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National drinking water targets – trends and factors associated with target-setting

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Abstract

We examine how national targets change with time and show that no consistent pattern exists across all countries examined for this article during the 1980–2013 period. Instead, countries fall into different trend types including constant, increasing, and decreasing national targets with time. We found that level of coverage is one likely factor in determining the national target of a country, where countries with low coverage levels set lower national targets compared to countries with high levels of coverage. In general, most countries set ambitious national targets that require the future rate of change to be more than 20% greater than the current rate. Setting ambitious targets is related to greater progress in increasing coverage, as long as the national target does not require countries to more than triple their current rate of change. Changes in national standards of safe water were shown to have occurred, where improved technology type was not used in national standards in 1994 but was present in 2011 and 2013. Comparison of national and international targets suggests that international targets may influence national targets, with approximately 70% of countries having national targets equal to, higher than, or converging towards international targets.

Keywords: Drinking water; GLAAS; International targets; National standards; National targets; Target-setting

Introduction

Lack of access to safe drinking water is an important public health issue that has prompted many countries to set national targets to increase coverage as part of a national drinking water policy or plan. Similar to global goals and targets, target-setting at the national level can have multiple purposes as a policy instrument, including: increasing awareness and mobilizing effort among policy makers for the provision of safe drinking water; holding government officials accountable to commitments made;

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and providing measurable time-bound outputs (Fukuda-Parr, 2013; Fukuda-Parr *et al*., 2014). National drinking water policies or plans then provide a framework for planning, implementing, coordinating, and monitoring all activities in the sector to achieve the desired target. As target-setting and its rationale are not unique to the drinking water sector and have been used in other fields, including health policy development (Nutbeam & Wise, 1996; Wismar *et al*., 2006) and poverty reduction (Roberts, 2005), countries can often draw from lessons learned in other sectors when developing national targets, policies, and plans.

Due to the time-bound nature of targets, countries periodically review and revise their national targets. The rationale that countries use for setting national targets is not always explicit and to the authors' knowledge, there is no prior study examining trends in national targets (e.g., do all countries show an increase in coverage for national targets over time?) and factors related to how national targets are set (e.g., are targets set based on existing levels of coverage?). One potential factor that may influence the setting of national targets is international drinking water targets. Since 1970, a single global target for access to safe water has been set for each international development agenda that mentions water, with the exception of the second United Nations (UN) Development Decade in 1970 which had separate rural and urban, as well as regional targets (World Health Organization (WHO), 1975). One hypothesis is that international targets form the basis upon which national targets are set (Carter & Danert, 2003) and thus international targets drive national targets. However, another hypothesis is that international targets represent the collective wishes of countries and thus national targets drive international targets (Vandemoortele, 2011). As such, it is not clear whether an association exists between national and international drinking water targets.

To examine trends in national targets and factors associated with target-setting, we look at the two components that targets have: the numerical or proportional *value* that defines the coverage to be reached (i.e., a percentage of the population having the desired level of service); and the *definition* of the types of drinking water sources and services that count towards the desired numerical value. For the purposes of this study, we use *target* to refer to the numerical or proportional value, as this is a commonly understood definition of target, and we use *standard* to refer to the types of water sources and services that are counted towards the target. For example, in the water supply and sanitation Sector Development Plan (FY 2011–25) for Bangladesh (Bangladesh, 2011), the water supply objective was to '… supply pure drinking water for the entire population by 2011 …'. In this instance, the target is 100% coverage and the Sector Development Plan provided two standards (basic and improved) for assessing water supply coverage based on drinking water technology and number of people served per water point.

From a policy perspective, both targets and standards are important and interconnected. Targets provide a concrete objective for countries to work towards, and standards determine what counts towards coverage of safe water and whether targets are achieved. As such, changes in national targets may occur as a result of re-defining national standards. Specifically, setting higher benchmarks for standards may lead to a drop in reported drinking water coverage for many countries, which may in turn affect the setting of future national targets. Accordingly, in this study, we seek to: (i) understand how national drinking water targets have changed over time; (ii) determine the effect of coverage on national targets; (iii) evaluate whether national targets are set as realistic values using current rates of change as a frame of reference; (iv) assess whether changes to the national standards of safe water occurred and are associated with changes to national targets; (v) evaluate whether a relationship exists between international and national targets; and (vi) compare the progress between countries with national targets greater than or equal to the international target against countries with national targets lower than the

international target. The results of this study provide insight on patterns and factors associated with national target-setting as well as policy recommendations on target-setting.

