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

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11

12 **Abstract**

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

27 **Keywords:** drinking water, GLAAS, international targets, national standards, national targets,

28 target-setting

29

30

## 31 **Introduction**

32 Lack of access to safe drinking water is an important public health issue that has prompted many  
33 countries to set national targets to increase coverage as part of a national drinking water policy or  
34 plan. Similar to global goals and targets, target-setting at the national level can have multiple  
35 purposes as a policy instrument, including: increasing awareness and mobilizing effort among  
36 policy makers for the provision of safe drinking water; holding government officials accountable  
37 to commitments made; and providing measurable time-bound outputs (Fukuda-Parr, 2013;  
38 Fukuda-Parr et al., 2014). National drinking water policies or plans then provide a framework for  
39 planning, implementing, coordinating, and monitoring all activities in the sector to achieve the  
40 desired target. As target-setting and its rationale are not unique to the drinking water sector and  
41 have been used in other fields, including health policy development (Nutbeam and Wise, 1996;  
42 Wismar et al., 2006) and poverty reduction (Roberts 2005), countries can often draw from  
43 lessons learned in other sectors when developing national targets, policies, and plans.

44 Due to the time-bound nature of targets, countries periodically review and revise their national  
45 targets. The rationale that countries use for setting national targets is not always explicit and to  
46 the authors' knowledge, there is no prior study examining trends in national targets (e.g., do all  
47 countries show an increase in coverage for national targets over time?) and factors related to how  
48 national targets are set (e.g., are targets set based on existing levels of coverage?). One potential  
49 factor that may influence the setting of national targets are international drinking water targets.  
50 Since 1970, a single global target for access to safe water has been set for each international  
51 development agenda that mentions water, with the exception of the second UN Development  
52 Decade in 1970 which had separate rural and urban, as well as regional targets (World Health  
53 Organization [WHO], 1975). One hypothesis is that international targets form the basis upon

54 which national targets are set (Carter and Danert, 2003) and thus international targets drive  
55 national targets. However, another hypothesis is that international targets represent the collective  
56 wishes of countries and thus national targets drive international targets (Vandemoortele, 2011).  
57 As such, it is not clear whether an association exists between national and international drinking  
58 water targets.

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

71 From a policy perspective, both targets and standards are important and interconnected. Targets  
72 provide a concrete objective for countries to work towards, and standards determine what counts  
73 towards coverage of safe water and whether targets are achieved. As such, changes in national  
74 targets may occur as a result of re-defining national standards. Specifically, setting higher  
75 benchmarks for standards may lead to a drop in reported drinking water coverage for many  
76 countries, which may in turn affect the setting of future national targets. Accordingly, in this

77 study, we seek to: (i) understand how national drinking water targets have changed over time; (ii)  
78 determine the effect of coverage on national targets; (iii) evaluate whether national targets are set  
79 as realistic values using current rates of change as a frame of reference; (iv) assess whether  
80 changes to the national standards of safe water occurred and are associated with changes to  
81 national targets; (v) evaluate whether a relationship exists between international and national  
82 targets; and (vi) compare the progress between countries with national targets greater than or  
83 equal to the international target against countries with national targets lower than the  
84 international target. The results of this study provide insight on patterns and factors associated  
85 with national target setting as well as policy recommendations on target-setting.

## 86 **Methods**

### 87 **Data sources**

88 Self-reported country survey data on national, urban, and rural coverage targets were obtained  
89 for eight years: 1980, 1985, 1990, 1995, 2005, 2009, 2011, and 2013, although the 1995 and  
90 2005 data sets were limited to approximately 15 countries each. The main datasets were obtained  
91 from the International Drinking Water Supply and Sanitation Decade (IDWSSD) baseline  
92 (1980), mid-decade (1985), and end of decade (1990) review reports (WHO, 1984, 1987, 1992),  
93 and the 2009, 2011, and 2013 Global Analysis and Assessment of Sanitation and Drinking-water  
94 (GLAAS) survey results (WHO, 2010, 2012, 2014). The mid-decade evaluation of water supply  
95 and sanitation in Latin America and the Caribbean from the Pan American Health Organization  
96 (1997) provided the 1995 national targets for 17 countries while the African Ministers' Council  
97 on Water Country Status Overview (CSO) reports (AMCOW, 2006) provided national targets  
98 during 2002-2006 for 16 countries.

