Accounting for water quality in monitoring access to safe drinking-water as part of the Millennium Development Goals: lessons from five countries

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Objective To determine how data on water source quality affect assessments of progress towards the 2015 Millennium Development Goal (MDG) target on access to safe drinking-water.

Methods Data from five countries on whether drinking-water sources complied with World Health Organization water quality guidelines on contamination with thermotolerant coliform bacteria, arsenic, fluoride and nitrates in 2004 and 2005 were obtained from the Rapid Assessment of Drinking-Water Quality project. These data were used to adjust estimates of the proportion of the population with access to safe drinking-water at the MDG baseline in 1990 and in 2008 made by the Joint Monitoring Programme for Water Supply and Sanitation, which classified all improved sources as safe.

Findings Taking account of data on water source quality resulted in substantially lower estimates of the percentage of the population with access to safe drinking-water in 2008 in four of the five study countries: the absolute reduction was 11% in Ethiopia, 16% in Nicaragua, 15% in Nigeria and 7% in Tajikistan. There was only a slight reduction in Jordan. Microbial contamination was more common than chemical contamination.

Conclusion The criterion used by the MDG indicator to determine whether a water source is safe can lead to substantial overestimates of the population with access to safe drinking-water and, consequently, also overestimates the progress made towards the 2015 MDG target. Monitoring drinking-water supplies by recording both access to water sources and their safety would be a substantial improvement.

Abstracts in عربي, 中文, Français, Русский and Español at the end of each article.

Introduction

The United Nations Millennium Development Goals (MDGs) encapsulated a global agreement to tackle the pervasive health, social and economic effects of poverty. Their influence on national policy and development practice has been profound. From their first formulation, the MDGs included a target for access to safe drinking-water. After several revisions, this target, designated Target 7c, is now to reduce by half, between 1990 and 2015, "the proportion of the population without sustainable access to safe drinking-water and basic sanitation".[1]

The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) report progress towards this target through their Joint Monitoring Programme for Water Supply and Sanitation.[2] However, the functioning of the Joint Monitoring Programme and the appropriateness of some of the indicators currently used to monitor access to safe drinking-water and the pace of improvement have been questioned.[3,4] A key concern has been the inclusion of the word *safe* in the target and whether or not the data on water quality available are suitable for monitoring access to safe drinking-water up to 2015, as well as for providing a retrospective estimate of access at baseline in 1990.

In the 1990s, WHO and UNICEF categorized households as obtaining drinking-water from either an improved or an unimproved source, with only water from an improved source being regarded as safe. This approach is still used today by the Joint Monitoring Programme. The decision on whether a source is classified as improved or unimproved is based on expert judgement of the likelihood that a particular type of source provides safe drinking-water (Table 1). Consequently, this approach assesses access to specific types of water sources but not the quality of the water sources.

Further, the indicator used for monitoring progress towards the achievement of MDG Target 7c is the "proportion of households using water from an improved source".[1] This indicator conflates the requirement for access with that for safety. Although this measure has been criticized, its use was perhaps inevitable given the need for a single percentage figure that could be used as a target and given the limited availability of data on water quality that could be backdated to 1990, the baseline year for Target 7c. In 1990, there was no international system for collating data on water quality. However, the information available today suggests that there were large gaps in data for peri-urban areas in low-income countries and for small, often rural, supply systems in low-, middle- and high-income countries. Moreover, data comparability between countries was poor since different parameters were assessed using a range of sampling and reporting methods.[5]

Currently, progress on the drinking-water component of MDG Target 7c is judged as being "on track". The most recent projections suggest that only 9% of the world's population will be using drinking-water from an unimproved source in 2015 — slightly better than the target requirement of 12%.[6] However, assessing the safety of drinking-water according to whether or not it comes from an improved source is likely to overestimate

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Table 1. **Classification of drinking-water source types as improved[a] or unimproved, Joint Monitoring Programme for Water Supply and Sanitation, 2011[21]**

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

[a] The Joint Monitoring Programme reports access to improved sources as an indicator of access to safe drinking-water.

both the proportion of the population with access to safe drinking-water at baseline and progress towards Target 7c because many improved sources will not provide safe water, particularly in developing countries. Conversely, the proportion of unimproved sources that actually do provide safe drinking-water is likely to be small.[7,8]

In 2010, WHO and UNICEF released data on the quality of water sources in five countries that had participated in the Rapid Assessment of Drinking-Water Quality (RADWQ) project.[9–13] The availability of these data offered the opportunity to determine how information on water quality affects Joint Monitoring Programme estimates of the proportion of the population without access to safe drinking-water.