Methods

Data sources

Self-reported country survey data on national, urban, and rural coverage targets were obtained for eight years: 1980, 1985, 1990, 1995, 2005, 2009, 2011, and 2013, although the 1995 and 2005 datasets were limited to approximately 15 countries each. The main datasets were obtained from the International Drinking Water Supply and Sanitation Decade (IDWSSD) baseline (1980), mid-decade (1985), and end of decade (1990) review reports (WHO, 1984, 1987, 1992), and the 2009, 2011, and 2013 Global Analysis and Assessment of Sanitation and Drinking-water (GLAAS) survey results (WHO, 2010, 2012, 2014). The mid-decade evaluation of water supply and sanitation in Latin America and the Caribbean from the Pan American Health Organization (1997) provided the 1995 national targets for 17 countries while the African Ministers' Council on Water Country Status Overview (CSO) reports (AMCOW, 2006) provided national targets during 2002–2006 for 16 countries.

We also extracted from each dataset the target years (i.e., year that the target should be reached) for the national, rural, and urban targets, as well as the level of coverage at the time the surveys were administered. Where possible, existing levels of coverage were obtained from the same report that provided the national target and used in the calculation of the different rates of change (see below); this was done because, when governments set national targets, the level of coverage at that time is taken into account (specifically, national targets are set to be higher than the existing level of coverage). For data sources that provided a national target and target year, but did not provide an existing level of coverage, estimates from the Joint Monitoring Programme (JMP) for Water Supply and Sanitation (WHO/United Nations Children's Fund (UNICEF) JMP, 2016) were used. All national targets, target years, and levels of coverage are listed in Table S1 of the Supporting Information (SI), available with the online version of this paper.

Data on national standards of safe water were obtained for 1994, 2011, and 2013. The 1994 standard was obtained from the 1996 Water Supply and Sanitation Sector Monitoring Report (WHO, 1996). This report did not provide responses for individual countries but summarized responses to report the number of countries that included the use of distance, time, or quantity in their national standard. National standards for 2011 and 2013 were obtained from the 2011 and 2013 GLAAS datasets (WHO, 2012, 2014) for 70 and 89 individual countries, respectively. Question B1b in the 2011 survey asked 'Please indicate what types of drinking-water supplies are considered as adequate (or hygienic) in your country and are therefore included in the official statistics on access to and use of safe drinking-water' and question A4ii in the 2013 survey asked 'Definition of improved services: Please indicate what types of drinking-water facilities are considered in your target coverage. If other criteria are also used please also describe (e.g., distance, volume)'. We note that despite the use of the word 'safe' in the 1994 report and 2011 survey question, there is typically insufficient data to determine whether water services are actually safe. For the most part, what is measured and reported by countries is access to improved services. Due to the large variety of technical terms used to describe technology types, the assumptions listed in Table S2 of the SI

were used to classify different water technologies. Additional assumptions used to classify national definitions on access to safe water are provided in the SI.

International drinking water targets from 1970 to 2015 were obtained from the literature, including United Nations documents and reports, and are shown in Figure S1 of the SI.

Calculation of national targets from rural and urban targets

For years in which only rural and urban drinking water targets were provided, the national target was calculated using the percentage of the rural and urban populations for the target year. When possible, we used the projected rural and urban populations for the target year provided by the reports, as these projections were likely taken into account when rural and urban targets were set. When rural and urban population projections were not provided, we used the population estimates for the target year from the United Nations Department of Economic and Social Affairs Population Division (2014). Only countries with at least two years of data were included in our analysis.

Calculation of current rate, actual future rate, and required future rate needed to achieve national target

We use the terminology 'current coverage' to refer to the coverage at the date of target setting, and 'future coverage' to refer to coverage beyond the date of target setting (e.g., coverage in the target year). Similarly, the point of reference for the terms 'current' and 'future rate' is the date of target setting. Both the current and actual future rate of change in coverage were calculated as the difference in coverage divided by the difference in years. For example, for the year 1985, the current rate would be equal to the difference between 1985 and 1980 coverage divided by five years, and the *actual* future rate would be calculated as the difference between 1990 and 1985 *coverage* divided by five years. The required future rate differs from the actual future rate as it is the rate of change in coverage needed to reach the national target within the number of years remaining until the target year. This variable was calculated as the difference between the national target and national coverage, divided by the difference between the target year and current year. For example, for the year 1985, the *required* future rate would be equal to the difference in the 1990 *target* and 1985 coverage divided by five years.

Difference between international and national targets

In order to compare international and national targets for a specific time point, we calculate the difference between international and national targets, which requires that values are available for the international target and target year, as well as the national target and target year. Additionally, both international and national targets need to have the same target year. For example, a comparison between international and national targets cannot be made if a country in the year 2000 sets a national target of 78% to be reached in 2010, while the international target in the year 2000 is to reach 88% coverage by the year 2015. When the target year between the international and national targets differed, we adjusted the targets through linear interpolation so that both targets had the same target year (see SI for full details and example calculations).

