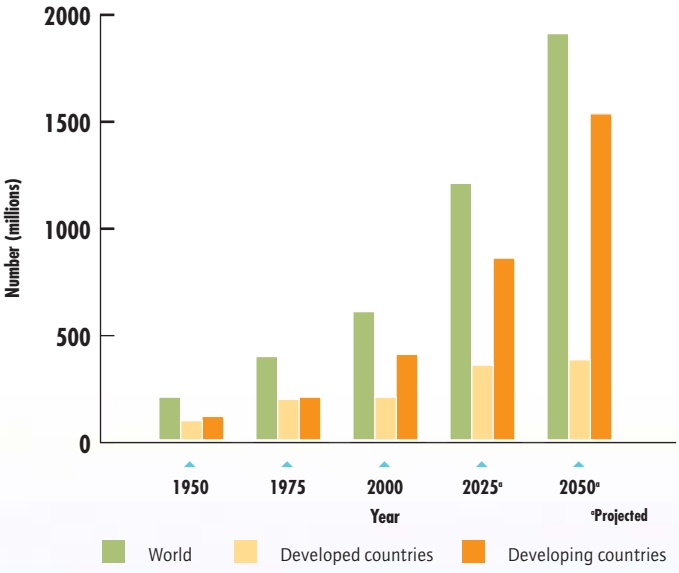
Poverty

Many elderly in several societies live in poverty, which reduces their access to adequate amounts of nutritious foods and health care, and also increases their likelihood of living in unsanitary conditions.

In addition to being more susceptible than younger adults to faecal-oral diseases, the elderly are also more likely to die from other conditions. For example, the elderly are 11–59 times more likely to die from some waterborne diseases such as campylobacteriosis and *E. coli* infections than members of the general population.

Countries with growing populations of older people will need to prepare for accommodating the special needs of this age group in the near future.

Figure 8 Number of people aged 60 years or over: world and development regions, 1950–2050



Source: *World population ageing: 1950 –2050.* New York, United Nations Department of Economic and Social Affairs, Population Division, 2001.

LEGIONELLA

Legionellosis is a serious and sometimes fatal form of pneumonia that predominantly affects adults over the age of 50 years.

It is caused by the bacterium *Legionella pneumophila* and other legionella species. These bacteria are found naturally in the environment and thrive in warm water and warm damp places.

The bacterium *Legionella pneumophila* was first identified in 1977, as the cause of an outbreak of severe pneumonia in a convention centre in the United States of America in 1976. *Legionella* organisms can be spread by aerosols such as wind. Infection results from inhalation of contaminated water sprays or mists and can occur particularly during outbreaks in hospitals. The bacteria live in water and colonize hot and cold water systems at temperatures of 20 to 50 degrees Celsius (optimal 35 degrees Celsius). They contaminate air conditioning cooling towers, hot and cold water systems, humidifiers, whirlpool spas and other water-containing devices. There is no direct human-to-human transmission.

In addition to age, other risk factors for community-acquired and travel-associated Legionellosis include: male, smoker, a history of heavy drinking, history of pulmonary-related deaths in the family, immunosuppression, and chronic debilitating illnesses.

Source: *Legionellosis.* Geneva, World Health Organization, 2005. (Fact Sheet No. 285). (http://www.who.int/mediacentre/factsheets/fs285/en/)

THE GENDER DIVIDE

Water and sanitation inadequacies affect all members of a household – but not equally. For men, lack of satisfactory drinking water and sanitation means that they are less productive and so earn less, as a result of more illness. They may also suffer from a lack of status in comparison with neighbours who benefit from improved services.

For women and girls, the penalties are typically much more severe.

- Mothers and daughters are mainly responsible for fetching the water that their families need for drinking, bathing, cooking and other household uses.
- Women face the challenge of maintaining basic household hygiene and keeping their own and their infants' hands and bodies clean, without contaminating the stored water they need for drinking and cooking.
- Sick children consume a considerable part of a woman's time, which otherwise could be used for other crucial activities.
- For pregnant women, access to enough good quality water is vitally important to protect them from serious diseases such as hepatitis. Giving birth in health centres with inadequate drinking water and sanitation and poor management of medical waste increases the risk of disease and death for both the mother and her baby.
- In poor rural households, it is usually women who tend household plots to grow vegetables and raise small livestock. That needs extra water, as do the micro-enterprises, for example brickmaking or food processing, that can be a poor family's escape route from poverty.

GENDER DISPARITIES IN ACCESS ARE DIFFICULT TO QUANTIFY

Do men have better access to drinking water, often brought to them by women or girls? The global monitoring instruments, on which the JMP relies for its coverage data, do not collect access data disaggregated by gender, nor do they collect information on who is responsible for carrying water in the household. Data are normally collected at household level, not at individual level.

Whereas it is generally assumed that women are the main water bearers in many societies, the numerical evidence base for this assumption is missing. In response, the JMP has successfully advocated for the inclusion of a question in the major survey instruments (DHS and MICS) to determine who usually goes to the source to get water for a household. The first results are expected by mid-2006, when data will become available from over 50 MICS surveys to be held in 2005 and over 20 new DHS surveys.

There is growing recognition that it is women and men together who need to decide on the best water and sanitation improvements for their communities. Past neglect of women's needs has led to well-intentioned new facilities falling into disuse. A pour-flush latrine can bring about a huge improvement in family hygiene if there is a nearby tap.

Meeting the MDG drinking water and sanitation target will require projects in which the water improvements match people's aspirations and willingness to pay with appropriate technologies and levels of service. There is clear evidence that women's influence on the planning, financing and upkeep of community projects makes those projects much more likely to succeed in the long term.

Women are starting to penetrate leadership positions in the water and sanitation sector. However, there is still a disparity between the numbers of women and men in charge of high-level policy-making functions at the national level.

Local decision-making (e.g. at village level) is also often a territory for men, and the lack of participation of women is increasingly recognized as an important cause of project failure.

