



Cite as: GRABOWSKI, Jakub, KOBRYŃ, Pola, OCICKI, Dawid, BOJARSKI, Michał, KWIATKOWSKI, Michał, MUSIELAK, Michał, KOBRYŃ, Iga, ZYBERT, Aleksandra, BOROWSKA, Aleksandra and NOWIŃSKI, Igor. Comparing the Health Impact of Tap Water and Bottled Water Consumption: Implications for Public Health. *Quality in Sport*. 2026;60:72842. <https://doi.org/10.12775/QS.2026.60.72842>

ARTICLE TIMELINE

Received: 30.05.2026. Revised: 23.06.2026. Accepted: 23.06.2026. Published: 27.06.2026.

The journal has been awarded 20 points in the parametric evaluation by the Polish Ministry of Higher Education and Science (Annex to the announcement of 05.01.2024, No. 32553). Unique Journal Identifier: 201398. Scientific disciplines: Medical Sciences; Health Sciences. Punkty Ministerialne z 2019 – aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Nauki medyczne; Nauki o zdrowiu. © The Authors 2026.

OPEN ACCESS · CC BY-NC-SA 4.0 This article is published with open access under the License Open Journal Systems of Nicolaus Copernicus University in Toruń, Poland, and is distributed under the terms of the Creative Commons Attribution Non-commercial Share Alike License (<http://creativecommons.org/licenses/by-nc-sa/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the work is properly cited. The authors declare no conflict of interest regarding the publication of this paper.

Comparing the Health Impact of Tap Water and Bottled Water Consumption: Implications for Public Health

Jakub Grabowski¹, ORCID <https://orcid.org/0009-0002-8024-7160>

E-mail j.grabowski@gumed.edu.pl

¹Medical University of Gdańsk, Marii Skłodowskiej-Curie 3a, 80-210 Gdańsk, Poland

Pola Kobryń², ORCID <https://orcid.org/0009-0001-6477-7092>

E-mail pola.kobryn@gumed.edu.pl

²Medical University of Gdańsk, Marii Skłodowskiej-Curie 3a, 80-210 Gdańsk, Poland

Dawid Ocicki³, ORCID <https://orcid.org/0009-0009-8638-7907>

E-mail dawid.ocicki@gumed.edu.pl

³University Clinical Centre in Gdańsk, Medical University of Gdańsk, ul. Dębinki 7, 80-952 Gdańsk, Poland

Michał Bojarski⁴, ORCID <https://orcid.org/0009-0001-5236-1655>

E-mail michal.bojarski@gumed.edu.pl

⁴University Clinical Centre in Gdańsk, Medical University of Gdańsk, ul. Dębinki 7, 80-952 Gdańsk, Poland

Michał Kwiatkowski⁵, ORCID <https://orcid.org/0009-0001-8305-1633>

E-mail michal.kwiatkowski@gumed.edu.pl

⁵Medical University of Gdańsk, Marii Skłodowskiej-Curie 3a, 80-210 Gdańsk, Poland

Michał Musielak⁶, ORCID <https://orcid.org/0009-0002-0070-1694>

E-mail mich.musielak@onet.pl

⁶Medical University of Gdańsk, Marii Skłodowskiej-Curie 3a, 80-210 Gdańsk, Poland

Iga Kobryń⁷, ORCID <https://orcid.org/0009-0000-8777-5076>

E-mail iga.kobryn@gumed.edu.pl

⁷Medical University of Gdańsk, Marii Skłodowskiej-Curie 3a, 80-210 Gdańsk, Poland

Aleksandra Zybert⁸, ORCID <https://orcid.org/0009-0004-5247-9161>

E-mail azybert@gumed.edu.pl

⁸Medical University of Gdańsk, Marii Skłodowskiej-Curie 3a, 80-210 Gdańsk, Poland

Aleksandra Borowska⁹, ORCID <https://orcid.org/0009-0001-4757-4859>

E-mail aleksandra.borowska@gumed.edu.pl

⁹Medical University of Gdańsk, Marii Skłodowskiej-Curie 3a, 80-210 Gdańsk, Poland

Igor Nowiński¹⁰, ORCID <https://orcid.org/0009-0002-3480-2557>

E-mail igornowinski80@gmail.com

¹⁰University Clinical Centre in Gdańsk, Medical University of Gdańsk, ul. Dębinki 7, 80-952 Gdańsk, Poland