Results and discussion

National drinking water targets and how they change with time

Data on national drinking water targets for two or more years were available for 97 countries. An examination of individual country trends showed that there is no one single trend observed in all countries. Instead, we classified the national targets of each country into one of five trend types: (i) constant at 100%; (ii) constant at non-100%; (iii) increasing; (iv) decreasing; and (v) no definitive trend (e.g., varying patterns such as down-up, up-down, up-down-up, and so forth). The criteria to determine each country's assignment into one of the five trend types are listed in Table S3 in the SI (e.g., all national targets must fall between 98 and 100% in order for a country to be classified as constant at 100%). Data from a country representing each trend type is presented in Figure 1, along with its corresponding national drinking water coverage. Of the 97 countries with national target data, 13 had a constant national target of 100%, 19 had a constant national target in the range of 45 to 98%, 37 had national targets that increased with time, 15 had national targets that decreased with time, and 13 had no definitive time trend for their national targets. In general, approximately 50% of countries consistently had a target of universal access or were moving towards universal access. The countries in each trend type are listed in Table S3 in the SI. The trend type of 'constant national target of 100%', which was the only type that had countries with gross national income (GNI) per capita values greater than 10,000 (see discussion and Figures S3–S5 in the SI), did not have any countries from Africa, and in general all countries had no to low official development assistance (ODA) per capita. For the trend type 'constant national targets at non-100%', the majority of countries were from Latin America and the Caribbean. There were no evident patterns observed in the other three trend types (see the SI for more detail, available with the online version of this paper).

Effect of coverage on national targets

A comparison of the trend in national coverage with the trend in national targets in Figure 1 suggests a potential association between coverage and target. We examined the relationship between coverage and target to determine whether a relationship exists between the two. Grouping countries by region (United Nations Department of Economic and Social Affairs Statistics Division, 2016), Figure 2(a) plots the national target values against their corresponding drinking water coverage levels for Southeast Asian countries in 1980 (national targets reported for 1990), Asian countries in 1985 and 2013 (national targets reported for 1990 and 2015, respectively), Latin American and Caribbean countries in 1995 (national targets reported for 2000), and sub-Saharan African countries in 2005 and 2009 (national targets reported for 2015 for both). From Figure 2(a), we see that level of coverage is one likely factor in determining the national target of a country, where countries with low coverage levels set lower national targets compared to countries with high levels of coverage. Interestingly, data points from these six groupings fell on the same line and sometimes overlapped, indicating approximately the same slope and thus the same relationship between coverage and national target for all six groups. However, this was not always the case (see Figure 2(b)), as some regional groupings and years had a constant 100% target regardless of coverage (Oceania in 1980) or an increasing trend with scatter and a different slope to that in Figure 2(a) (Asia in 1980).