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

110 Data on national standards of safe water were obtained for 1994, 2011, and 2013. The 1994  
111 standard was obtained from the 1996 Water Supply and Sanitation Sector Monitoring Report  
112 (WHO, 1996). This report did not provide responses for individual countries but summarised  
113 responses to report the number of countries that included the use of distance, time, or quantity in  
114 their national standard. National standards for 2011 and 2013 were obtained from the 2011 and  
115 2013 GLAAS datasets (WHO, 2012, 2014) for 70 and 89 individual countries, respectively.

116 Question B1b in the 2011 survey asked ‘Please indicate what types of drinking-water supplies  
117 are considered as adequate (or hygienic) in your country and are therefore included in the official  
118 statistics on access to and use of safe drinking-water’ and question A4ii in the 2013 survey asked  
119 ‘Definition of improved services: Please indicate what types of drinking-water facilities are  
120 considered in your target coverage. If other criteria are also used please also describe (e.g.,  
121 distance, volume)’. We note that despite the use of the word ‘safe’ in the 1994 report and 2011

122 survey question, there is typically insufficient data to determine whether water services are  
123 actually safe. For the most part, what is measured and reported by countries is access to  
124 improved services. Due to the large variety of technical terms used to describe technology types,  
125 the assumptions listed in Table S2 of the SI were used to classify different water technologies.  
126 Additional assumptions used to classify national definitions on access to safe water are provided  
127 in the SI.

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

### 130 **Calculation of national targets from rural and urban targets**

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

### 139 **Calculation of current rate, actual future rate, and required future rate needed to achieve** 140 **national target**

141 We use the terminology ‘current coverage’ to refer to the coverage at the date of target setting,  
142 and ‘future coverage’ to refer to coverage beyond the date of target setting (e.g., coverage in the



143 target year). Similarly, the point of reference for the terms ‘current’ and ‘future rate’ is the date  
144 of target setting. Both the current and actual future rate of change in coverage were calculated as  
145 the difference in coverage divided by the difference in years. For example, for the year 1985, the  
146 current rate would be equal to the difference between 1985 and 1980 coverage divided by five  
147 years, and the actual future rate would be calculated as the difference between 1990 and 1985  
148 coverage divided by five years. The required future rate differs from the actual future rate as it is  
149 the rate of change in coverage needed to reach the national target within the number of years  
150 remaining until the target year. This variable was calculated as the difference between the  
151 national target and national coverage, divided by the difference between the target year and  
152 current year. For example, for the year 1985, the required future rate would be equal to the  
153 difference in the 1990 target and 1985 coverage divided by five years.

#### 154 **Difference between international and national targets**

155 In order to compare international and national targets for a specific time point, we calculate the  
156 difference between international and national targets, which requires that values are available for  
157 the international target and target year, as well as the national target and target year.

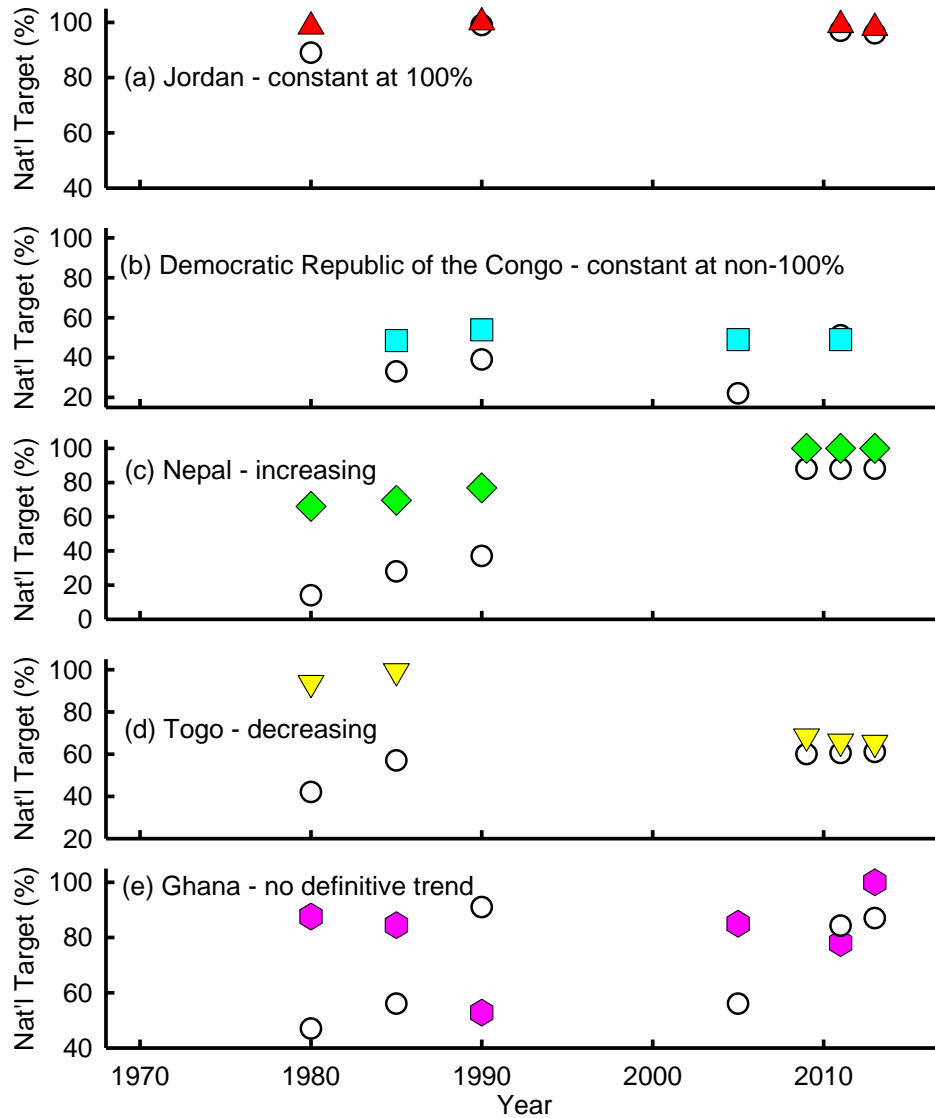
158 Additionally, both international and national targets need to have the same target year. For  
159 example, a comparison between international and national targets cannot be made if a country in  
160 the year 2000 sets a national target of 78% to be reached in 2010, while the international target in  
161 the year 2000 is to reach 88% coverage by the year 2015. When the target year between the  
162 international and national targets differed, we adjusted the targets through linear interpolation so  
163 that both targets had the same target year (see SI for full details and example calculations).