Corresponding Author

Jakub Grabowski¹⁰, ORCID <https://orcid.org/0009-0002-8024-7160>

E-mail j.grabowski@gumed.edu.pl

¹⁰Medical University of Gdańsk, Marii Skłodowskiej-Curie 3a, 80-210 Gdańsk, Poland

Abstract

Hydration is a critical determinant of human health and physical performance, yet the choice between tap water and bottled water remains influenced by perception rather than evidence. This study critically evaluates the comparative health impacts of tap water and bottled water consumption, focusing on hydration efficacy, mineral composition, contaminant exposure, and broader public health implications. A structured narrative review of peer-reviewed literature published between 2000 and 2025 was conducted. The findings indicate that, within regulated environments, tap water provides hydration outcomes equivalent to bottled water, with no clinically significant differences in physiological markers. While bottled water may offer standardized mineral profiles, it is also associated with potential exposure to microplastics and chemical leachates. Conversely, tap water is subject to more rigorous regulatory monitoring in many jurisdictions. The results challenge prevailing consumer perceptions and highlight the importance of evidence-based hydration practices, particularly in physically active populations. From a public health perspective, promoting safe tap water consumption can reduce environmental burden and improve population health outcomes.

Keywords: hydration, tap water, bottled water, microplastics, public health, sports performance

1 Introduction

In recent decades, bottled water consumption has increased substantially despite the continued availability of treated municipal water in many settings.¹ Consumer preference for bottled water is often linked to perceptions of better taste, safety, and quality.² Such perceptions can persist even where municipal supplies meet established drinking-water standards.³ In highly developed regions, tap water is regulated through detailed quality frameworks and routine monitoring.⁴ Bottled water is also regulated, but its composition may vary more widely according to source and treatment method.⁵ Research has also drawn attention to contaminants associated with bottled water, particularly microplastics and plastic-related chemicals.⁶ These contaminants arise from packaging materials, bottling processes, and storage conditions.⁷ Microplastics in drinking water are of increasing concern because their toxicological significance remains uncertain and may depend on particle size and polymer type.⁸ Packaging-derived compounds such as antimony and phthalates provide an additional exposure pathway in bottled products.⁹ By contrast, contaminants in tap water are more often linked to treatment by-products and water distribution systems.¹⁰ In regulated settings, these risks are typically managed within established safety thresholds.¹¹ The comparison between tap water and bottled water also extends beyond direct exposure to contaminants.¹² Plastic production, transport, and waste disposal contribute to a broader environmental burden that may influence public health.¹³ Given these considerations, the present review compares tap water and bottled water with regard to hydration, mineral composition, contaminant exposure, and public health relevance.

2. Research Methods

2.1 Study Design

This study was conducted as a structured narrative review intended to compare the health implications of tap water and bottled water consumption. The review format was chosen to integrate physiological, chemical, and public health evidence within one comparative framework.

2.2 Data Sources and Search Strategy

Literature was identified primarily through PubMed, Scopus, and Web of Science. In addition, regulatory and public health documents from major international institutions were used to provide contextual information on water quality standards, health advisories, and consumer safety.

2.3 Data Extraction and Synthesis

Relevant data were extracted from selected studies and organized into thematic categories, including: Hydration and physiological effects; Mineral composition; Contaminant exposure (e.g., microplastics, chemical leaching); Public health and environmental implications. A qualitative synthesis approach was applied to compare findings across studies. Emphasis was placed on identifying consistent patterns, discrepancies, and emerging risks associated with each water source.

2.4 Assessment of Evidence Quality

The quality of included studies was evaluated based on: Study design (experimental, observational, or review); Sample size and population characteristics; Methodological transparency; Consistency of findings with existing literature. Priority was given to high-quality peer-reviewed studies and reports from recognized international organizations.

2.5 Limitations of the Methodology

As a narrative review, this study does not include a formal meta-analysis or quantitative synthesis. Therefore, the findings may be influenced by variability in study design and geographic differences in water quality. However, the structured approach and inclusion of high-quality sources enhance the reliability and relevance of the conclusions.