At the household level, women are in charge not only of fetching water from long distances but have also to manage wisely small quantities of water often insufficient to meet even the most basic needs of the family.

SOUTH AFRICA POINTS THE WAY TO GENDER EQUITY

South Africa has carried out massive reforms of the water sector in a participatory process that has been under way since 1997. At the heart of the new framework are catchment management agencies, whose management boards include a wide range of stakeholders and are obliged to have balanced gender representation. A mainstreaming gender project initiated by the Department of Water Affairs and Forestry includes training programmes on gender for water professionals and practitioners.

"... the goals of the Decade should be a greater focus on water-related issues at all levels and on the implementation of water-related programmes and projects, while striving to ensure the participation and involvement of women in water-related development efforts ..."

Extract from United Nations General Assembly resolution proclaiming the International Decade for Action: Water for Life.

THE THREAT FROM HIV/AIDS

In Africa and Asia especially, development efforts of all kinds are being undermined by the rapid spread of HIV and AIDS. The problem is so serious in parts of sub-Saharan Africa that life expectancy of a person born between 1995 and 2000 is as low as 49 years. Without the effects of AIDS, the figure would be 62 years.

For immunocompromised people living with HIV/AIDS, their status makes it imperative to have a safe and adequate supply of water for drinking and for personal care. Without it, the risk of opportunistic infection resulting from inadequate personal hygiene is higher, particularly for those in advanced stages of the disease. Health-care services in poor countries are increasingly finding their limited facilities and resources overwhelmed by the volume of patients. This has led to an increasing trend towards home-based care, which brings new urgency to the need to examine the implications of inadequate water and sanitation facilities.

HIV/AIDS increases an individual's susceptibility to diseases related to water, sanitation and hygiene. Once infected, the person is also much more likely to die from these diseases. For example, diseases which are normally mild and self-limiting (for example cryptosporidiosis) in healthy adults may be incurable in people with HIV/AIDS, eventually leading to death. The result is much higher mortality among populations affected by HIV/AIDS when drinking water and sanitation services are lacking.

Death and disability from HIV/AIDS can have a dramatic impact on a community's capacity to cope with the hardships caused by lack of improved water and sanitation services. With a high proportion of HIV/AIDS victims in the community, the need for sufficient quantitities of safe water are even greater than elsewhere. Currently, in sub-Saharan Africa, a larger proportion of women are infected with HIV than men. When women are living with HIV/AIDS, their suffering has a double impact on their families' water problems. Not only may they face increasing difficulty to fetch and carry water or fulfil their roles as home carers, but their daughters, who would normally share the water hauling burden, have instead to tend to their sick parents and dependent grandparents.

The driving forces behind both inadequate water and sanitation services, and being at higher risk of contracting HIV/AIDS, include poverty and inequity. The effects play out amongst people who are increasingly cared for in their own homes, in circumstances where their health and well-being is put further at risk by lack of adequate water and sanitation infrastructure to support invalid care. The water and sanitation sector needs to become more actively involved in understanding and addressing these links.

In addition to the question of health-care provision, a high proportion of people living with HIV/AIDS in a community undermines the sustainability of water and sanitation systems in a number of ways such as the following.

- Loss of productivity reduces the ability of water users to pay water fees and maintain connections to piped systems.
- Loss of knowledge and skills through death and disease decreases management capacity in the water and sanitation sector.
- Incapacity reduces household and community involvement in water management activities.

Programmes for improving drinking water, sanitation and hygiene education are desperately needed to break this downward spiral.

Table 1 Adults and children living with HIV and AIDS, and adult and child deaths, by region, end of 2004 (thousands)

Region	Adults and children living with HIV	Adult and child deaths attributable to HIV
Sub-Saharan Africa	25 400	2 300
North Africa and & Middle East	540	28
South and South-East Asia	7 100	490
East Asia	1 100	51
Latin America	1 700	95
Caribbean	440	36
Eastern Europe and Central Asia	1 400	60
Western & Central Europe	610	6
North America	1 000	16
Oceania	35	1
TOTAL	39 325	3 083

Source: Adapted from power point chart from http://www.unaids.org/en/resources/questions_answers.asp, accessed on 8 March 2005.

PART 2 MAKING IT HAPPEN

The International Decade for Action Water for Life was proclaimed by the United Nations General Assembly at its 78th plenary meeting on 23 December 2003. The proclamation "Calls upon the relevant United Nations bodies, specialized agencies, regional commissions and other organizations of the United Nations system to deliver a coordinated response to make 'Water for Life' a decade for action."

In subscribing to the goals of the Decade and to those of the Millennium Declaration, national governments, external support agencies, and nongovernmental organizations commit themselves to concerted action to bring improved water and sanitation services to those who currently lack them. But how?

A coordinated response and concerted action need direction, agreement on principles and approaches that will bring cost-effective and sustainable improvements. There is plenty of advice around. On pages 34–35, we offer a wide range of further reading for those wanting a grounding in concepts relating to the drinking water and sanitation sector or details of specific actions being advocated by agencies active in the sector.

Here we look at five interventions for improving drinking water and sanitation services. These interventions are currently tackled by a wide range of institutions and stakeholders. They are all useful and valid approaches for different purposes, and as such should be seen as a series of mutually supportive courses of action. They form a series of steps towards better health that can be progressively taken in pursuit of the MDGs.

Meeting basic sanitation demand

Without basic sanitation, ill-health dominates a life without dignity. Simply having access to and using sanitation facilities increases health, well-being and economic productivity. Inadequate sanitation has a negative impact on individuals, households, communities and countries. Despite its importance, achieving real gains in sanitation coverage has been slow. Scaling up and increasing the effectiveness of investments in sanitation need to be accelerated to meet the ambitious targets agreed at Johannesburg. What needs to be done to reach those targets?

