

**Commentary**



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## Tacking stock of the use of drinking well waters and natural spring waters in Morocco: a commentary

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## Abstract

*Due to various reasons, drinking water from wells and natural springs is still frequent in Morocco, posing a risk of water-related diseases. Since August 2016, having the authorization to construct a well has been made mandatory for upcoming owners. One may identify two types of wells: the collective ones that serve at least two families and the private or individual ones. Monitoring water of the collective ones is the responsibility of the health ministry within a program related to water for drinking and food use, whereas testing the water of individual wells is the owner's responsibility. Well water monitoring data collected via such a program are used for statistics and regulatory purposes and do not serve exposure assessment. Fostering further collaboration with stakeholders concerned with the water sector and using GIS-based methodology for exposure assessment in epidemiology could improve well water data collection, allowing more detailed analysis of water-borne or water-related diseases in the country.*

## Commentary

In Morocco, even though access to safe drinking water (i.e. drinking water from the distribution systems and controlled standpipes) covers a large part of the population, drinking water from wells and natural springs is still frequent. Such drinking water systems are mainly located in rural and suburban areas; in urban areas, well waters are mainly used in public bathrooms (*Hammams*). According to the recent census, 91.3% of the population in the urban area and only 37.8% in the rural area, which made 73% of the general population, had access to an improved water source [1]. Reasons behind such a lack of water supply can be diverse in the country. One reason may be the habitat's dispersal. For many dispersed households, drinking water from the distribution systems may be a pretty long-term project; for others in remote areas, the small drinking water systems will always be the unique source of

drinking water. Unsatisfactory available water quantity or quality may be an added reason for limited access to drinking water from public distribution systems [2-3]; limited funding resources and unaffordable water pricing may be further reasons for the lack of water supply. Some populations use natural spring waters for drinking because of the scarcity of other drinking water sources or their believed therapeutic effects. In the late nineties, aiming to improve the rural area's water supply at medium term, Morocco elaborated a program, "*Programme d'Approvisionnement Groupé en Eau potable des populations Rurales (PAGER)*" that lasted between 1995 and 2010. Both water points fitted from a well, a source, or a borehole and standpipes connected to drinking water systems were adopted. Such a program has made a perceptible improvement in water supply in the country [4]; however, there is still demand in rural areas.

### **Challenges in preventing the risk of exposure to chemical contaminants and microbial pollutants from well waters:**

there is a health concern related to well water and natural spring water. Biological contaminants and chemical pollutants may leak into wells' water, which poses a danger to their use for drinking or preparing food [5]. It may cause the emergence of diseases and epidemics of varying severity if these waters are not monitored. Such a situation may mainly occur in rural areas where septic tanks may prevail. According to the recent census, in Morocco, only 2.9% of the population uses a domestic system; a proportion of 49.2% evacuates wastewaters in septic tanks, 47.9% in abandoned wells, or directly in nature [1]. Fertilizers and pesticides used in agriculture may be a source of water pollution with chemicals, particularly nitrate. The soil nature may also contribute to water contamination, which makes fluoride, selenium, and sulfates specific concerns in some areas in the country. Legislators have enhanced regulations as to wells in Morocco. In August 2016, a new law (*Act 36-15 related to water*), an update of a previous one (*Act 10-95 related to water*), was promulgated to competently

manage and protect all the water resources in the country; this applies to national, regional and local levels. Since August 2016, having the authorization to construct a well was made mandatory for upcoming owners (*Act 36-15 related to water*). Also, the concerned water sector agencies are currently trying to regulate existing unauthorized wells constructed before such date.

However, while Moroccan regulations require strict recommendations regarding water quality from the public network, such requirements may not apply to wells and natural springs. At present, the health ministry has a program concerned with checking the quality of drinking water from the public network (i.e. tap water or controlled standpipes), drinking water from small systems (i.e. well, spring, and rainwater), or other water sources used as drinking water or for food use (*Decree N°2-94-285 of 21 November 1994 and Decree N°2-05-1326 of July 2006*). Surveillance of water quality from the public distribution system, a continuous, systematic process, is a prerogative of the operator producing such water and others distributing it; simultaneously, the health ministry checks the quality of this water and its production and distribution conditions. Such water surveillance and quality checking are performed according to a national standard for public supply networks (i.e. NM 03.7.002). The concerned operators perform these tasks from the source to the tap and conduct many water analyses. As to wells and natural springs, the situation may be different, and responsibilities may overlap. One may identify two types of wells or drinking water points, the collective or communal ones that serve at least two families and the private or individual ones; a natural spring is considered a collective water point. Surveillance of water quality of the communal water points is a task of the local collectivities affiliated with the Interior Ministry (*Dahir n° 1-02-297 of 3 October 2002*); insufficient locally available staff, funding, and laboratories may hinder such a task. Monitoring water of the collective wells is the responsibility of the health ministry, whereas testing water of individual wells is the owner's

responsibility or choice. A further issue is that collected monitoring data related to well water quality would not serve exposure assessment and risk prevention. They are organized for statistics or regulatory purposes rather than environmental public health. Thus, it would not help health professionals and stakeholders assess this situation and promptly conduct appropriate analyses and interventions.

**Improvement and use of drinking well waters monitoring data for exposure assessment and risks prevention:** collecting and assembling data on well waters may be a prerequisite to assess exposure and prevent the risk of developing water-related diseases. In Morocco, since 2017, hydraulic agencies have started gathering data on private wells, which can be shared. In contrast, there is still a need for data on collective wells, including the actual number of such wells, the geo-localization, and the size of the served households. Computerization and water analysis consistency of the collective wells need to be improved. We can make such data available, which would require further cooperation between departments concerned with the water sector. On the other hand, interpretation of water quality problems based on aggregated data may be misleading unless we perform the analysis at the appropriate scale. Using GIS-based methodology for exposure assessment in epidemiology could improve well waters data collection, allowing more detailed analysis of water-borne or related diseases.

## Competing interests

The authors declare no competing interests.

## Authors' contributions

MS conceptualized and wrote the original draft; MT, RE, and MA revised and edited the paper. All the authors have read and approved the manuscript.

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