#### 164 **Results and Discussion**

## 165 **National drinking water targets and how they change with time**

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

186



187

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

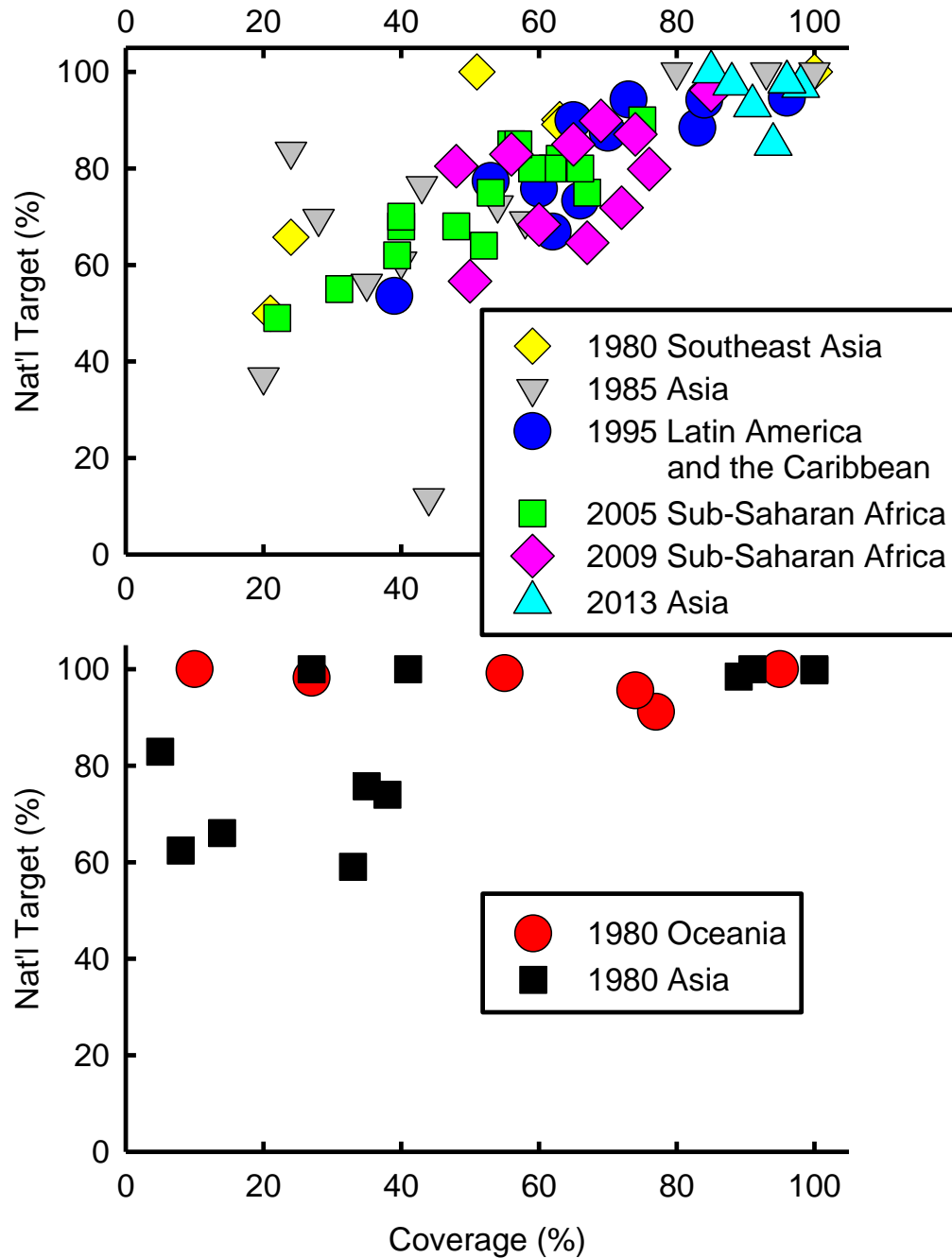
192

193 **Effect of coverage on national targets**

194 A comparison of the trend in national coverage with the trend in national targets in Figure 1

195 suggests a potential association between coverage and target. We examined the relationship

196 between coverage and target to determine whether a relationship exists between the two.  
197 Grouping countries by region (United Nations Department of Economic and Social Affairs  
198 Statistics Division, 2016), Figure 2a plots the national target values against their corresponding  
199 drinking water coverage levels for Southeast Asian countries in 1980 (national targets reported  
200 for 1990), Asian countries in 1985 and 2013 (national targets reported for 1990 and 2015,  
201 respectively), Latin American and Caribbean countries in 1995 (national targets reported for  