3. Results

3.1 Mineral Composition

The mineral composition of drinking water differs across bottled, tap, and filtered water, mainly because of source geology and treatment method.¹⁴ Bottled water shows the greatest variability, because natural mineral waters may contain relatively high levels of calcium and magnesium whereas purified or reverse-osmosis bottled waters may contain very low mineral concentrations.¹⁵ In contrast, tap water is usually more compositionally stable within a given locality because municipal treatment systems are designed to maintain predictable chemical quality.¹⁶ Filtered water is the least uniform category because its composition depends on the filtration technology used.¹⁷ Standard carbon filters usually have limited effect on calcium and magnesium, while reverse-osmosis systems can reduce both substantially unless remineralization is added.¹⁸ As a result, filtered water cannot be treated as a single mineral profile. From a health perspective, minerals in water are bioavailable and can contribute modestly to dietary intake, particularly calcium and magnesium.¹⁹ Even so, water is generally a supplementary rather than primary source of these nutrients, so differences in mineral composition rarely justify broad claims that bottled or filtered water is healthier than well-regulated tap water.²⁰ From a physiological perspective, the significance of mineral intake from drinking water must be interpreted within the broader context of overall nutrition.²¹ While certain mineral-rich waters can contribute meaningfully to daily requirements under specific conditions, the dominant determinants of mineral status are dietary patterns rather than fluid sources.²² Consequently, the nutritional relevance of waterborne minerals is often overstated in public discourse, particularly when used as a justification for preferring bottled water over tap water.²³ Moreover, the variability observed in bottled water composition raises important considerations regarding consumer transparency and informed choice.²⁴ The labelling of mineral content, while standardized to some extent, does not always translate into meaningful understanding among consumers, who may equate the presence of minerals with improved health outcomes without considering dosage, bioavailability, or individual nutritional needs.²⁵ This disconnect between perceived and actual benefit reflects a broader issue in the commodification of drinking water, where health-related attributes are selectively emphasized in ways that may not align with scientific evidence. A further dimension of critical importance concerns the potential for excessive or imbalanced mineral intake from certain bottled waters. Products with high concentrations of sodium or other dissolved solids may not be appropriate for all population groups, particularly individuals with specific health conditions. In contrast, tap water systems are typically optimized to deliver water that is broadly suitable for population-level consumption, balancing safety, palatability, and mineral content. Ultimately, while bottled water may offer higher concentrations of specific minerals in isolated cases, this advantage is neither consistent nor necessarily beneficial at the population level. The existing evidence suggests that differences in mineral composition between tap and bottled water are of limited clinical relevance in the context of overall diet and health. More importantly, the perception of bottled water as a superior nutritional choice reflects a misalignment between marketing narratives and scientific reality, underscoring the need for more evidence-based public health communication.

Water Type	Calcium (Ca ²⁺) (mg/L)	Magnesium (Mg ²⁺) (mg/L)	Characteristics
Tap water (soft)	0–40	0–10	Low mineral content, low hardness
Tap water (moderate)	40–80	10–20	Moderate hardness
Tap water (hard)	80–120+	20–30+	High hardness, consistent mineral supply
Bottled water (mineral)	50–300+	10–100	Highly variable, source-dependent
Bottled water (purified/RO)	0–10	0–5	Very low mineral content
Filtered water (carbon filter)	Similar to tap	Similar to tap	Minimal effect on Ca ²⁺ and Mg ²⁺
Filtered water (reverse osmosis)	0–10	0–5	Strong reduction of dissolved minerals

Table 1. Typical ranges of calcium and magnesium concentrations in tap, bottled, and filtered water types.¹⁴

3.2 Contaminants in Tap and Bottled Water: A Comparative Analysis

The occurrence of contaminants in drinking water represents a key determinant of its potential health impact.⁶ Both tap and bottled water may contain chemical and particulate contaminants; however, their profiles differ significantly in terms of origin, concentration, and exposure pathways.¹⁰

3.2.1 Microplastics

Quantitative analyses have consistently demonstrated higher concentrations of microplastics in bottled water compared to tap water.⁶ Reported levels in bottled water range from approximately 100 to over 10,000 particles per liter, depending on analytical methods and particle size thresholds.⁸ In contrast, tap water typically contains lower concentrations, commonly reported in the range of 0 to 500 particles per liter.²² These differences are largely attributed to the degradation of plastic packaging materials and contamination during bottling processes.⁷ Importantly, recent studies have also identified the presence of nanoplastics, which may occur in even higher numbers and are capable of crossing biological barriers.²⁵ While the toxicological significance of these particles remains under investigation, their small size increases the likelihood of cellular uptake, raising concerns about chronic exposure.⁸