Taking water quality into account was expected to have two main consequences. First, since some of the water sources categorized as improved at baseline in 1990 were actually unsafe, the proportion of the population without access to safe drinking-water at that time will have been greater than estimated. Second, since some of the new water sources installed since 1990 and categorized as improved were actually unsafe, the subsequent reduction in the proportion of the population without access to safe drinking-water will have been smaller than estimated.

The combined effect of these two factors on estimates of progress towards achieving MDG Target 7c will vary between countries according to the mix of improved source types in use and the actual safety of each source type. Thus, for countries with predominantly safe, well maintained, piped systems, taking water quality into account probably leads to only small adjustments in the estimates. In contrast, the adjustments are likely to be substantial for countries where a large proportion of improved water sources are poorly maintained.

The aim of this study was to determine how accounting for RADWQ data on water source quality affects Joint Monitoring Programme assessments of progress towards achieving MDG Target 7c in five countries: Ethiopia, Jordan, Nicaragua, Nigeria and Tajikistan.

Method

Data on drinking-water safety

Between October 2004 and April 2005, the RADWQ project conducted pilot studies in eight countries to assess drinking-water safety and to determine how the Joint Monitoring Programme could be modified to take drinking-water safety into account. Each survey considered a nationally representative sample of approximately 1500 water sources, with an emphasis on the types of improved water source in widespread use.[14] Each water source was assessed using a checklist of potential risk factors and tested for a restricted set of water quality parameters. Summary reports of the pilot studies carried out in Ethiopia, Jordan, Nicaragua, Nigeria and Tajikistan are available.[2]

Water sources were tested for the presence of thermotolerant coliform bacteria, fluoride, arsenic and nitrate compounds. Coliform bacteria serve as an indicator of the possible presence of waterborne pathogens, which cause more disease than any other drinking-water contaminant. Among chemical contaminants, fluoride and arsenic are believed to have the greatest effect on public health globally.[15] They both occur naturally in groundwater in certain geological settings. Although the presence of nitrates is thought to pose a smaller threat to public health globally, it is still a concern. Moreover, as nitrates are primarily anthropogenic in origin, these compounds provide another perspective on drinking-water safety.

For each of the five countries, we used RADWQ data on drinking-water safety to determine the percentage of each type of water source that complied with WHO guidelines on thermotolerant coliforms (i.e. percentage microbial compliance) and the percentage that complied with guidelines on thermotolerant coliforms, arsenic, fluoride and nitrates (i.e. percentage overall compliance).[16]

Adjustment for compliance

The Joint Monitoring Programme bases its estimates of access to improved water sources on data from selected national censuses and nationally representative household surveys. The proportion of the population with access to an improved water source is derived by categorizing the water source types reported in national data as either improved or unimproved using the classification shown in Table 1. Then, for each country, the figures for access derived from individual surveys and censuses are plotted over time, separately for rural and urban populations, and least squares linear regression is used to fit temporal trend lines. When required, the trend line is extrapolated for up to 2 years beyond the available data points, after which it is assumed that the figure does not change for another 4 years. The Joint Monitoring Programme uses these trend lines to estimate the proportion of the population with access to an improved water source in any given year.

To ensure that we were applying the methodology correctly, we replicated the procedures used for the five study countries for the data contained in the Joint Monitoring Programme country reports. The figures we obtained for Ethiopia, Jordan, Nicaragua and Nigeria were checked against the published figures;[17] the figures for Tajikistan were checked against revised figures provided by the Joint Monitoring Programme.

Our first step in investigating the effect of RADWQ drinking-water safety data on Joint Monitoring Programme estimates of access to safe drinking-water was to match the source types reported in the RADWQ project with those reported in the household surveys and censuses used by the Joint Monitoring Programme. In some instances, we encountered difficulties in matching the two sets of source types (details of these difficulties and how they were resolved are available from the corresponding author on request). To estimate the proportion of the population with access to safe drinking-water, we adjusted the proportion with access to water from each source type using estimates of the percentage microbial compliance and percentage overall compliance for each source type reported by the RADWQ project. Although Joint Monitoring Programme estimates of the proportion using specific source types were available for rural and urban areas separately, RADWQ compliance figures were for rural and urban areas combined. Moreover, improved sources used by only a small proportion of the population were not assessed in the RADWQ project (Table 2). In the absence of RADWQ data, we followed the approach used by the Joint Monitoring Programme and assumed that such sources were 100% compliant.