202 2000), sub-Saharan African countries in 2005 and 2009 (national targets reported for 2015 for  
203 both). From Figure 2a, we see that level of coverage is one likely factor in determining the  
204 national target of a country, where countries with low coverage levels set lower national targets  
205 compared to countries with high levels of coverage. Interestingly, data points from these six  
206 groupings fell on the same line and sometimes overlap, indicating approximately the same slope  
207 and thus the same relationship between coverage and national target for all six groups. However,  
208 this was not always the case (see Figure 2b), as some regional groupings and years had a  
209 constant 100% target regardless of coverage (Oceania 1980) or an increasing trend with scatter  
210 and a different slope to that in Figure 2a (Asia 1980).



211

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

217

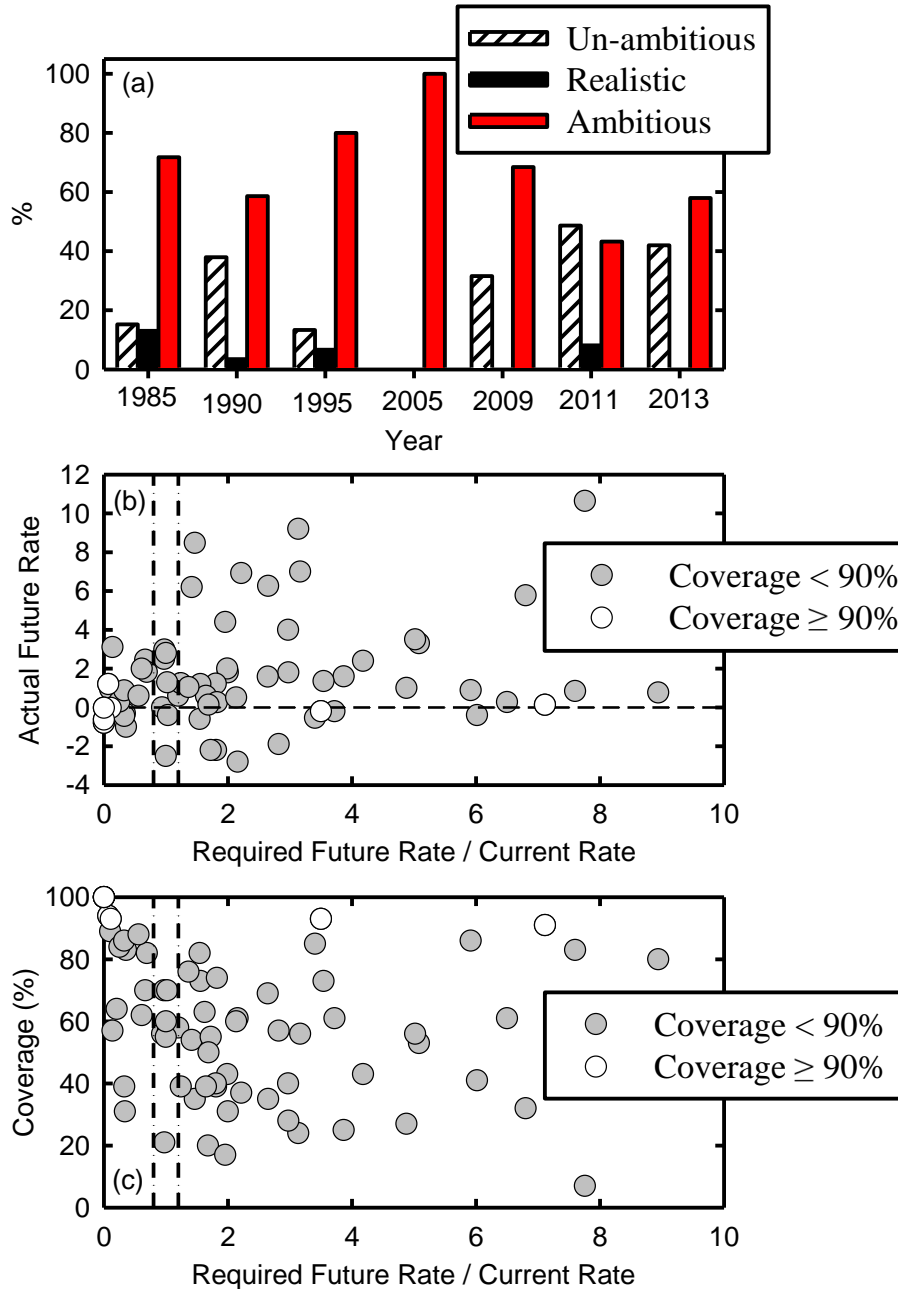
## 218 **Assessment of the degree of realism of national targets**