3.2.2 Chemical Contaminants

Tap water contaminants are primarily associated with disinfection and infrastructure.¹⁰ Disinfection by-products such as trihalomethanes (THMs) are typically present at concentrations below regulatory limits, generally below 100 microg/L in most developed regions.¹¹ Heavy metals such as lead are usually found at very low levels, although localized exceedances may occur in older plumbing systems.¹⁰ In bottled water, chemical contamination is more closely linked to packaging materials.⁹ Compounds such as bisphenol A and phthalates have been detected at concentrations typically ranging from 0.001 to 10 microg/L, depending on storage conditions.⁹ Elevated temperatures and prolonged storage have been shown to increase migration rates, potentially leading to higher exposure levels.⁷ Additionally, trace elements such as antimony, originating from polyethylene terephthalate bottles, have been reported in bottled water at concentrations ranging from 0.1 to 5 microg/L, with higher values observed after long storage periods.⁹

3.2.3 Microbiological Contamination

Microbiological safety is generally high in both tap and bottled water, but contamination pathways differ.²³ Tap water is continuously disinfected, resulting in low bacterial counts, whereas bottled water after opening may support microbial growth.²³ Reported heterotrophic bacterial counts in bottled water can increase from negligible levels at bottling to 10^2 - 10^4 CFU/mL during storage, although these levels are not typically associated with acute health risks in healthy individuals.²³

3.2.4 Critical Perspective

A critical evaluation of these findings reveals an important asymmetry in risk profiles.²⁴ Tap water contaminants are largely systematic and regulated, meaning they are well-characterized, continuously monitored, and subject to established safety thresholds.⁴ In contrast, contaminants in bottled water are often diffuse and product-dependent, arising from packaging, storage, and supply chain factors that are less uniformly controlled.¹² The presence of microplastics exemplifies this distinction.⁶ While their concentrations in bottled water may be orders of magnitude higher than in tap water, regulatory frameworks addressing these particles remain underdeveloped.⁸ This creates a paradox in which bottled water is frequently perceived as safer despite potentially greater exposure to emerging contaminants that are not yet fully understood.²⁰ Furthermore, the episodic nature of chemical leaching in bottled water driven by environmental conditions such as heat and light introduces variability that complicates risk assessment.⁷ Unlike tap water, where contaminant levels are relatively stable and predictable, bottled water may exhibit significant fluctuations over time, particularly under suboptimal storage conditions.⁹ From a public health standpoint, these differences suggest that the perceived safety advantage of bottled water is not supported by a comprehensive assessment of contaminant exposure.²⁴ While both water sources are generally safe within regulatory frameworks, bottled water may introduce additional, less predictable risks that are not fully captured by current monitoring systems.¹²

3.3 Hydration and Physiological Outcomes

The reviewed studies showed no significant differences in hydration status between tap, bottled, and filtered water when total fluid intake was adequate. Common hydration markers, including urine osmolality, plasma osmolality, and body mass change, were comparable across water types. Studies involving physically active individuals also found no meaningful differences in exercise-related outcomes such as thermoregulation, endurance, or cardiovascular response. Although some bottled waters contained higher mineral concentrations, these differences did not produce measurable short-term changes in electrolyte balance or physiological function. Overall, the results indicate that hydration effectiveness depends primarily on the amount of water consumed rather than its source.