The revised figures for access to safe drinking-water for different source types were summed to give separate estimates for the proportion of the urban and rural population with access to safe drinking-water in each country. Trend lines were fitted to each separately, in accordance with Joint Monitoring Programme methods. Each trend line was then used to estimate the proportion with access to an improved water source that met our microbial and overall compliance criteria in 1990, 1995, 2000, 2005 and 2008. In addition, for these years, the number of individuals with access to safe drinking-water in each country was calculated using United Nations population data obtained from the Joint Monitoring Programme web site.

Table 2. **Compliance of drinking-water sources with WHO guidelines on contamination in five countries, Rapid Assessment of Drinking-Water Quality project, 2004–2005**

Improved drinking-water source type,[a] by country	Population coverage[b] (%)	Microbial compliance[c]		Overall compliance[d]	
		Compliant sources (%)	Sources sampled (*n*)	Compliant sources (%)	Sources sampled (*n*)
Ethiopia					
Piped supply from a public utility	19.8	87.6	838	80.4	832
Borehole	5.1	67.9	290	65.6	270
Protected spring	7.0	43.3	319	43.3	313
Protected dug well	5.0	54.8	155	54.8	155
Total	36.9	–	1602	–	1570
Jordan					
Piped supply from a public utility	93.4	99.9	1639	97.8	1639
Other improved source[e]	4.5	NA	0	NA	0
Total	97.9	–	1639	–	1639
Nicaragua					
Piped supply from a public utility	69.0[f]	89.9	335	89.1[g]	335
Community supply	6.6[f]	39.0	265	38.6[g]	265
Borehole or tube well	4.6[f]	45.7	442	41.6[g]	442
Protected dug well	3.9[f]	19.3	446	18.5[g]	446
Other improved source[e]	0.1[f]	NA	0	NA	0
Total	84.1[f]	–	1488	–	1488
Nigeria					
Piped supply from a public utility	19.6	77.0	630	77.0	630
Borehole or tube well	14.7	94.0	525	86.0	525
Protected dug well	12.9	56.0	424	51.0	424
Total	47.2	–	1579	–	1579
Tajikistan					
Piped supply from a public utility	58.4	88.6	1286	88.2	1286
Protected spring	9.6	82.0	334	82.0	334
Other improved source[e]	1.2	NA	0	NA	0
Total	69.2	–	1620	–	1620

NA, not available; WHO, World Health Organization.

[a] The Rapid Assessment of Drinking-Water Quality (RADWQ) project assessed only water source types classified as improved by the Joint Monitoring Programme for Water Supply and Sanitation.

[b] The percentage of the population receiving drinking-water from each source in 2004 to 2005 was estimated from RADWQ project reports.

[c] Compliance with WHO guidelines on drinking-water contamination with thermotolerant coliform bacteria.

[d] Compliance with WHO guidelines on drinking-water contamination with thermotolerant coliforms, arsenic, fluoride and nitrates.

[e] Apart from in the Nicaraguan study, types of improved water source used by less than 5% of the population were not sampled during the RADWQ project.

[f] Since, unlike reports for other countries, the RADWQ report for Nicaragua did not record the proportion of unimproved sources, Joint Monitoring Programme figures were used to estimate population coverage in the country.

[g] Since overall compliance was not recorded in the RADWQ report for Nicaragua, overall compliance was estimated from separate chemical and microbial compliance figures on the assumption that the two were independent.