Significantly increasing access to safe drinking water

Water for drinking, cooking and basic hygiene represents a relatively small amount of the total quantities withdrawn for other uses. Yet, an estimated 1.1 billion people do not have access to any type of improved drinking water facility, and nearly half the world population do not have access through a household connection or a yard tap from a piped distribution system. What can be done to improve access and to ensure that drinking water is safe?

Focusing on changing key hygiene behaviours

Campaigns to promote handwashing with soap and safe disposal of infants' stools have been shown to deliver big health gains. They are effective ways to cut the toll of death and morbidity caused by water-related diseases. What effort is needed to ensure a lasting effect when the initial campaign is over?

Promoting household water treatment and safe storage

There is a huge return in terms of lives saved and disease reduction from adoption of simple techniques for disinfecting water used for drinking and cooking. Household treatment cuts the primary transmission route for diarrhoeal disease and can pay back up to US$ 60 for every US$ 1 invested. How can we account for "safety" in coverage statistics?

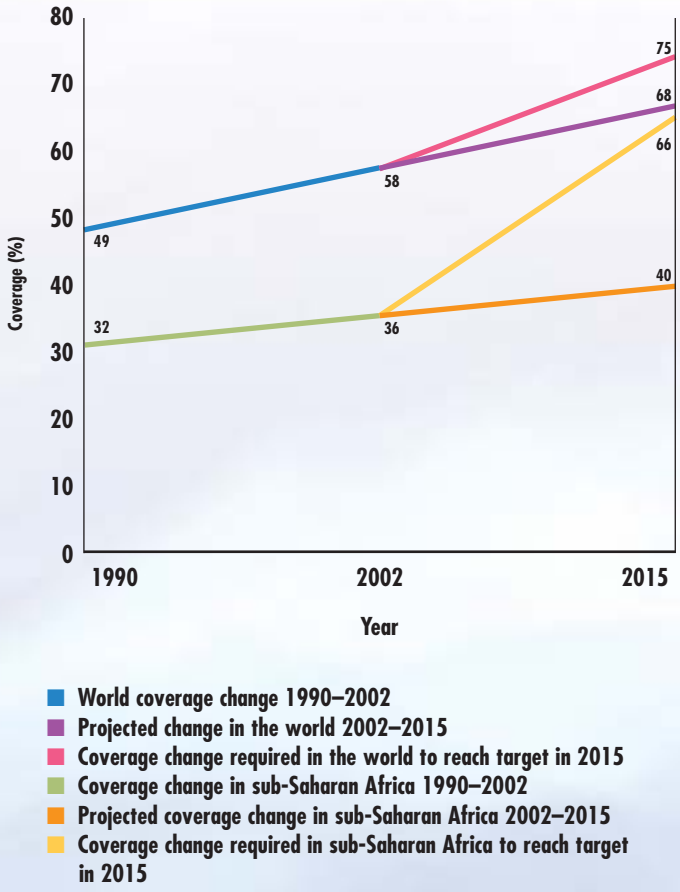
Ensuring more health for the money

Water and sanitation interventions are cost effective and provide multiple returns to communities. Cost-effectiveness analysis is a tool for selecting the interventions that yield the most health benefits at the lowest cost. What are the cost-effective options for different situations?

MEETING BASIC SANITATION DEMAND

In 2002 there were an estimated 2.6 billion people in the world without proper sanitation facilities, representing close to 50% of the world's population. By 2015, that number should be reduced to 1.8 billion if the MDG sanitation target is to be met. With 10 years to go until 2015, when the proportion of people in the world not served with basic sanitation is supposed to have been halved, the world is still lagging far behind the progress needed to attain the MDG sanitation target (see Figure 9). Without practical and cost-effective measures, the world will obviously fall short of its MDG aims.

Figure 9 Change in sanitation coverage from 1990 to 2002, projection of change from 2002 to 2015 and MDG target globally and in sub-Saharan Africa



Lack of sanitation has profound effects on the health of the world's people. As indicated in the first part of this report, children under 5 years of age in developing countries are the ones most affected by mortality and morbidity attributable to diarrhoeal diseases.

After many years of trying different approaches to sanitation in myriad contexts, we have a good idea of what the problems are and how to deal with them. It is crucial that everyone who has an interest in improving access to sanitation agrees on the interventions to be applied, and promotes and supports them. The World Health Organization, and its partner agencies, have outlined 11 key areas in which action can lead to substantive support for improvements in sanitation[2].

Making political commitments

Since the health and environmental benefits of improved sanitation and hygiene are enjoyed by the community at large and are fundamental to economic, social and health development, there should be genuine interest at all levels in expanding access to sanitation. Policy-making, planning, budgeting and implementation are key issues to be tackled.

Legislation and regulations

Creating the right types of legislation and regulations in support of extending sanitation and hygiene services and improving their quality is essential in the process of achieving targets and maintaining achievements.

Building capacity to make a difference

Building capacity means bringing together more resources, having stronger institutions and better trained people, and improving skills. Unless national capacity grows, nothing much will change; some regions will continue to make slow progress and others will even see coverage drop in the coming decade.

[2] WHO, UNDESA, UNICEF, UN-HABITAT, UNEP. *The sanitation challenge: turning commitment into reality.* Geneva, World Health Organization, 2004.

Getting sanitation and hygiene right

Effective sanitation and hygiene programmes need to combine interventions to change behaviour with selection of the right technology. Changing behaviour requires culturally sensitive and appropriate health education. Making the right choice of technology requires an assessment of the costs (both for building the facility, and for operation and maintenance) and the effectiveness of the technology in a specific setting.

Mobilizing financial resources

Although external support agencies and users themselves can help with funding, governments will still need to contribute most of the resources to accelerate implementation of sanitation and hygiene programmes. It is hoped that, having endorsed the MDG sanitation target, governments will allocate the required resources so that the target is achieved.

Paying attention to gender and equity

The effective use of sanitation facilities will depend on the involvement of both women and men in selecting the location and technology of such facilities. It is also essential that facilities are designed to accommodate the special needs of children. The design of the latrine, and the location of water points and toilet facilities close to the home, can increase family members' health and preserve their dignity.