219 We assessed whether the national target of a country is realistic by taking into account the level  
220 of coverage in a country when the national target was set. Specifically, we looked at the ratio  
221 between (i) the required rate of increase in coverage of a country to achieve its national target by  
222 the target year (which we refer to as ‘required future rate’) and (ii) its current rate of increase.  
223 High positive values for the required future rate indicate that a country has set an ambitious  
224 objective while negative values indicate that the coverage in a country has already exceeded its  
225 national target and signals a need for updating the national target (see Table S4 in the SI for list  
226 of countries that show an increasing, decreasing, or constant trend for required future rate). The  
227 ratio of required future rate to current rate is used to determine whether a national target is  
228 realistic, ambitious, or un-ambitious. We considered a national target to be realistic if the  
229 required future rate is within 20% of the current rate of increase (i.e., ratio is between 0.8 and  
230 1.2). If the required future rate is more than 20% greater than the current rate, the national target  
231 is considered to be ambitious, and if the required future rate is less than 80% of the current rate  
232 (i.e., more than 20% lower than the current rate), the country is un-ambitious. The range of  
233  $\pm 20\%$  for a realistic target is used to account for the fact that (i) countries should aim to improve  
234 on their current performance and (ii) as coverage approaches 100%, rates of change will decrease  
235 as it becomes increasingly more difficult to reach the unserved. We note that in addition to using  
236 rates of change to evaluate whether targets are realistic, alternative methods such as the  
237 achievement possibilities frontier approach from the SERF Index (Fukuda-Parr et al., 2009) can  
238 also be used.

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

241 with a higher rate of change in coverage by plotting the ratio of required future rate / current rate  
242 against the actual future rate of increase. Figure 3b shows that in general, many countries with  
243 un-ambitious national targets have an actual future rate of change close to zero, suggesting that  
244 when countries do not set targets that, at the very least, maintain their current rate of change,  
245 little progress towards achieving universal access is achieved. Increasing the level of ambition of  
246 national targets (i.e., moving right on the x-axis) results in an increase in future rate of change;  
247 however, with the exception of one or two data points, this peaks at a required future rate /  
248 current rate ratio of 2-3. This suggests that setting ambitious targets can lead to greater progress  
249 in increasing coverage, as long as the national target does not require countries to more than  
250 triple their current rate of change. We do not suggest causality between level of ambition and  
251 progress; rather, that countries that set reasonably ambitious national targets have the capacity to  
252 follow through. Countries that set overly ambitious targets that require more than tripling their  
253 current rate may perceive these targets to be unrealistic, which may lead to little progress.