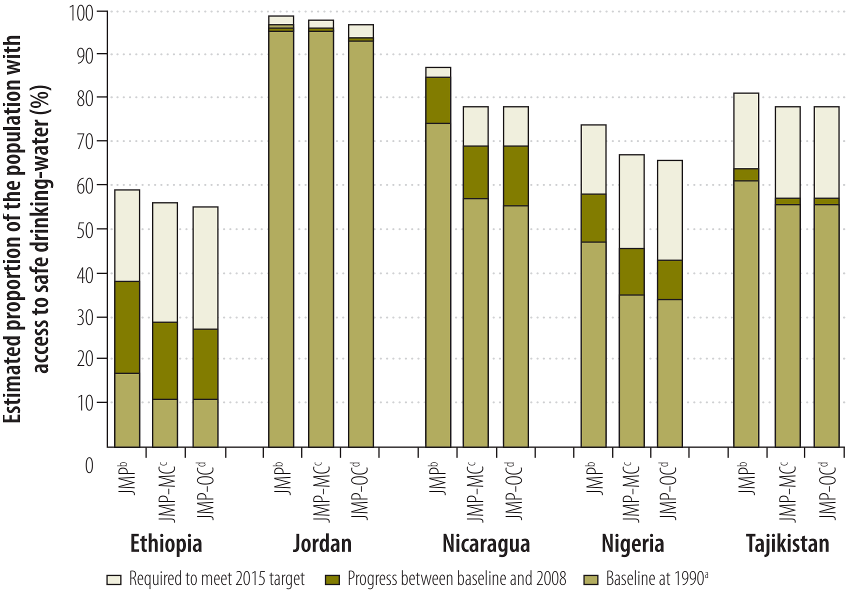
The MDG targets for each country except Tajikistan were recalculated using revised estimates of the proportion of the population with access to safe drinking-water at baseline in 1990. For Tajikistan, the 1995 figure was the earliest available. This process produced three sets of figures for each country for both the MDG target and for the proportion of the population with access to safe drinking-water in any year: (i) the original Joint Monitoring Programme figures; (ii) the Joint Monitoring Programme figures adjusted for percentage microbial compliance; and (iii) the Joint Monitoring Programme figures adjusted for percentage overall compliance.

Results

Revised 2008 safe drinking-water estimates

Taking RADWQ data on water source quality (Table 2) into account substantially reduced the estimated proportion of the population with access to safe drinking-water in 2008 in four of the five study countries. After adjusting for percentage overall compliance, the estimated proportion of the Ethiopian population with access to safe drinking-water in 2008 fell by 11% (Fig. 1). The reductions in three other countries were similar: 16% in Nicaragua, 15% in Nigeria and 7% in Tajikistan. In addition, Fig. 1 also shows that this adjustment had the greatest effect in Nicaragua and Nigeria, mainly because the microbial compliance of improved water sources was low. In Ethiopia, microbial contamination of springs and protected dug wells was the main reason for the reduction; in Tajikistan, it was microbial contamination of piped supplies. In Jordan, the main source of water is a piped supply provided by public utilities, which was almost entirely free of microbial and chemical contamination (Table 2). Consequently, adjustment for percentage overall compliance resulted in only a slight reduction in the estimated proportion of the population with access to safe drinking-water. Overall, microbial contamination was the principal reason that improved water sources in all five countries were judged unsafe by the RADWQ project. Chemical contamination had only a limited effect.

Fig. 1. **Estimated percentage of the population with access to safe drinking-water in 1990[a] and 2008 in five countries and the Millennium Development Goal target for 2015, by assessment method**



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.

Revised Millennium Development Goal targets

Fig. 1 shows the revised figures for the proportion of the population with access to safe drinking-water at baseline in 1990 in the five study countries and the revised MDG targets for 2015 based on these figures. Since adjustment for microbial and chemical contamination resulted in lower baseline values, the target increase in the proportion of the population that should have access to safe drinking-water by 2015 was raised. Consequently, less progress was made between baseline and 2008 than previously estimated. In addition, progress was reduced further because some improved water sources installed after baseline did not comply with guidelines on contamination and were reclassified as unsafe.

Adjustment for microbial and chemical contamination meant that in all countries except Jordan the estimated proportion of the population needing to gain access to safe drinking-water between 2008 and 2015 to reach the 2015 target increased: the absolute increase was 8% in Ethiopia, 7% in Nicaragua, 8% in Nigeria and 4% in Tajikistan. Table 3 lists the size of the population without access to safe drinking-water in the five study countries between 1990 and 2008, as estimated using the original Joint Monitoring Programme figures and using these figures adjusted for percentage microbial compliance and percentage overall compliance, respectively. Adjustment for percentage overall compliance increased the estimated number of people without access to safe drinking-water in 2008 in Ethiopia and Nigeria, the two most populous countries, by 8.9 and 22 million, respectively.