Supporting small-scale entrepreneurs

Local entrepreneurs will continue to prove essential in reaching the millions who are yet to be served, both in rural and urban areas. On all continents, there are examples of successful local entrepreneurial efforts to provide improved sanitation services. These efforts could be replicated as a way of expanding sanitation programmes in low-income and rural communities.

PUBLIC TOILETS

India's largest nongovernmental organization, Sulabh International, employs 55 000 people, provides communities with clean toilets and washing facilities, and has removed the demand for night-soil porters. It also provides the former night-soil porters with training and new skills that help them find alternative employment.

A low-cost on-site sanitation system has been central to the success of the Sulabh public toilet complexes, where toilets, showers and clothes-washing facilities are provided. Toilets in slum areas cost very little, whereas those in railway stations, bus stands and markets cost more. The Sulabh toilets also provide more dignified employment for many scavengers.

Focusing on youth and using education

Well-designed educational programmes to demonstrate the link between sanitation, hygiene, health and economic development can contribute to increasing demand for improved sanitation. Hygiene promotion campaigns are most effective among younger populations, and students can be targeted both as beneficiaries and as agents of behavioural change within their families and their communities.

Taking responsibility for the environment

Finding technologies that safeguard the environment and maximize the potential of waste products to be reused at the local level will have a major impact on the long-term sustainability of sanitation systems and processes.

Monitoring progress

It will be important to keep track of what is happening, monitor progress, assess the impact of new ideas on access, and evaluate whether things are really improving for households. While global estimates of coverage will remain important, local capacity to generate and use information will be a vital part of the effort.

Making information flow

Getting the most useful information to flow from those who produce it to the people who use it is the challenge. Several types of information are relevant: technical information for practitioners and professionals; right-to-know or public participation information, deriving from the rights and responsibilities of citizens under legislation and regulations; data collected from users for monitoring purposes.

CONDOMINIAL SEWERS IN LATIN AMERICA

In many Latin American countries, urban households expect to connect to a networked sewerage system. In congested urban slums, this may be the only option. But sewerage is expensive. In Brazil, an alternative approach was developed more than 20 years ago and is now adopted in many cities and towns. Condominial systems are cheaper to build and easier to operate than conventional systems but have not been adopted in other developing countries as fast as could have been expected.

In Bolivia, the intervention of an external support agency (the Swedish International Development Cooperation Agency) and support from the World Bank's Water and Sanitation Program enabled the Government and the private operator in La Paz, El Alto, to experiment with the condominial approach. In such cases, external support agencies can provide access to technical or social development skills, and they can provide funds for activities that perhaps cannot initially be funded by the government's own programme because the approaches being pilot-tested fall outside existing rules and standards.

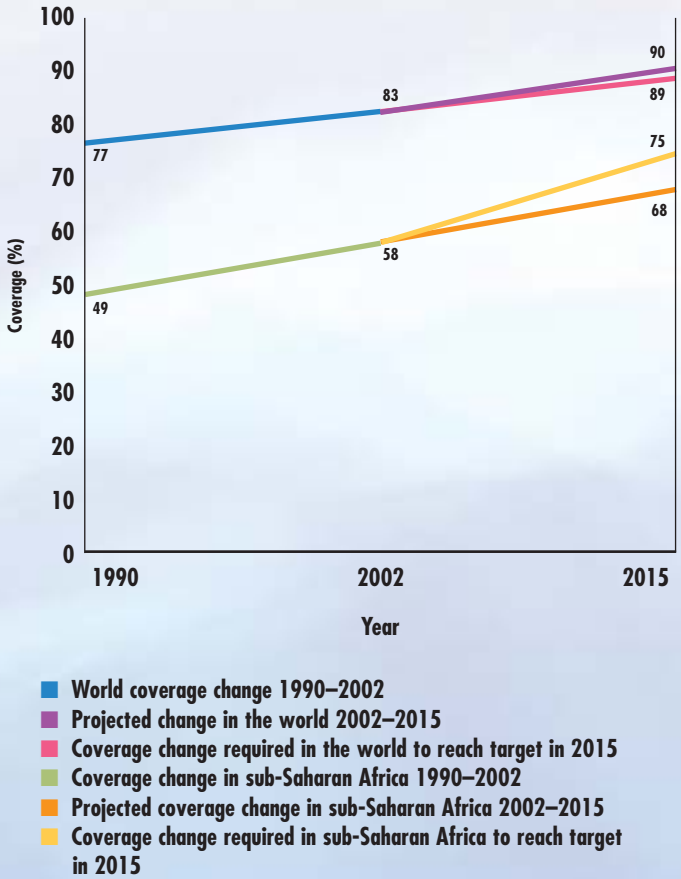
Source: Foster V. *Condominial water and sewerage systems – costs of implementation of the model.* Lima, Peru, Vice-Ministry of Basic Services, Government of Bolivia, World Bank, Water and Sanitation Program; Swedish International Development Cooperation Agency; undated.

SIGNIFICANTLY INCREASING ACCESS TO SAFE DRINKING WATER

Human life, like all animal and plant life on the planet, is dependent upon water. Not only do we need water to grow our food, generate our power and run our industries, but we need it as a basic part of our daily lives – our bodies need to ingest water every day to continue functioning. Communities and individuals can exist without many things if they have to – they can be deprived of comfort, of shelter, even of food for a period, but they cannot be deprived of water and survive for more than a few days.

Although 83% of the population of developing countries have access to improved drinking water sources, only 42% have access through a household connection or a yard tap. Approximately 1.1 billion people do not have access to any type of improved drinking water facility. Coverage trends indicate that the world is likely to achieve the drinking water MDG target but sub-Saharan Africa is not (see Figure 10).