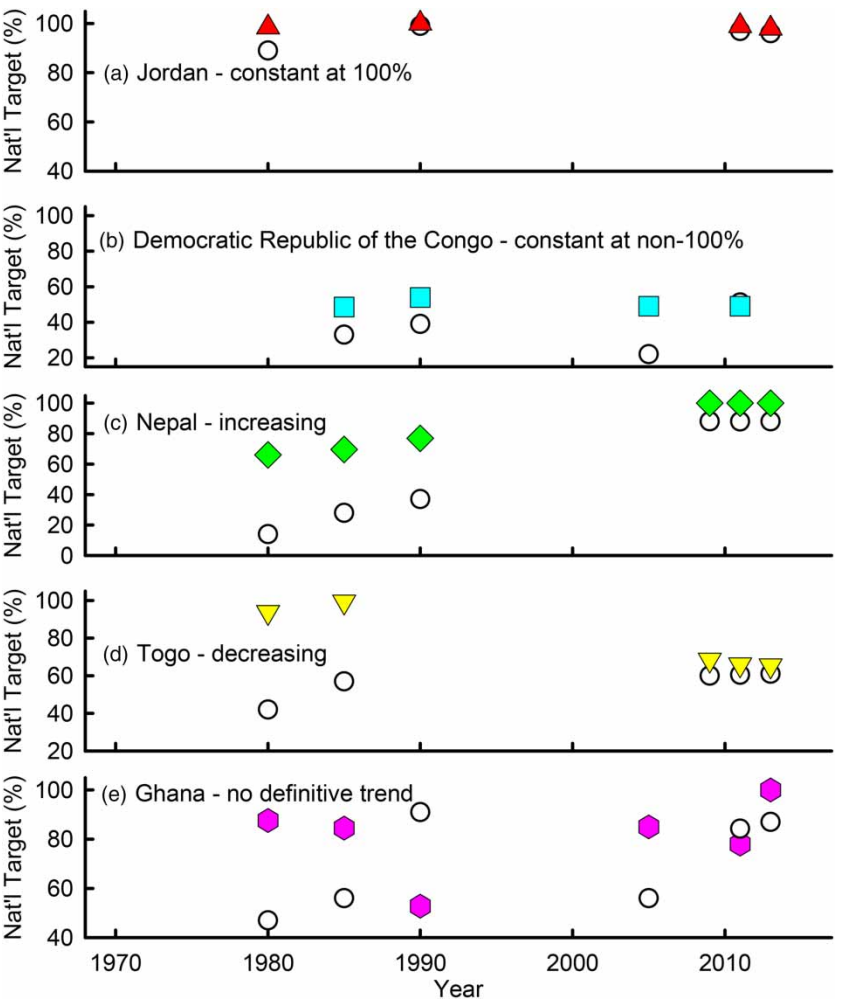

Fig. 1. Change in national drinking water targets (filled symbols) with time for representative countries for the following trend types: (a) constant at 100% target; (b) constant at a non-100% target; (c) increasing; (d) decreasing; (e) no definitive trend. Open circles represent national drinking water coverage.

Assessment of the degree of realism of national targets

We assessed whether the national target of a country is realistic by taking into account the level of coverage in a country when the national target was set. Specifically, we looked at the ratio between (i) the required rate of increase in coverage of a country to achieve its national target by the target year (which we refer to as 'required future rate') and (ii) its current rate of increase. High positive values for the required future rate indicate that a country has set an ambitious objective while negative values indicate that the coverage in a country has already exceeded its national target and signals a need for updating the national target (see Table S4 in the SI for list of countries that show an increasing, decreasing, or constant trend for required future rate). The ratio of required future rate to current rate

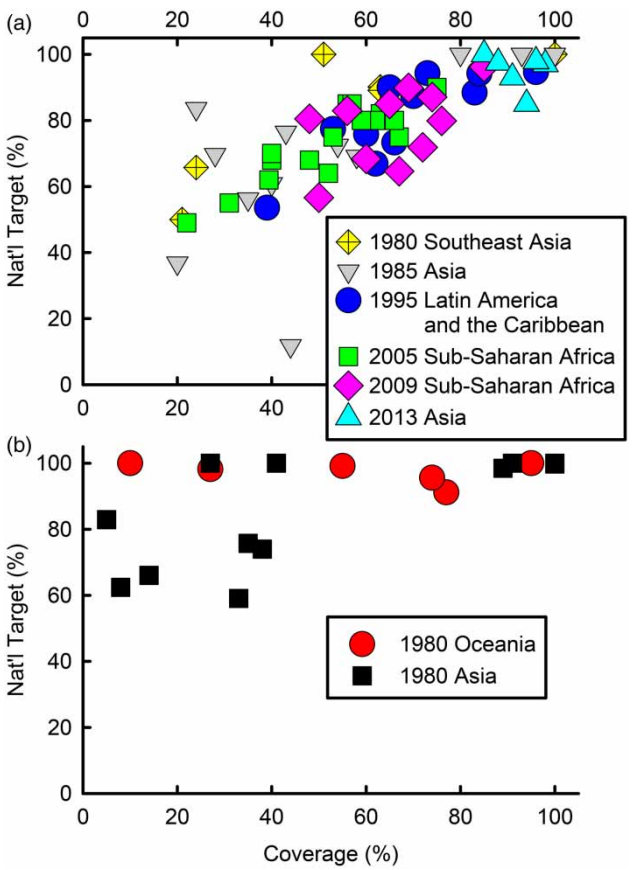

Fig. 2. National targets as a function of coverage for (a) Southeast Asia in 1980, Asia in 1985 and 2013, Latin America and the Caribbean in 1995, sub-Saharan Africa in 2005 and 2009; and (b) Oceania and Asia in 1980. For the 2009 and 2013 datasets where the target year varied (e.g., the target year ranged from 2014 to 2033 for the 2013 dataset), interpolation was used to obtain national targets for the common year of 2015.

is used to determine whether a national target is realistic, ambitious, or unambitious. We considered a national target to be realistic if the required future rate is within 20% of the current rate of increase (i.e., ratio is between 0.8 and 1.2). If the required future rate is more than 20% greater than the current rate, the national target is considered to be ambitious, and if the required future rate is less than 80% of the current rate (i.e., more than 20% lower than the current rate), the country is unambitious. The range of $\pm 20\%$ for a realistic target is used to account for the fact that (i) countries should aim to improve on their current performance and (ii) as coverage approaches 100%, rates of change will decrease as it becomes increasingly more difficult to reach the unserved. We note that in addition to using rates of change to evaluate whether targets are realistic, alternative methods such as the achievement possibilities frontier approach from the Social and Economic Rights Fulfillment (SERF) Index (Fukuda-Parr *et al.*, 2009) can also be used.