Discussion

Our revision of the estimated proportion of the population with access to safe drinking-water involved several assumptions that could have led to systematic underestimation or overestima-

Table 3. **Estimated population without access to safe drinking-water in five countries, by assessment method, 1990–2008**

Assessment method, by country	Population without access to safe drinking-water (millions)[a]				
	1990	1995	2000	2005	2008
Ethiopia					
JMP[b]	40.1	44.4	47.2	48.5	50.0
JMP adjusted for microbial compliance[c]	42.8	48.4	52.0	55.0	57.3
JMP adjusted for overall compliance[d]	43.1	48.9	52.8	56.2	58.9
Jordan					
JMP[b]	0.1	0.2	0.2	0.2	0.2
JMP adjusted for microbial compliance[c]	0.1	0·1	0.2	0.2	0.2
JMP adjusted for overall compliance[d]	0.2	0·2	0.3	0.3	0.4
Nicaragua					
JMP[b]	1.1	1.1	1.0	0.9	0.9
JMP adjusted for microbial compliance[c]	1.8	1.8	1.8	1.8	1.7
JMP adjusted for overall compliance[d]	1.8	1.9	1.9	1.8	1.8
Nigeria					
JMP[b]	51.6	55.2	58.7	60.6	63.5
JMP adjusted for microbial compliance[c]	63.7	68.3	73.0	78.0	81.1
JMP adjusted for overall compliance[d]	64.5	69.8	75.4	81.6	85.5
Tajikistan					
JMP[b]	NA	2.3	NA	NA	2.5
JMP adjusted for microbial compliance[c]	NA	2.6	2.7	2.8	2.9
JMP adjusted for overall compliance[d]	NA	2.6	2.8	2.8	2.9

JMP, Joint Monitoring Programme for Water Supply and Sanitation; NA, not available.

[a] United Nations population data were obtained from the JMP web site.

[b] The population without access to safe drinking-water was estimated using the original JMP figures.

[c] Microbial compliance: the population without access to safe drinking-water was estimated using the original JMP figures adjusted for the percentage compliance with World Health Organization (WHO) guidelines on drinking-water contamination with thermotolerant coliform bacteria derived during the Rapid Assessment of Drinking-Water Quality (RADWQ) project.

[d] Overall compliance: the population without access to safe drinking-water was estimated using the original JMP figures adjusted for the percentage compliance with WHO guidelines on drinking-water contamination with thermotolerant coliforms, arsenic, fluoride and nitrates derived during the RADWQ project.

tion. These assumptions and their likely effects are detailed in Table 4 (available at: http://www.who.int/bulletin/volumes/90/3/11-094284).

Notably, we assumed that the best estimate of the percentage of each type of water source that complied with WHO guidelines in 1990 was the same as that observed in the RADWQ project in 2004 and 2005 because equivalent data on water source quality were not available for 1990. However, our analysis did take account of the mix of improved water source types in use at baseline in each of the five countries, as recorded in Joint Monitoring Programme inventories. This ensured that we correctly accounted for a major influence on estimated overall access to safe drinking-water. In our view, the variation over time in the quality of water from each source type is likely to have a smaller effect on estimated access to safe drinking-water than the variation in the mix of improved water source types in use. Since comprehensive data on water quality were not available for different source types in each reporting period, we believe that the best estimates were obtained by extrapolating RADWQ data on compliance rates to both earlier and later periods.

In addition to assuming that the percentage of each type of water source that complies with WHO safety guidelines remains constant over time, we also assumed that the percentage is the same for urban and rural areas. The effect of these two assumptions on our analysis and on progress towards achieving MDG Target 7c will vary between countries.

One consequence of the lack of data on changes in water source quality over time is that the target of increasing the "proportion of households using water from an improved source" in MDG Target 7c encourages the installation of new improved water sources but does not provide an incentive for maintaining the quality of existing sources. Modifying the target to include both water source quality and the type of source could lead to improvements in existing sources as well as to the installation of new sources.

For water sources other than reliable piped water into the home, contamination between the source and the point of use is known to be significant and has led to increasing interest in household water treatment and safe storage.[18] We did not account for this type of contamination or for the effect of home water treatment in our study because of the conceptual and methodological difficulties in doing so.[19]

The RADWQ project assessed one unimproved water source: vehicle tankers in Nigeria. These were used by 2.5% of the population in 2008 and their percentage overall compliance was 62%. However, we followed the standard Joint Monitoring Programme methodology and treated these tankers as an unimproved water source in our analysis since the sustainability of access was questionable.

During our study, we found it difficult to match the water source types reported in the various surveys from which the Joint Monitoring Programme obtained its data with those reported by the RADWQ project. We resolved these difficulties by adopting the same approach as the Joint Monitoring Programme, where possible, or by disaggregating water source types into broad groups using data from a more recent survey that provided a sufficiently detailed classification. In addition, we observed discrepancies between the data on access to water sources used by the Joint Monitoring Programme and those reported by the RADWQ project, particularly for the estimated coverage of boreholes in Ethiopia and Nigeria.