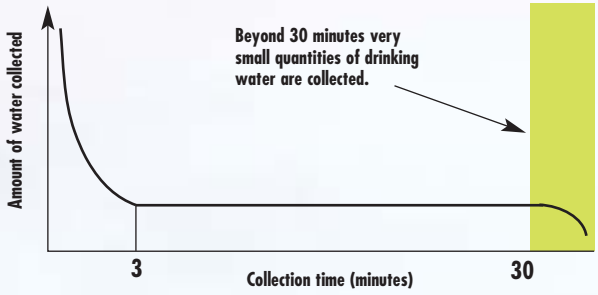
Figure 10 Change in drinking water coverage from 1990 to 2002, projection of change from 2002 to 2015 and MDG target globally and in sub-Saharan Africa



In designing and building drinking water services, important factors should be taken into consideration such as continuity of services, quantity of water available per capita, affordability and the quality of the water provided. Unreliable services force consumers to use alternative, less safe sources and lead to problems with user satisfaction, cost recovery, vandalizing of facilities, etc.

The *quantity* of water collected and used by households has an important influence on health. There is a basic human physiological requirement for water to maintain adequate hydration, and an additional requirement for food preparation. There is a further requirement for water to support the hygiene necessary for health (see Table 2). Where it takes more than 30 minutes to go to the source, fetch water and come back, the amounts collected per capita will probably not reach a minimum requirement for drinking, cooking and personal hygiene (see Figure 11).

Figure 11 Water consumption depends on time to source



Source: adapted from Cairncross, 2000.

Interruptions to drinking-water supply either through intermittent sources or resulting from engineering inefficiencies are a major determinant of the access to and quality of drinking-water. Interpretation of data on continuity of supply requires the consideration of several components. Solving continuity problems requires extensive improvement in operation and maintenance of facilities, sound demand control, good management practices and frequently major investment in expansion and rehabilitation of production and distribution systems.

The *affordability* of water also has a significant influence on the use of water and selection of water sources. Households with the lowest levels of access to safe water supply frequently pay more for their water than do households connected to a piped water system. The high cost of water may force households to use alternative sources of water of poorer quality that represent a greater risk to

Table 2 Service level and quantity of water collected

Service level	Distance/time	Likely volume of water collected	Public health risk from poor hygiene	Intervention priority and actions
No access	More than 1 km; more than 30 min round-trip	Very low: 5 litres per capita per day	**Very high** Hygiene compromised; basic consumption may be compromised	**Very high** Provision of basic level of service; hygiene education
Basic access	Within 1 km; within 30 min round-trip	Average approximately 20 litres per capita per day	**High** Hygiene may be compromised; laundry may occur off-plot	**High** Hygiene education; provision of improved level of service
Intermediate access	Water provided on-plot through at least one tap (yard level)	Average approximately 50 litres per capita per day	**Low** Hygiene should not be compromised; laundry likely to occur on-plot	**Low** Hygiene promotion still yields health gains; encourage optimal access
Optimal access	Supply of water through multiple taps within the house	Average 100–200 litres per capita per day	**Very low** Hygiene should not be compromised; laundry will occur on-plot	**Very low** Hygiene promotion still yields health gains

Source: *Domestic water quantity, service level and health.* Geneva, World Health Organization, 2004.

health. It may also reduce the volume of water used by households, jeopardize hygiene practices and increase risks of disease transmission.

In many developing countries and some developed countries, water quality complying with national standards or international guidelines is not continuously assured. In many developing and developed countries, a high proportion of drinking-water systems fail to meet minimum requirements for water safety. In such circumstances, and in addition to the efforts towards providing sufficient amounts of water through improved sources to unserved populations, it is important that realistic goals for progressive improvement of water quality are agreed upon and implemented.

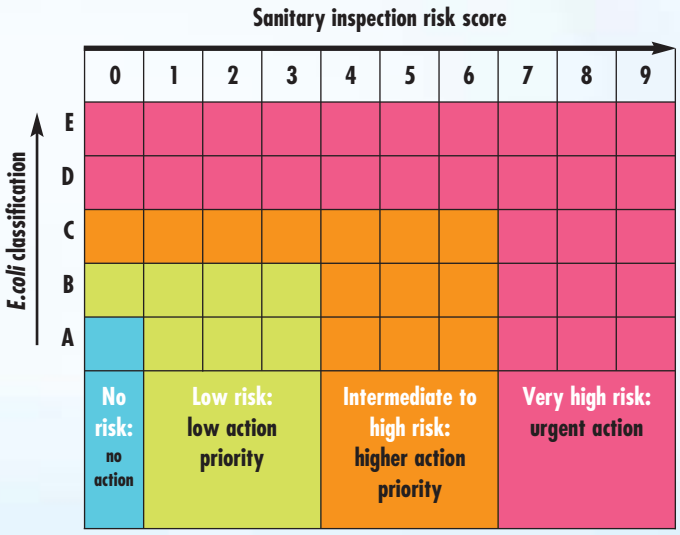
It is practical to classify water quality in terms of an overall grading for water safety linked to priority for action, as illustrated in Table 3. Grading schemes may be of particular use in community supplies where the frequency of testing is low and reliance on analytical results alone is especially inappropriate. Such schemes will typically take account of both analytical findings and results of sanitary inspection through a schema such as illustrated in Figure 12.

Combined analysis of sanitary inspection and water quality data can be used to identify the most important causes of contamination and the control measures that can prevent contamination. Such information supports effective and rational decision-making. For instance, it will be important to know whether on-site or off-site sanitation is associated with contamination of drinking water, as the remedial actions required will be different.

Table 3 Categorization of drinking water systems based on compliance with performance and safety plans: proportion (%) of samples negative for *E.coli*

	Population size		
Quality of water system	<5000	5000–100 000	>100 000
Excellent	90	95	99
Good	80	90	95
Fair	70	85	90
Poor	60	80	85

Figure 12 Example of assessment of priority of remedial actions for community drinking water supplies, using a grading system based on microbial quality and sanitary inspection



Source: *Guidelines for drinking-water quality – recommendations,* 3rd ed. Vol. 1. Geneva, World Health Organization, 2004.