254 These findings are true even if we consider only countries with levels of coverage less than 90%  
255 (filled symbols) and are thus not approaching 100% coverage. Of the data points shown in Figure  
256 3b, seven have a coverage of 90% or greater (open symbols) and are thus expected to have an  
257 actual future rate that is zero or close to zero in order to account for the sigmoidal or S-shaped  
258 pattern observed when a country approaches 100% (Fuller et al., 2016). However, from Figure  
259 3c, we see that many of the countries that have un-ambitious national targets have levels of  
260 coverage significantly less than 90%, and despite approaching 100% coverage, two countries  
261 (open symbols) have coverage levels greater than 90%. A sensitivity analysis showed that the  
262 results in Figure 3 are similar if we define a national target to be realistic if the required future  
263 rate is within 50% of the current rate of increase (i.e., ratio is between 0.5 and 1.5, see SI).



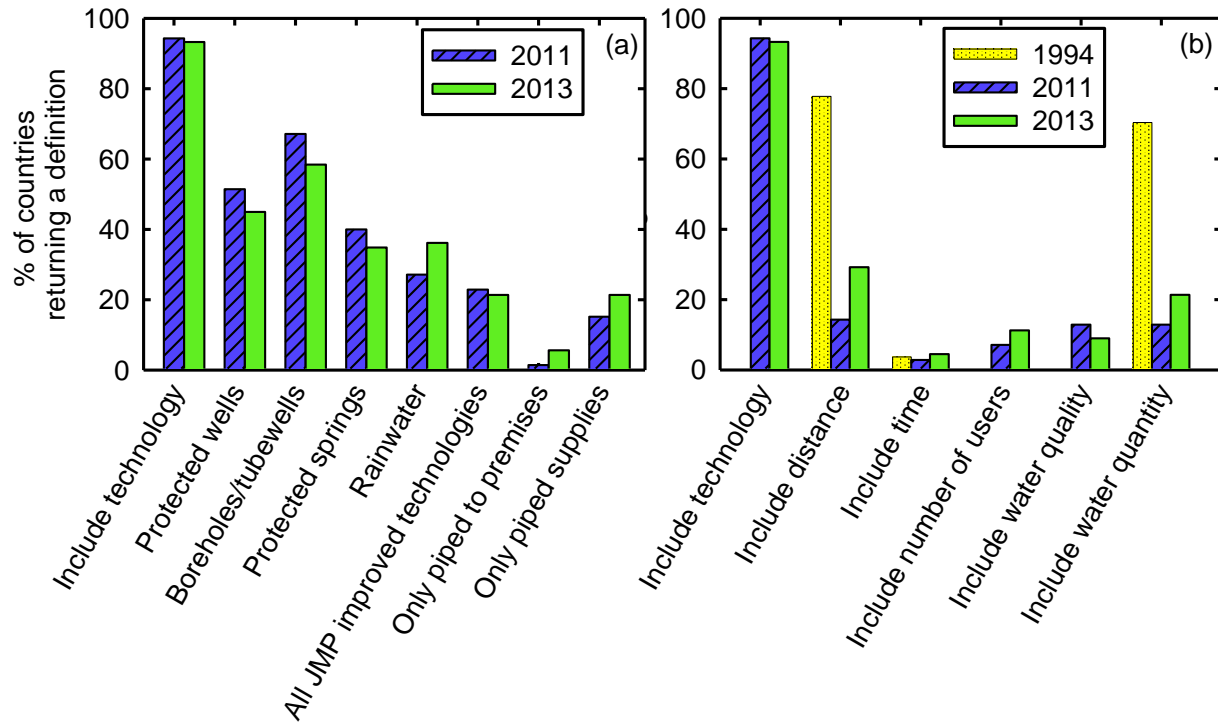
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265 Figure 3. Realism of national targets and their association with progress. (a) Percentage of  
 266 countries that have realistic, ambitious, and un-ambitious national targets. (b) Actual future rate  
 267 of change compared to the ratio of required future rate divided by current rate. (c) Coverage  
 268 compared to the ratio of required future rate divided by current rate. The vertical lines at required  
 269 future rate / current rate = 0.8 and 1.2 define unambitious (<0.8), realistic (0.8-1.2), and  
 270 ambitious (>1.2) national targets. Data points in panel (b) are for the years 1985, 1990, 1995, and  
 271 2009 as coverage values prior and after the year in question are needed to calculate current and  
 272 actual future rates.