We found that few countries set realistic national targets (Figure 3(a)), with the majority of countries setting ambitious targets. We then assessed whether ambitious targets were associated with a higher rate

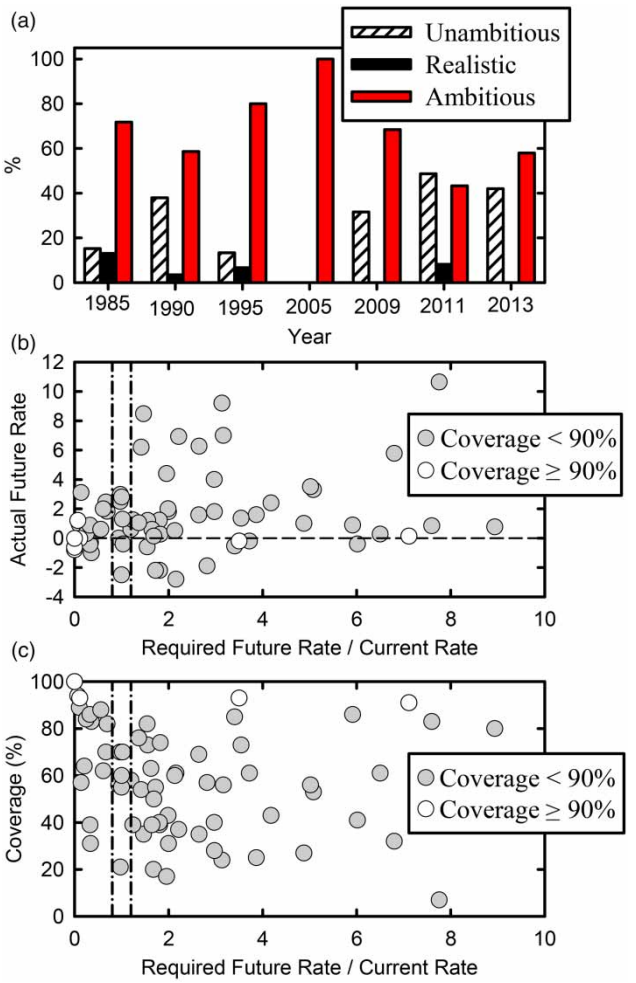

Fig. 3. Realism of national targets and their association with progress. (a) Percentage of countries that have realistic, ambitious, and unambitious national targets. (b) Actual future rate of change compared to the ratio of required future rate divided by current rate. (c) Coverage compared to the ratio of required future rate divided by current rate. The vertical lines at required future rate/current rate = 0.8 and 1.2 define unambitious (<0.8), realistic (0.8–1.2), and ambitious (>1.2) national targets. Data points in panel (b) are for the years 1985, 1990, 1995, and 2009 as coverage values prior and after the year in question are needed to calculate current and actual future rates.

of change in coverage by plotting the ratio of required future rate/current rate against the actual future rate of increase. Figure 3(b) shows that in general, many countries with unambitious national targets have an actual future rate of change close to zero, suggesting that when countries do not set targets that, at the very least, maintain their current rate of change, little progress towards achieving universal access is achieved. Increasing the level of ambition of national targets (i.e., moving right on the *x*-axis) results in an increase in future rate of change; however, with the exception of one or two data points, this peaks at a required future rate/current rate ratio of 2–3. This suggests that setting ambitious targets can lead to greater progress in increasing coverage, as long as the national target does not require countries

to more than triple their current rate of change. We do not suggest causality between level of ambition and progress; rather, that countries that set reasonably ambitious national targets have the capacity to follow through. Countries that set overly ambitious targets that require more than tripling their current rate may perceive these targets to be unrealistic, which may lead to little progress.

These findings are true even if we consider only countries with levels of coverage less than 90% (filled symbols) and are thus not approaching 100% coverage. Of the data points shown in Figure 3(b), seven have a coverage of 90% or greater (open symbols) and are thus expected to have an actual future rate that is zero or close to zero in order to account for the sigmoidal or S-shaped pattern observed when a country approaches 100% (Fuller *et al.*, 2016). However, from Figure 3(c), we see that many of the countries that have unambitious national targets have levels of coverage significantly less than 90%, and despite approaching 100% coverage, two countries (open symbols) have coverage levels greater than 90%. A sensitivity analysis showed that the results in Figure 3 are similar if we define a national target to be realistic if the required future rate is within 50% of the current rate of increase (i.e., ratio is between 0.5 and 1.5, see the SI).