PROMOTING HOUSEHOLD WATER TREATMENT AND SAFE STORAGE

Some of the 83% of the world's population who use "improved" water sources nonetheless drink water that has been contaminated – either at source or through seepage of contaminated run-off water, or in the piped distribution system, or as a result of unhygienic handling during transport, or in the home. The unserved 17% have little choice but to carry home water from unsafe sources. Simple techniques for treating water at home and storing it in safe containers could save a huge number of lives each year.

Because the treatment techniques can be cheap and the impact of improving water quality dramatic, household water treatment and safe storage can produce huge health and economic benefits (see Box on page 13 and Table 4 on page 33).

Examples of technologies include:

- chlorination
- solar disinfection
- filters
- combined flocculation/chlorination powders.

Treated water must be stored safely to prevent re-contamination, for example, using containers with narrow openings and dispensing devices such as taps or spigots.

HOUSEHOLD WATER TREATMENT IN EMERGENCIES

Household water treatment is especially applicable to populations recovering from disaster situations. Such households often lack facilities and resources. WHO estimates that between 3 and 5 million people were unable to gain access to safe water as a result of the South Asia tsunami alone. Both central treatment of drinking water and household water disinfection have been strongly promoted in the aftermath of this natural disaster.

The adoption of home water treatment does not preclude the need for infrastructure aimed at sustainable access to safe water supplies such as piped systems, boreholes, protected dug wells, and so on. Not only water quality, but also sufficient quantities of accessible drinking water are fundamental to prevent water-related diseases.

Home water treatment can be adopted immediately in the homes of poor families in advance of centralized water treatment and distribution systems. There is a wide range of technologies, providing options to communities and households to determine what is

EXAMPLES OF HOUSEHOLD WATER TREATMENT AND SAFE STORAGE IN PRACTICE

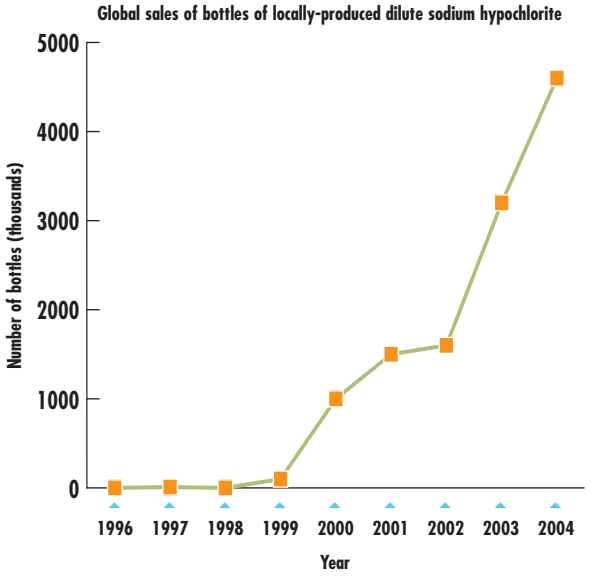
Household water management practices have been introduced in approximately 50 developing countries. These range from simple filters made from sari cloth and nylon to commercially produced sachets of flocculant-disinfectants.

When considering the type of home intervention to be applied, a key criterion is that it must be locally available and appropriate for the community. For example, a recent solar disinfection project in Kenya was successful because community members were able to get the bottles themselves. It also built on the local understanding that leaving pots, plates and utensils in the sun would help disinfect them.

Experience has shown that household treatment can be self-sustaining and promote local entrepreneurship. In Madagascar, locally produced sodium hypochlorite, sold under the brand name SUR'EAU, has been used by 18% of all households since its introduction in 2000. This is possible through social marketing, and the creation of a network of more than 10 000 community-based retailers.

The graph below shows global sales of bottles of locally-produced dilute sodium hypochlorite exclusively marketed and used for household treatment of water. Each bottle offers one to two months protection for a household of six.

Source: http://www.cdc.gov/safewater/default.htm



most suitable for them. Furthermore, the use of simple technologies provides scope for local industry.

Although home water treatment is an effective and useful approach applicable in many circumstances, questions about acceptability and long-term use have yet to be addressed.

PROMOTING HOUSEHOLD WATER TREATMENT PRODUCTS

A variety of household water treatment and safe storage products are being developed through small-scale industries worldwide. As demand for these increases it becomes possible for people to sell their products and make a living. In some areas, viable commercial micro-enterprises have been created around certain products.

For example, it has been reported that local factories in Kenya producing ceramic filters can recoup set-up costs within the first year of production.

Several local women's groups, also in Kenya, have found that there is sufficient demand for them to manufacture and sell relatively inexpensive clay pots modified for safe storage, with a narrow mouth, a lid, and a spigot.

With the backing of vigorous social marketing, local vendors in a number of African countries have been able to procure dilute sodium hypochlorite (a household water disinfection solution) at wholesale prices. These groups have been able to add other health products to their basket of goods to enhance their income-generating opportunities.

The low production costs of many household-level technologies open the door to reaching vulnerable groups through sustainable market channels.

MONITORING HOUSEHOLD WATER TREATMENT

In principle, the population applying correct household water treatment methods should be included among those considered to have access to safe drinking water. But comparability of country data would be compromised if that population was included from some countries and not for others. In order to obtain comprehensive information on the population applying correct water treatment methods, questions addressing this matter have recently been included in the DHS and MICS household surveys. Results from over 50 MICS and 20 DHS surveys will become available by mid-2006. The information thus obtained will allow the JMP to provide a baseline for future interventions promoting household water treatment.

FOCUSING ON CHANGING KEY HYGIENE BEHAVIOURS

Providing improved drinking water and sanitation services, and adopting good hygiene behaviours are of the utmost importance in reducing diarrhoeal disease. Mothers should dispose of their babies' faeces in a safe way, wash their hands after defecation, after handling babies faeces, after cleaning their babies' bottoms and before preparing food in order to break the disease chain. The full benefits of improved drinking water and sanitation services will be accrued only with effective and sustainable behaviour change.