We noted substantial differences between countries in the level of compliance of certain types of improved water sources with WHO water safety guidelines. For example, in Ethiopia the percentage overall compliance reported in the RADWQ project for water from piped supplies from public utilities was higher than that from boreholes (80.4% versus 65.6%, respectively; Table 2), whereas in Nigeria compliance was lower for water from piped supplies than from boreholes or tube wells (77.0% versus 86.0%, respectively). These data highlight the potential for substantial water quality improvements.

In conclusion, we found that taking water quality into account substantially reduced estimates of the proportion of the population with access to safe drinking-water at baseline in four of the five study countries. Although this resulted in lower revised values for MDG Target 7c in 2015, the difference between the revised baseline and target values increased. Progress towards the target was further impeded because some improved water sources installed after the baseline year were likely to be unsafe. Countries in which a high proportion of improved water sources is poorly maintained would be most affected.

Our analysis suggests that the criterion used by the Joint Monitoring Programme to monitor progress towards MDG Target 7c, namely, whether drinking-water comes from an improved or unimproved source, is likely to lead to substantial overestimation of the number of safe sources compared with criteria that include water quality. An earlier study in Madhya Pradesh, India, led to a similar conclusion.[20]

A way of monitoring water supplies that records details of both access to water sources and their safety, rather than the composite parameter used at present, would be a substantial improvement. However, water quality assessment would place greater demands on national and international monitoring systems and on the data collection methods on which they rely.

For the future, we recommend, first, that the usefulness of data on water quality currently available from national monitoring programmes be assessed by comparing these data with data from the RADWQ project and, second, that the feasibility and cost of including selected water quality parameters in household surveys be evaluated. ■

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Competing interests: Stephen W Gundry is named as the sole inventor on European patent number 1960104 entitled: Apparatus for determining the presence of a contaminant in a sample of water or other fluid. Patents for this apparatus have been granted or are pending in a number of other countries. Stephen W Gundry and Rob Bain are named as coinventors on International Patent Application number PCT/GB2010/050728 entitled: Apparatus for testing the quality of a fluid sample.

ملخص

دور جودة المياه في رصد الوصول إلى مياه الشرب المأمونة كجزء من الأهداف الإنمائية للألفية: دروس من خمسة بلدان

الغرض تحديد مدى تأثير البيانات الخاصة بجودة مصادر المياه على تقييمات التقدم المحرز نحو الهدف الإنمائي للألفية 2015 (MDG) المعني بالوصول إلى مياه الشرب المأمونة.

الطريقة تم الحصول على البيانات من خمسة بلدان من مشروع التقييم السريع لجودة مياه الشرب بشأن ما إذا كانت مصادر مياه الشرب تتوافق مع إرشادات منظمة الصحة العالمية الخاصة بجودة المياه المعنية بالتلوث بالبكتريا القولونية متحملة الحرارة والزرنيخ والفلوريد والنيترات في عام 2004 وعام 2005. وتم استخدام هذه البيانات لضبط تقديرات نسبة السكان التي يتاح لها الوصول إلى مياه الشرب المأمونة عند البيانات الأساسية للهدف الإنمائي للألفية في عام 1990 وفي عام 2008 المقدمة بواسطة برنامج الرصد المشترك لإمدادات المياه والصرف الصحي الذي صنَّف جميع المصادر المحسَّنة باعتبارها مأمونة.

النتائج أدى وضع البيانات المعنية بجودة مصادر المياه في الاعتبار إلى انخفاض كبير في تقديرات النسبة المئوية للسكان المتاح لها الوصول إلى مياه الشرب المأمونة في عام 2008 في أربعة من بلدان الدراسة الخمسة: كان الانخفاض المطلق 11 ٪ في إثيوبيا و16 ٪ في نيكاراغوا و15 ٪ في نيجيريا و7 ٪ في طاجيكستان. وكان هناك انخفاض بسيط فقط في الأردن. وكان التلوث الميكروبي أكثر شيوعًا من التلوث الكيماوي.