Changes to the national standards of safe water

To determine whether the different national target trend types (Table S3) were associated with changes in the national standards of safe water (as opposed to a truly increasing or declining level of ambition in the national government for example), we evaluated the number of countries that included the following five factors in their national standards: improved-source technology, distance (or time) to water source, water quality, water quantity, and number of users per water point. Figure 4(a) shows the 2011 and 2013 results for the percentage of countries that included an improved-source technology in their national standards, as well as a breakdown of specific technology types. Since the total number of countries that provided a standard varied between the two years (70 in 2011 and 89 in 2013), the percentage of countries is reported here. Between 2011 and 2013, the percentage of countries including technology in their national standard remained the same. With the exception of rainwater harvesting, the inclusion of all other non-piped technologies (i.e., protected wells, boreholes/tubewells, protected springs) decreased from 2011 to 2013, suggesting that countries are setting higher benchmarks for what constitutes a safe drinking water source. This aligns with an increase in the number of countries, from one country (1%) in 2011 to five countries (6%) in 2013, that consider piped on-premises (dwelling or plot/yard) to be the only safe source (i.e., non-piped technologies and piped technologies that are off-premises are not considered safe).

From Figure 4(b), we see that from 1994 to the 2011–2013 period, the percentage of countries that included distance to source and water quantity significantly decreased, with no effect observed for time to source (see Tables S5–S9 in the SI for a discussion and list of countries that included each of the above parameters, as well as water quality criteria and maximum number of users). One possible explanation for this decrease is the difficulty in obtaining meaningful data, since self-reported data is often inaccurate and subject to recall bias. For example, in a study that looked at per capita usage among households with private connections, for households that shared their water bill with an enumerator, the consumption based on water bills was more than two times the consumption for households that estimated their usage (Zuin *et al.*, 2011). From 2011 to 2013, the percentage of countries that included number of users and water quality remained relatively unchanged.

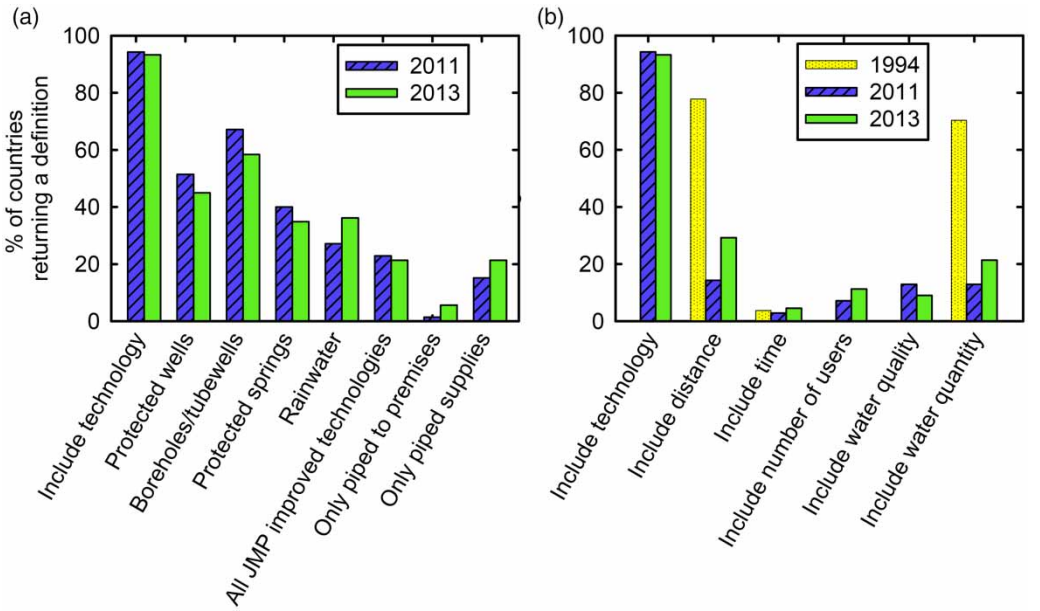

Fig. 4. Countries that included (a) technology by type, (b) distance to source, time to source, number of users, water quality, and water quantity in their national standard of safe water.

As no national standards were reported for individual countries in 1994 (only the average results were reported), it was not possible to determine whether changes to the national standards of safe water were associated with changes to national targets. Additionally, few countries had data on national targets for 1995, the closest year to 1994 (year of data on national standards).

Evaluation of relationship between international and national standards and targets

As little data is available to determine whether, and to what extent, re-defining national standards may have affected national targets, we focus on whether international standards and targets are associated with their national counterparts. In the above analysis of national standards, we note that of the five factors we assessed (improved-source technology, distance (or time) to water source, water quality, water quantity, and number of users per water point), the first four factors align with the four elements for monitoring the international Sustainable Development Goal (SDG) Target 6.1 (United Nations Economic and Social Council, 2015; WHO/UNICEF JMP, 2015). The finding that, from 2011 to 2013, the inclusion of non-piped technologies in national standards decreased and the number of countries that considered piped on-premises to be the only safe source increased, is consistent with the SDG approach that requires drinking water coverage to be at the household level. As the SDGs were only adopted in 2015, this suggests that national standards may have had an influence on international standards.

