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This article examines the consequences of the disparity between the drinking-water target of the Millennium Development Goals and the measure used to report progress. It has recently been announced that the target had been met in 2010. The authors adjust reported figures to reflect that the official measure, use of an 'improved water source', may not always indicate safe water. They find that progress towards the target may have been substantially over-estimated.

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In early 2012, the United Nations announced that the drinking-water target of the Millennium Development Goals (MDGs) had been reached in 2010: in two decades, and five years ahead of schedule, the proportion of people without sustainable access to safe drinking-water had been halved¹. Whilst this undoubtedly represents a major achievement, fundamental concerns regarding the monitoring of safe water have been gaining prominence².

The measure used to assess progress towards the MDG target is use of an *improved* source; these are water sources that were considered likely to provide safe drinking-water (Table 1). Consequently, this approach is an assessment of specific types of water sources rather than the quality of the water they provide.

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Source class	Types of source included
Unimproved drinking water sources	Unprotected dug well, unprotected spring, cart with small tank/drum, surface water (river, dam, lake, pond, stream, canal, irrigation channels), and bottled water.
Improved: Piped into dwelling, plot, or yard	Piped water connection located inside the user's dwelling, plot, or yard.
Improved: other sources	Public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, or rainwater collection.

Table 1. *The Joint Monitoring Programme (JMP) classification of source types into improved and unimproved.* Source: WHO/UNICEF³.

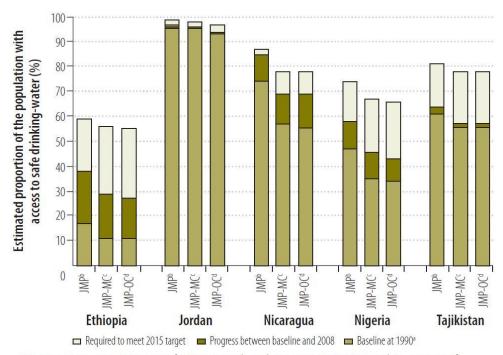
Improved sources do not always supply safe water due to the presence of microbial or chemical contamination. In order to explore the scale of this discrepancy and how it might be addressed in monitoring, the Joint Monitoring Programme of the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) commissioned a number of nationally representative studies. These Rapid Assessment of Drinking-Water Quality (RADWQ) studies were conducted in Ethiopia, Jordan, Nicaragua, Nigeria, and Tajikistan between 2004 and 2005.

In recent work⁴, we sought to determine how these data on water source quality would affect assessments of progress towards the 2015 (MDG) target in these countries. We adjusted reported coverage estimates for the following water quality parameters: thermotolerant coliform bacteria, arsenic, fluoride and nitrates. Accounting for compliance with the WHO Guidelines for

Drinking-Water Quality for these parameters substantially lowers estimates of 'safe' water use in four of the five countries (see Figure 1). In the countries with the largest populations, Ethiopia and Nigeria, the adjustment represents an additional 8.9 and 22 million people without safe water in 2008. Across the five countries, the adjustment reduces reported access by 32 million people - a sizeable difference when compared to the 70 million that have begun to use improved water sources in these countries between 1990 and 2008.

The RADWQ studies show marked differences between countries, not only in the extent of the adjustment, but also in the likelihood of particular supply types being contaminated. For example, in Nigeria boreholes were more likely to be compliant (86%) than piped supplies (77%), whereas in Ethiopia the reverse was the case (80% versus 66% respectively). The compliance rate of





JMP, Joint Monitoring Programme for Water Supply and Sanitation; RADWQ, Rapid Assessment of Drinking-Water Quality; WHO, World Health Organization.

- ^a For Tajikistan, the baseline year was 1995.
- ^b JMP: the percentage with access to safe drinking-water was estimated using the original JMP figures.
- ^c JMP-MC: the percentage with access to safe drinking-water was estimated using the original JMP figures adjusted for the percentage microbial compliance (MC) with WHO guidelines on drinking-water contamination with thermotolerant coliform bacteria derived during the RADWQ project.
- d JMP-OC: the percentage with access to safe drinking-water was estimated using the original JMP figures adjusted for the percentage overall compliance (OC) with WHO guidelines on drinking-water contamination with thermotolerant coliforms, arsenic, fluoride and nitrates derived during the RADWQ project.

Figure 1. Estimated percentage of the population using safe drinking-water in 1990 and 2008 in five countries and the Millennium Development Goal target for 2015, by indicator. Source: Bain et al. (2012)⁴. Reproduced with permission from the Bulletin of the WHO (ID 102084).

improved sources is also likely to vary considerably within countries, for example between urban and rural areas or socioeconomic groups. Further research is required to understand the distribution of improved but unsafe supplies. As these data highlight, there remains a need for substantial improvement of 'improved sources'.

Studies in a number of other countries also highlight the discrepancy between improved water sources and the provision of water that is free of chemical and microbial contamination. For example, a preliminary study shows the Chinese population that gained access to safe water between 1990 and 2010 is at most 330 million, whereas 457 million people are reported as having gained



access to an improved source during the same period⁵.

The magnitude of the problem globally has also been estimated. Given that nationally representative water quality data are only available through RADWQ for five countries and that results vary greatly between countries, this exercise requires a range of assumptions. However, when water quality is incorporated, global estimates of those without safe water range from 1.8 to 1.9 billion^{6,7} – over a quarter of the 2010 world

population and more than double the reported population not using improved sources.

This work shows that interpretation of the MDG indicator as a surrogate for safe water can lead to substantial overestimates of the population using safe drinking-water and, consequently, also overestimates the progress made towards the 2015 MDG target. There are important policy implications — whilst progress has been made, adjusting for water quality shows that much of the world's population still lacks access to safe water.

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