الاستنتاج من الممكن أن يؤدي المعيار المستخدم من جانب مؤشر الأهداف الإنمائية للألفية لتحديد أمان مصدر المياه إلى تقديرات مبالغ فيها على نحو كبير بالنسبة للسكان المتاح لهم الوصول إلى مياه الشرب المأمونة، ومن ثم أيضًا تقديرات مبالغ فيها بالنسبة للتقدم الذي تم إحرازه نحو الهدف الإنمائي للألفية 2015. وسوف يكون رصد إمدادات مياه الشرب عن طريق تسجيل الوصول إلى مصادر المياه وأمانها تحسنًا كبيرًا.

摘要

监控作为千年发展目标组成部分的获得安全饮用水的水质量思索：五个?家的经验

目的 确定水源质量数据对?得安全饮用水的 2015 年千年发展目标(MDG)的进展评估的影响方式。

方法 从饮用水质量快速评估 (Rapid Assessment of Drinking-Water Quality) 项目获得 2004 和 2005 年五个国家饮用水源在耐热大肠菌群、砷、氟和硝酸盐等污染方面是否符合世界卫生组?水质量指导方针的数据。这些数据用于校正“供水和卫生联合监控计划”(将所有改善的水源分类为安全水源)估算的 1990 年和 2008 年的 MDG 基线的安全饮用水的人口比例值。

结果 考虑水源质量数据，在 2008 年五个研究国家中有四个国家获得安全饮用水的人口百分比估计值明显降低：埃塞俄比亚绝对降低值为 11%，尼加拉瓜降低 16%，尼日利亚降低 15%，塔吉克斯坦降低 7%。约旦略微降低。微生物污染比化学污染更普遍。

结论 MDG 指标用于确定水源是否安全的标准可能导致明显高估获得安全饮用水人口数量，因此，也高估了 2015 年 MDG 目标的实?进度。实质性的改善之举?为?获得水源及其安全性都进行记?以监控饮用水供应。

Résumé

Rapport sur la qualité de l'eau du suivi de l'accès à l'eau potable dans le cadre des objectifs du Millénaire pour le développement: les leçons de cinq pays

Objectif Déterminer comment les données sur la qualité des sources d'eau affectent les évaluations de la progression vers l'accès à l'eau potable fixé par l'objectif du Millénaire pour le développement 2015 (OMD).

Méthodes On a extrait du projet Évaluation rapide de la qualité de l'eau potable les données de cinq pays relatives au fait que les sources d'eau potable étaient conformes aux directives de la qualité de l'eau de l'Organisation mondiale de la Santé en matière de contamination par des bactéries coliformes thermotolérantes, d'arsenic, de fluorure et de nitrates dans les années 2004 et 2005. Ces données ont été utilisées pour ajuster les estimations de la proportion de la population ayant accès à l'eau potable en 1990 et en 2008, années de référence de l'OMD, effectuées par le Programme conjoint de suivi de l'approvisionnement et de l'assainissement de l'eau, qui qualifiait de sûres toutes les sources améliorées.

Résultats Tenir compte des données sur la qualité des sources d'eau a conduit à des estimations nettement inférieures du pourcentage de la population ayant accès à l'eau potable en 2008 dans quatre des cinq pays étudiés: la réduction absolue était de 11% en Éthiopie, 16% au Nicaragua, 15% au Nigeria et 7% au Tadjikistan. Il n'y avait qu'une légère diminution en Jordanie. La contamination microbienne était plus fréquente que la contamination chimique.

Conclusion Le critère utilisé par l'indicateur OMD pour déterminer si une source d'eau est sûre peut entraîner des surestimations importantes de la population ayant accès à l'eau potable et, par conséquent, également des surestimations des progrès accomplis vers les résultats visés par l'OMD 2015. Faire le suivi de l'approvisionnement en eau potable, en contrôlant à la fois l'accès aux sources d'eau et leur sûreté, représenterait une amélioration importante.

Резюме

Отчет о качестве воды по результатам мониторинга доступа к безопасной питьевой воде в рамках Целей тысячелетия в области развития: опыт пяти стран

Цель Определить, как данные о качестве источника воды влияют на оценку прогресса, направленного на достижение задачи Целей тысячелетия в области развития (ЦТР) по обеспечению доступа к безопасной питьевой воде к 2015 г.

Методы В рамках Проекта по оперативной оценке качества питьевой воды были получены данные из пяти стран, касающиеся соответствия источников питьевой воды директивам Всемирной Организации Здравоохранения по качеству воды в отношении заражения терморезистентными колиподобными бактериями, мышьяком, фтором и нитратами в 2004 и 2005 гг. Эти данные были использованы для корректировки пропорций оценок населения с доступом к безопасной питьевой воде на основе исходных данных ЦТР в 1990 и 2008 гг., составленных в рамках Совместной программы по мониторингу водоснабжения и санитарного надзора, которая классифицировала все улучшенные источники как безопасные.