To assess the relationship between international and national targets, we use the quantitative variable: difference between international and national targets (with both targets having the same target year), which takes into account different target years for national targets. The importance of accounting for

different target years is illustrated in the example of Mali. In 2009, 2011, and 2013, Mali reported drinking water national targets of 83, 76, and 83%, respectively, which would suggest a down-up pattern when looking at national targets alone. However, upon closer inspection we see that the corresponding target years were 2015, 2011, and 2015, and thus the decrease in national target from 83 to 76% may be due to the different target years. Using the difference between international and national targets, we can assess whether countries are setting national targets equal to, lower than, or higher than the international target and provide insight on the potential relationship between the two.

Visual inspection of data from 88 countries with two or more data points showed that five main trend types exist for the difference between international and national targets, corresponding to: (i) constant at a positive value – which indicates that the national target was always lower than the international target; (ii) constant at a value less than or equal to zero – which indicates that the national target was always higher than or equal to the international target; (iii) increasing; (iv) decreasing; and (v) no definitive trend. Within the increasing and decreasing trend types, countries can be further divided into ones that converge or diverge from international targets depending on whether the points are positive or negative (see Table S10 in the SI for list of countries in each trend type).

We found that 10 countries had national targets that were lower than the international targets by a constant percentage point, 12 consistently had national targets equal to international targets, two had national targets higher than international targets by a constant percentage point, 11 had an increasing gap between national and international targets, 19 had a decreasing gap between international and national targets, 27 had national targets that converge and then diverge from international targets with almost all (26) having national targets higher than the international targets, and seven had no clear trend. Altogether, approximately 70% of countries have national targets equal to, higher than, or converging towards international targets, suggesting that international targets may influence the setting of national targets.

We also attempted to assess whether an association existed between trends in international and national targets by comparing the individual country trends in national targets to the trend in international targets. Specifically, we examined whether countries have trends in national targets that parallel, follow, or precede international targets to assess if international targets influence national targets or the alternative that national targets influence international targets (see the SI for analysis and detailed discussion). Figure S7 in the SI presents the countries with trends in national targets that potentially parallel, follow, or precede the trend in international targets. However, since national target data were only available starting in 1980, and the international drinking water targets remained constant at 100% coverage after 1980 until the year 2000 when the target dropped to 88%, followed by an increase to 100% in 2015 (Figure S7(a)), there was not enough national target data or variation in the trend in international targets to evaluate the existence of an association between trends in national targets and trends in international targets, and the potential influence of one on the other.

Comparison of progress between countries with national targets greater than or equal to the international targets against countries with national targets lower than the international targets

Having evaluated how national targets compared to international targets, we looked at whether the progress made by countries with national targets greater than or equal to the international target was different than the progress made by countries with national targets lower than the international target. We used the difference between international and national targets where both targets have the same

target year, to categorize these two groups of countries. The national target of a country was defined as lower than the international target when the difference between international and national targets was greater than 1 percentage point (i.e., difference >1). The national target of a country was defined as greater than the international target when the international target was more than 1 percentage point lower than the national target (i.e., difference between international and national target < -1). For countries where the percentage difference between the international and national target was between -1 and 1, the national target was considered to be equal to the international target.

Due to the fact that drinking water coverage data from the JMP only begins in 1990, our analysis focused on the international Millennium Development Goal (MDG) target, set in the year 2000, as our reference point. A comparison of the 2011 national targets to the international targets showed that during the 2000–2015 period, the average annual rate of change in coverage for countries with national targets greater than or equal to the MDG target was 0.72% as compared to 0.60% for countries with national targets lower than the MDG target (see Table S11 in the SI). An unpaired t-test for groups with different variances showed that no statistically significant difference exists between the two average rates, indicating that whether a country had a 2011 national target greater than or lower than the MDG target had no effect on its rate of increase in coverage. A similar lack of statistical difference was observed when the analysis was performed comparing the 2013 national target to the international target (Table S11).