Researchers at the London School of Hygiene and Tropical Medicine claim that handwashing with soap can cut the risk of diarrhoeal diseases by 42–47%[3]. Good hygiene behaviour brings about huge health gains with relatively small investment.

So, handwashing is effective when it is practised, but how can the necessary behavioural change be achieved? Most handwashing campaigns are effective in the short term, but behaviour reverts to the old patterns soon after the campaign ends. An encouraging exception relates to an intensive 3-year study in an urban area of Burkina Faso, involving house visits, radio messages and training of health-centre staff[4]. At the end of the project, the proportion of mothers who washed their hands after using the latrine rose from 1% to 17% and the proportion that did so after handling children's stools went up from 13% to 31%. It is clear that sustainable behaviour change is difficult to achieve and requires significant resources, persistency and capacity.

[3] Curtis V, Cairncross S. Infectious Diseases. Lancet, 2003.
[4] Curtis V, Cairncross S. Tropical Medicine and International Health, 2000, 5 (1): 22-32.

CREATING DEMAND FOR HYGIENE IN BOTSWANA

In a school in Botswana, a latrine block had recently been built by the government. Hand-washing facilities were provided, but not soap. Teachers and parents decided that this was not acceptable, and created a fund to buy soap dispensers and keep them filled. The majority of parents contributed the small sum necessary to make the improvement. The teachers introduced hand-washing into their teaching, particularly with the youngest pupils, and helped the children to arrange a cleaning rota to ensure that the latrine blocks stayed clean.

Source: WHO, UNDP, WSP. *The PHAST initiative: participatory hygiene and sanitation transformation. A new approach to working with communities.* Geneva, World Health Organization, 1997.

SENDING THE RIGHT MESSAGES – NEPAL

In Nepal, hygiene and sanitation messages are incorporated in the school curriculum on health education. Since it was felt that regular practice is needed in order to make sanitation education more meaningful, UNICEF developed a sanitation package to facilitate the design and implementation of a sanitation programme at primary-school level. It has five major components: habit formation, and hygiene and sanitation education for students; constructing sanitary facilities at school; use and maintenance of these facilities; organizing extracurricular activities and events; and operaton of a school-to-community programme. Teachers are encouraged to reinforce concepts and ideas by practical demonstrations, repetition of messages during prayer sessions and sport events, on-the-spot correction of unsanitary practices, and stimulating the use of sanitary facilities such as latrines and garbage pits.

Source: *Towards better programming: a manual on school sanitation and hygiene.* New York, NY, United Nations Children's Fund, 1998.

EXPERIENCE IN PERU AND NICARAGUA

A study in Peru and Nicaragua by the Environmental Health Project showed notable gains in handwashing frequency and use of soap after a year's campaigning. It also recorded significant reductions in childhood diarrhoea. Key components of successful project implementation included:

- form a team – consistent participation of technical collaborators is important;
- select project communities to ensure the commitment of both communities and health workers – and develop clear criteria for selecting communities;
- work with local nongovernmental organizations and other groups active in the communities;
- pretest instructional materials;
- develop appropriate communications materials;
- ensure extensive community participation – include not only communities but individual families;
- develop and use appropriate surveys to measure change;
- design project to allow for adequate implementation time and development of local capacity.

The lesson from both countries was that hygiene promotion needs to be sustained and replicated if behavioural change is to be maintained. WHO is working with the London School of Hygiene and Tropical Medicine to develop indicators and monitoring methodologies to standardize the evaluation of handwashing compliance.

Source: Favin M. *Promoting hygiene change within C-IMCI: the Peru and Nicaragua experience.* Washington, DC., Environmental Health Project, 2004.

HYGIENE SUSTAINABILITY

A review of hygiene programmes in six countries to assess factors that contributed to sustainable change in hygiene behaviour concluded the following:

- Adoption of sustainable hygiene behaviours is strongly linked to the educational level of women. Better-educated women are more likely to adopt long-term hygiene behaviours. Stronger hygiene interventions are needed (i.e. more inputs, time, efforts to reach the harder-to-reach and strategies suitable for the less-educated) if more of the less-educated women are to do better in adopting hygienic practices. This highlights the value of women's education as a development priority.
- Complex behaviour changes, such as regular hand-washing and consistent use of a latrine require sustained interventions (for example, multiple home visits).
- Continued access to services is not sufficient to sustain hygienic behaviour; hygiene promotion and health education are also of fundamental importance.
- Project variables have an impact on the adoption of good hygiene practices. Key project components include: intensity and duration of the programmes; support from influential community members or groups; attendance in hygiene classes and training. Intensive interventions to promote hygiene, that use small groups and personal contact, are likely to be more effective than others in creating lasting good hygiene behaviours.

Source: Cairncross S, Shordt K. *It does last! Some findings from a multi-country study of hygiene sustainability.* Waterlines, 2004 22(3):4-7.

LIFE-SAVING HYGIENE BEHAVIOUR

Three simple actions by mothers can make a huge difference to the health of their babies and their communities:

- **safe disposal of faeces**, particularly those of babies, young children and people with diarrhoea – disposal into a latrine, or by safe burying, removes a major cause of the spread of diarrhoeal diseases;
- **handwashing** by mothers and children, after defecation (and including washing of children's bottoms), after handling babies' faeces, before preparing food, and before feeding and eating;
- **protection of water** both at its sources and when it is stored in the home – contamination of water stored in household containers is now known to be a major factor in spreading disease.

ORAL REHYDRATION THERAPY

Diarrhoea, aggravated by malnutrition, is a significant cause of death among children under 5 years of age. The children die of dehydration because their diarrhoea leads to a fatal loss of water and salt from their bodies. Prevention is better than cure – so improved water, improved sanitation, and hygiene education head the life-saving option. They will reduce the incidence and gravity of diarrhoea, but they will not eliminate it. Also, even if the MDG target is achieved, there will be nearly two billion people without improved sanitation in 2015. That means many millions of children at risk.