Результаты Учет данных о качестве источника воды привел к существенно более низким оценкам процента населения с доступом к безопасной питьевой воде в 2008 г. в четырех из пяти исследованных стран: абсолютное снижение на 11% было отмечено в Эфиопии, 16% – в Никарагуа, 15% – в Нигерии и 7% – в Таджикистане. Лишь очень небольшое снижение было отмечено в Иордании. Микробное заражение было более распространено, нежели чем химическое загрязнение.

Вывод Способ оценки, использованный в показателе ЦТР для определения, является ли источник воды безопасным, может привести к существенному завышению процента населения, обладающего доступом к безопасной питьевой воде и, как следствие, завышению уровня прогресса, направленного на достижение данной задачи ЦТР к 2015 г. Мониторинг снабжения питьевой водой посредством учета как доступа к источникам воды, так и их безопасности, явился бы существенным улучшением.

Resumen

Presentación de informes acerca de la calidad del agua para la supervisión del acceso al agua potable segura como parte del Objetivo de Desarrollo del Milenio: lecciones de cinco países

Objetivo Determinar cómo afectan los datos sobre la calidad de las fuentes de agua a las evaluaciones del progreso hacia la meta de los Objetivos de Desarrollo del Milenio (ODM) sobre el acceso al agua potable segura.

Métodos A través del proyecto Evaluación rápida de la calidad del agua potable se obtuvieron los datos sobre la adecuación de las fuentes de agua de cinco países a las directrices de calidad del agua de la Organización Mundial de la Salud en cuanto a contaminación por bacterias coliformes termorresistentes, arsénico, fluoruro y nitratos en 2004 y 2005. Estos datos se emplearon para ajustar los cálculos sobre la proporción de la población con acceso al agua potable segura en la línea de referencia del ODM de 1990 y de 2008 realizados por el Programa conjunto de vigilancia del abastecimiento de agua y el saneamiento, que clasificó todas las fuentes mejoradas como seguras.

Resultados La inclusión de los datos sobre la calidad de la fuente de agua se tradujo en unas estimaciones sustancialmente menores del porcentaje de población con acceso al agua potable segura en 2008 en cuatro de los cinco países estudiados: la reducción absoluta fue de un 11% en Etiopía, un 16% en Nicaragua, un 15% en Nigeria y un 7% en Tayikistán. En Jordania sólo se apreció una disminución leve. La contaminación microbiana fue más frecuente que la contaminación química.

Conclusión Los criterios empleados por el indicador del ODM para determinar si una fuente de agua es segura pueden comportar una sobreestimación considerable de la población con acceso al agua potable segura y, en consecuencia, una sobrevaloración del progreso dentro de la meta del ODM para 2015. La supervisión de los suministros de agua potable teniendo en consideración tanto el acceso a las fuentes de agua como su seguridad constituiría una mejora significativa.

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Table 4. **Effect of study assumptions on the estimated percentage of the population with access to safe drinking-water**

Study assumption	Effect on estimated percentage with access to safe drinking-water
No contamination occurred between the water source and the point of use.	Overestimation
The percentage of water sources found to comply with WHO drinking-water safety guidelines at a single survey date remained constant for a year.	Overestimation, particularly for nitrates and thermotolerant coliform bacteria
All untested types of improved water source[a] complied with WHO drinking-water safety guidelines.	Overestimation
All water sources complied with WHO drinking-water safety guidelines on parameters not measured in the RADWQ project.[b]	Overestimation
All unimproved water sources did not comply with WHO drinking-water safety guidelines.	Underestimation
No account was taken of household water treatment and safe storage.	Underestimation
The percentage of water sources that complied with WHO drinking-water safety guidelines remained constant before and after the RADWQ project.[c]	Unclear but country-specific
The percentage of water sources that complied with WHO drinking-water safety guidelines was the same in urban and rural areas for each source type.	Unclear but country-specific

RADWQ, Rapid Assessment of Drinking-water Quality; WHO, World Health Organization.

[a] Types of improved water source used by less than 5% of a country's population were not sampled during the RADWQ project.

[b] The RADWQ project tested water sources for the presence of thermotolerant coliform bacteria, fluoride, arsenic and nitrate compounds.

[c] The RADWQ project was carried out between October 2004 and April 2005.