For the two groups of countries (those with national targets greater than or equal to the MDG targets and those with national targets lower than the MDG target), we then compared the rate of change in coverage for the five years prior to the adoption of the MDGs (from 1995 to 1999) against the following rates of change in coverage (Table S12 in the SI): immediately after MDG adoption (2000–2004), delayed five year time period after MDG adoption (2005–2009), and delayed 10 year time period after MDG adoption (2010–2015). Using national target data in 2011, a paired t-test showed that for both groups of countries, the pre-MDG rate was statistically significantly higher than the 10-year delayed post-MDG rate. Similarly, when the analysis was repeated using 2013 national target data, the pre-MDG rate was higher than the post-MDG rates (for all three post-MDG periods tested) for countries with national targets greater than or equal to international targets. No difference was found pre- and post-MDG for countries with 2013 national targets lower than the international target. The difference in results due to using the 2011 or 2013 national target data is likely due to the additional countries that responded to the 2013 survey as well as inconsistencies in the responses. For example, 17 countries reported a national target in 2013 but did not report one in 2011, while 10 countries reported a national target in 2011 and not in 2013. Four countries reported a 2013 national target lower than the international target but a 2011 national target that was higher than the same international target. The reverse (a lower national target for 2011 but a higher national target for 2013) was true for five countries.

Regardless of any differences between using the 2011 or 2013 national target dataset, the only significant difference in rates of change showed higher rates of change for the pre-MDG period. This higher rate is likely due to the fact that countries have increased their level of coverage and as countries approach universal access, it becomes increasingly difficult to reach the remaining unserved. Coverage begins to plateau and rates of change achieved when a country is at 60% coverage, for example, are not feasible at 97% coverage. The lack of an apparent increase in the rate of change post-MDG is consistent with studies that looked at whether there was a difference in the rate of change for all countries (regardless of whether their national target was equal or not to the international target) before and after the

MDG adoption. Langford & Winkler (2013) reported that the rates of change between the 1990s and 2000s were approximately the same for all countries and Fukuda-Parr *et al.* (2013) showed that for countries that increased their drinking water coverage in the 1990s and 2000s, only one-third had a higher rate of change in the 2000s than the 1990s.

Study limitations

The quality and availability of the data limited the types of analyses that could be conducted. National targets were only available for a limited number of years and only 38 of the 97 countries with two or more data points actually had four or more data points. Only national targets with a corresponding target year were used in the analyses, as a target without a time point is meaningless. In addition, as the national target data and national definitions used in this study are self-reported, the quality of the data is limited to the accuracy of the respondent. For example, in Figure 1(e), the 1990 data point for Ghana appears to be either an outlier or a possible reversal in the reporting of coverage and national target. As these coverage and target values are taken directly from the reports, there is no way to validate and check whether reporting errors occurred. In another example, the 2009 and 2013 GLAAS surveys reported urban and rural targets for Niger which we used to calculate national targets of 80 and 63%, respectively. It is not clear whether the inconsistencies between the GLAAS datasets were due to a change in national target during 2009–2013 or whether one of these targets is incorrect.

Conclusions

We collated publicly available data on national drinking water targets for 97 countries during the 1980–2013 time period and assessed how they changed with time. We found that there is no one single trend observed in all countries. Instead, countries fall into different trend types including constant, increasing, and decreasing national targets with time. The trend type of 'constant national target of 100%' was the only group that had countries with GNI per capita values greater than 10,000, no countries from Africa, and in general, no to low ODA per capita.

Level of coverage was found to be one likely factor in determining the national target of a country, where countries with low coverage levels set lower national targets. In general, few countries set realistic national targets, with the majority of countries setting ambitious targets that required the future rate of change to be more than 20% greater than the current rate. Setting ambitious targets was related to greater progress in increasing coverage, as long as the national target did not require countries to more than triple their current rate of change. These results suggest that for target-setting, countries should aim to have national targets that challenge them to exceed their current level of performance, yet not be overly-ambitious.

Comparison of international and national standards suggest that national *standards* may influence international standards. On the other hand, when evaluating *targets*, approximately 70% of countries have national targets equal to, higher than, or converging towards international targets, which may suggest that international targets influence national targets. We showed that there was no significant difference in progress made by countries with national targets greater than or equal to the MDG target as compared to countries with national targets lower than the MDG target. However, when comparing pre- and post-MDG rates, in all possible scenarios examined, the adoption of the MDG target did

not result in higher rates of change and actually showed higher rates of change for the pre-MDG period. This would support arguments made by many (Vandemoortele, 2011; Langford & Winkler, 2013) that the MDGs were under-ambitious for many countries and were not meant to be applied to individual countries.

The results of this study show the potential analyses that could be performed given additional data on national targets and emphasize the need for continued data collection. The interaction between standards of safe water and national targets is complex and additional analysis at country level would be needed to enable countries to set achievable and relevant goals in the new SDG era. As indicated by SDG Target 6a, there is a need to strengthen national systems and one area to improve is the collection and review of national target data. With more data, one can better understand what drives national targets and how the international community, through international targets or standards, can affect these national targets.

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Supporting information

Supporting data associated with this article can be found in the online version.

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