273 **Changes to the national standards of safe water**

274 To determine whether the different national target trend types (Table S3) were associated with  
275 changes in the national standards of safe water (as opposed to a truly increasing or declining  
276 level of ambition in the national government for example), we evaluated the number of countries  
277 that included the following five factors in their national standards: improved-source technology,  
278 distance (or time) to water source, water quality, water quantity, and number of users per water  
279 point. Figure 4a shows the 2011 and 2013 results for the percentage of countries that included an  
280 improved-source technology in their national standards, as well as a breakdown of specific  
281 technology types. Since the total number of countries that provided a standard varied between  
282 the two years (70 in 2011 and 89 in 2013), the percentage of countries is reported here. Between  
283 2011 and 2013, the percentage of countries including technology in their national standard  
284 remained the same. With the exception of rainwater harvesting, the inclusion of all other non-  
285 piped technologies (i.e., protected wells, boreholes/tubewells, protected springs) decreased from  
286 2011 to 2013, suggesting that countries are setting higher benchmarks for what constitutes a safe  
287 drinking water source. This aligns with an increase in the number of countries, from one country  
288 (1%) in 2011 to five countries (6%) in 2013, that consider piped on-premises (dwelling or  
289 plot/yard) to be the only safe source (i.e., non-piped technologies and piped technologies that are  
290 off-premises are not considered safe).



291

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

294

295 From Figure 4b, we see that from 1994 to the 2011-2013 period, the percentage of countries that  
 296 included distance to source and water quantity significantly decreased, with no effect observed  
 297 for time to source (see Tables S5-S9 in the SI for a discussion and list of countries that included  
 298 each of the above parameters, as well as water quality criteria and maximum number of users).

299 One possible explanation for this decrease is the difficulty in obtaining meaningful data, since  
 300 self-reported data is often inaccurate and subject to recall bias. For example, in a study that  
 301 looked at per capita usage among households with private connections, for households that  
 302 shared their water bill with an enumerator, the consumption based on water bills was more than  
 303 two times the consumption for households that estimated their usage (Zuin et al., 2011). From

304 2011 to 2013, the percentage of countries that included number of users and water quality  
305 remained relatively unchanged.

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

### 310 **Evaluation of relationship between international and national standards and targets**

311 As little data is available to determine whether, and to what extent, re-defining national standards  
312 may have affected national targets, we focus on whether international standards and targets are  
313 associated with their national counterparts. In the above analysis of national standards, we note  
314 that of the five factors we assessed (improved-source technology, distance (or time) to water  
315 source, water quality, water quantity, and number of users per water point), the first four factors  
316 align with the four elements for monitoring the international Sustainable Development Goal  
317 (SDG) Target 6.1 (United Nations Economic and Social Council, 2015; WHO/UNICEF JMP,  
318 2015). The finding that, from 2011 to 2013, the inclusion of non-piped technologies in national  
319 standards decreased and the number of countries that considered piped on-premises to be the  
320 only safe source increased, is consistent with the SDG approach that requires drinking water  
321 coverage to be at the household level. As the SDGs were only adopted in 2015, this suggests that  
322 national standards may have had an influence on international standards.

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

326 of accounting for different target years is illustrated in the example of Mali. In 2009, 2011, and  
327 2013, Mali reported drinking water national targets of 83, 76, and 83%, respectively, which  
328 would suggest a down-up pattern when looking at national targets alone. However, upon closer  
329 inspection we see that the corresponding target years were 2015, 2011, and 2015, and thus the  
330 decrease in national target from 83 to 76% may be due to the different target years. Using the  
331 difference between international and national targets, we can assess whether countries are setting  
332 national targets equal to, lower than, or higher than the international target and provide insight on  
333 the potential relationship between the two.

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

343 We found that 10 countries had national targets that were lower than the international targets by  
344 a constant percentage point, 12 consistently had national targets equal to international targets,  
345 two had national targets higher than international targets by a constant percentage point, 11 had  
346 an increasing gap between national and international targets, 19 had a decreasing gap between  
347 international and national targets, 27 had national targets that converge and then diverge from  
348 international targets with almost all (26) having national targets higher than the international

349 targets, and seven had no clear trend. Altogether, approximately 70% of countries have national  
350 targets equal to, higher than, or converging towards international targets, suggesting that  
351 international targets may influence the setting of national targets.

352 We also attempted to assess whether an association existed between trends in international and  
353 national targets by comparing the individual country trends in national targets to the trend in  
354 international targets. Specifically, we examined whether countries have trends in national targets  
355 that parallel, follow, or precede international targets to assess if international targets influence  
356 national targets or the alternative that national targets influence international targets (see SI for  
357 analysis and detailed discussion). Figure S7 in the SI presents the countries with trends in  
358 national targets that potentially parallel, follow, or precede the trend in international targets.  
359 However, since national target data were only available starting in 1980, and the international  
360 drinking water targets remained constant at 100% coverage after 1980 until the year 2000 when  
361 it dropped to 88%, followed by an increase to 100% in 2015 (Figure S7a), there was not enough  
362 national target data or variation in the trend in international targets to evaluate the existence of an  
363 association between trends in national targets and trends in international targets, and the potential  
364 influence of one on the other.