Oral rehydration therapy (ORT) is a cheap and effective way of saving lives. Widespread availability of oral rehydration salts has contributed to significant reductions in infant diarrhoeal deaths in recent years in countries as far apart as Bangladesh, Egypt and Mexico. ORT reduces the severity of diarrhoea and the duration of individual episodes. It saves millions of lives each year. What it does not do is tackle the underlying causes of the sickness. That is why it is so important to accompany ORT treatment with prevention, by tackling the primary causes of diarrhoea.

The primary causes are poor hygiene, inadequate sanitation, lack of clean drinking water, overcrowding, and poor infant feeding practices. Babies who are fed only breast milk up to the age of six months seldom get diarrhoea in that vital period. Although this report is primarily concerned with the issue of improved water, sanitation and hygiene, its co-sponsors, WHO and UNICEF, also lead the drive to promote breastfeeding and ORT as major elements of country strategies to reduce child mortality.

ENSURING MORE HEALTH FOR THE MONEY – Costs and benefits of achieving the MDG target for drinking water and sanitation

SUB-SAHARAN AFRICA AND SOUTH ASIA FACE A MAJOR CHALLENGE IN ACCELERATING THEIR PROGRESS TOWARDS THE SANITATION TARGET. IN OTHER REGIONS, THERE IS SCOPE TO GO BEYOND THE LIMITED TARGET OF HALVING THE PROPORTION OF PEOPLE WITHOUT IMPROVED SERVICES BY 2015.

Proponents of higher investment in drinking water and sanitation services speak of the multiple benefits this is likely to bring. Disease prevention, fewer child deaths, social and human development, poverty alleviation, gender equity, productivity gains and environmental improvement are all cited as justification for spending more money on drinking water and sanitation improvements.

A study published by WHO in 2004[5] assessed the costs and benefits of meeting the MDG target on drinking water and sanitation, and compared them with four other investment options, including the ultimate achievement of piped water and sewerage for all. This analysis was based on epidemiological, demographic and economic data from global sources. Table 4 indicates that even costly interventions result in a high benefit/cost ratio.

Improved water and sanitation facilities, and better hygiene behaviour, will radically reduce illness. In addition, greater access to improved water and sanitation services may confer many other benefits. These include averted health-related costs, avoidance of time lost from daily activities as a result of illness, and time saved by having water and sanitation facilities closer to home. Time saved may translate into higher productivity, higher school attendance and more leisure time. All these benefits would have economic and social impacts, both immediate and future.

[5] Hutton G, Haller L. *Evaluation of the costs and benefits of water and sanitation improvements at the global level.* Geneva, World Health Organization, 2004

The costs of achieving these benefits would vary considerably, depending on the level of water and sanitation services chosen. The costs should take into account all resources required to put in place and maintain the interventions. These are divided into investment and recurrent costs. Initial investment costs include planning and supervision, and hardware construction. Recurrent costs are those concerning operation and maintenance of water and sanitation systems, including maintenance of hardware and replacement of parts, emptying of septic tanks and latrines, ongoing protection and monitoring of water sources, water and wastewater treatment, water distribution and wastewater collection, regulation and control of water and sanitation systems, and continuing educational activities. Each activity could be financed through a number of different sources, both public and private, internal and external, depending on the country context and which intervention is being considered.

The study found that achieving the MDG drinking water and sanitation target would produce substantial economic benefits; each US$ 1 invested would yield an economic return of between US$ 3 and US$ 34, depending on the region. Globally, the cost of achieving the MDG drinking water and sanitation target is estimated at US$ 11.3 billion a year. The benefits would include an average global reduction of diarrhoeal episodes of around 10%. The health-related costs avoided would reach US$ 7.3 billion per year worldwide in 2015 if the MDG drinking water and sanitation target is achieved. The annual global value of adult working days gained – on the assumption that time saved is converted into income earned at the minimum wage rate in each country – would amount to almost US$ 750 million if the target is met.

According to the study's calculations, one of the major benefits of improving access to water and sanitation derives from the time saving associated with having water and sanitation facilities closer to home. This can be achieved, for example, by relocating a well or borehole closer to the user communities, or installing piped water in houses, and reducing distances to latrines. The annual value of these time savings globally would amount to US$ 63.5 billion in 2015 if the MDG target is met.

The burden of disease associated with lack of access to safe water supply and inadequate sanitation and hygiene is greatest for children under 5 years of age in developing countries. Accordingly, emphasis should be placed on interventions likely to yield an accelerated affordable and sustainable health gain among this group. The evidence points to household water treatment and safe storage, and to promoting hygiene behaviour to reduce diarrhoeal disease, alongside longer-term upgrading of water and sanitation services. Such approaches are also valid for emergency situations. A policy shift to include better household water quality management to complement the continuing expansion of coverage and upgrading of services may prove a low-cost and effective health intervention in many developing countries, particularly some African and South Asian countries likely to remain without improved drinking water and sanitation services for years to come.

WATER AND SANITATION INTERVENTIONS ARE COST-EFFECTIVE

Table 4 shows the cost-benefit ratios for a range of interventions, for developing regions and Eurasia. Even on the most pessimistic assumptions about health impacts, income-earning potential and investment costs, the study shows positive rates of return for all the water and sanitation investment scenarios.

Table 4 Benefit/cost ratio by intervention in developing regions and Eurasia

	Benefit/cost ratio by intervention
Halving the proportion of people without access to improved water sources by 2015	9
Halving the proportion of people without access to improved water sources and improved sanitation by 2015	8
Universal access to improved water and improved sanitation services by 2015	10
Universal access to improved water and improved sanitation and water disinfected at the point of use by 2015	12
Universal access to a regulated piped water supply and sewage connection in house by 2015	4