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

368 Having evaluated how national targets compared to international targets, we looked at whether  
369 the progress made by countries with national targets greater than or equal to the international  
370 target was different than the progress made by countries with national targets lower than the

371 international target. We used the difference between international and national targets where  
372 both targets have the same target year, to categorise these two groups of countries. The national  
373 target of a country was defined as lower than the international target when the difference  
374 between international and national targets was greater than 1 percentage point. The national  
375 target of a country was defined as greater than the international target when this difference was  
376 less than -1 percentage point. For countries where the difference between international and  
377 national target was between -1 and 1, the national target was considered to be equal to the  
378 international target.

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

390 For the two groups of countries (those with national targets greater than or equal to the MDG  
391 targets and those with national targets lower than the MDG target), we then compared the rate of  
392 change in coverage for the five years prior to the adoption of the MDGs (from 1995-1999)  
393 against the following rates of change in coverage (Table S12 in the SI): immediately after MDG

394 adoption (2000-2004), delayed five year time period after MDG adoption (2005-2009), and  
395 delayed 10 year time period after MDG adoption (2010-2015). Using national target data in  
396 2011, a paired t-test showed that for both groups of countries, the pre-MDG rate was statistically  
397 significantly higher than the 10-year delayed post-MDG rate. Similarly, when the analyses is  
398 repeated using 2013 national target data, the pre-MDG rate was higher than the post-MDG rates  
399 (for all three post-MDG periods tested) for countries with national targets greater than or equal to  
400 international targets. No difference was found pre- and post-MDG for countries with 2013  
401 national targets lower than the international target. The difference in results due to using the  
402 2011 or 2013 national target data is likely due to the additional countries that responded to the  
403 2013 survey as well as inconsistencies in the responses. For example, 17 countries reported a  
404 national target in 2013 but did not report one in 2011, while 10 countries reported a national  
405 target in 2011 and not in 2013. Four countries reported a 2013 national target lower than the  
406 international target but a 2011 national target that was higher than the same international target.  
407 The reverse (a lower national target for 2011 but a higher national target for 2013) was true for  
408 five countries.

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

417 to the international target) before and after the MDG adoption. Langford and Winkler (2013)  
418 reported that the rates of change between the 1990s and 2000s were approximately the same for  
419 all countries and Fukuda-Parr, Greenstein, and Stewart (2013) showed that for countries that  
420 increased their drinking water coverage in the 1990s and 2000s, only one-third had a higher rate  
421 of change in the 2000s than the 1990s.

## 422 **Study limitations**

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

## 436 **Conclusions**

437 We collated publicly available data on national drinking water targets for 97 countries during the  
438 1980-2013 time period and assessed how they changed with time. We found that there is no one



439 single trend observed in all countries. Instead, countries fall into different trend types including  
440 constant, increasing, and decreasing national targets with time. The trend type of ‘constant  
441 national target of 100%’ was the only group that had countries with GNI per capita values  
442 greater than 10,000, no countries from Africa, and in general, no to low ODA per capita.

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

451 Comparison of international and national standards suggest that national standards may  
452 influence international standards. On the other hand, when evaluating targets, approximately  
453 70% of countries have national targets equal to, higher than, or converging towards international  
454 targets, which may suggest that international targets influence national targets. We showed that  
455 there was no significant difference in progress made by countries with national targets greater  
456 than or equal to the MDG target as compared to countries with national targets lower than the  
457 MDG target. However, when comparing pre- and post-MDG rates, in all possible scenarios  
458 examined, the adoption of the MDG target did not result in higher rates of change and actually  
459 showed higher rates of change for the pre-MDG period. This would support arguments made by  
460 many (Langford and Winkler, 2013; Vandemoortele, 2011) that the MDGs were under-ambitious  
461 for many countries and were not meant to be applied to individual countries.

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

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482 focus on the enabling environment (laws, plans and policies, institutional arrangements and  
483 monitoring systems) for water, sanitation and hygiene (WASH). While the biennial GLAAS  
484 report provides a broader overview of the enabling environment, these articles use the same data

485 to generate perspectives that provide deeper analysis and insight into specific WASH topics that  
486 can be used for advocacy efforts as well as for strengthening the WASH sector both locally and  
487 globally. For more information, please contact [glaas@who.int](mailto:glaas@who.int)

## 488 **Supporting Information**

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

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