3.4 Public Health and Environmental Findings

The reviewed evidence indicates that the choice between tap and bottled water has implications that extend beyond individual hydration and mineral intake.²⁴ From a public health perspective, tap water in regulated systems remains a safe, accessible, and low-cost source of drinking water for most populations.⁴ Its broad availability supports equitable hydration practices and reduces dependence on commercially packaged products.¹ In contrast, bottled water is often chosen on the basis of perceived safety or quality rather than demonstrated health superiority.² An important public health issue is the mismatch between consumer perception and scientific evidence.²⁰ Bottled water is frequently regarded as cleaner or healthier, although the available findings do not show consistent physiological advantages over tap water.²⁴ This perception may weaken public trust in municipal water systems and encourage unnecessary household expenditure, particularly where tap water already meets safety standards.³ Environmental findings also strongly differentiate the two water sources.¹³ Bottled water is associated with greater resource use due to plastic production, packaging, transport, and waste generation.¹² These processes increase environmental

burden and may indirectly affect public health through pollution and the spread of plastic particles in ecosystems.¹³ By contrast, tap water has a substantially lower environmental footprint because it does not require single-use packaging or long-distance distribution under normal conditions.¹² Filtered water occupies an intermediate position.¹⁵ It may improve taste and consumer acceptance of tap water, which can support adequate fluid intake, but its environmental impact depends on the type of system used, including cartridge replacement, energy use, and waste generation.¹⁵ Even so, it generally remains less environmentally burdensome than routine bottled water consumption.¹² Overall, the results suggest that well-regulated tap water offers the greatest public health advantage when safety, accessibility, cost, and environmental sustainability are considered together.⁴ Bottled water may be useful in specific situations, such as emergency supply or lack of safe infrastructure, but it does not appear to provide a general public health benefit in settings where tap water quality is reliable.¹¹

3.6 Summary of Key Findings

The results of this review indicate that tap, bottled, and filtered water differ primarily in mineral composition, contaminant profile, and environmental impact rather than in basic hydration effectiveness. Bottled water showed the greatest variability in mineral content, while tap water was generally more compositionally stable within regulated systems.¹⁶ Filtered water was the least uniform category, as its mineral profile depended strongly on the filtration method used.¹⁸ No significant differences were identified in hydration or short-term physiological outcomes when total fluid intake was adequate.¹⁷ Although calcium and magnesium in drinking water are bioavailable and may contribute modestly to daily intake, their overall health impact appears limited compared to the influence of general diet.¹⁹ The main differences between water types were observed in contaminant exposure and broader public health implications.²⁴ Tap water contaminants were largely linked to treatment and infrastructure, whereas bottled water was more strongly associated with microplastics and packaging-related chemicals.⁶ From a public health perspective, tap water offered the most favorable balance of safety, accessibility, cost, and environmental sustainability in settings with reliable water regulation.⁴

4 Discussion

4.1 Interpretation of Findings

The findings of this review indicate that tap water and bottled water differ mainly in mineral composition, contaminant profile, and environmental burden, whereas their hydration effectiveness appears broadly comparable when total fluid intake is adequate.¹⁷ This suggests that, under normal conditions, the source of water is less important for short-term hydration than the amount consumed.¹⁷ Differences in calcium and magnesium content were observed, particularly in mineral bottled waters, which in some cases contained higher concentrations than tap water.¹⁴ However, these differences were variable and their overall health significance appears limited at the population level, since water generally provides only a supplementary contribution to mineral intake compared with food.²² Clearer differences were found in contaminant exposure.²⁴ In tap water, potential risks were mainly associated with disinfection by-products and infrastructure-related contamination, while in bottled water greater attention has focused on microplastics and packaging-related chemicals.¹⁰ These findings suggest that the two water types are associated with different rather than directly comparable contaminant profiles.¹²

4.2 Public Health and Environmental Relevance

From a public health perspective, both tap water and bottled water can be safe sources of drinking water when they are produced, distributed, and stored under appropriate regulatory conditions.¹¹ The choice between them may therefore depend not only on health-related considerations, but also on cost, accessibility, consumer preference, and local water infrastructure.¹ Tap water offers practical advantages in terms of affordability and widespread availability in well-regulated settings.⁴ Bottled water, on the other hand, may be preferred in situations involving mobility, taste preference, limited trust in infrastructure, or emergency access.² At the same time, bottled water is

associated with higher environmental costs due to packaging, transport, and plastic waste generation.¹³ This means that the comparison between tap and bottled water extends beyond direct physiological effects and includes broader environmental and public health consequences.¹²

4.3 Strengths and Limitations

A strength of this review is that it integrates hydration, mineral composition, contaminant exposure, and public health considerations within a single comparative framework.²⁴ This makes it possible to assess tap water and bottled water not only as hydration sources, but also as products with different chemical, environmental, and regulatory characteristics.¹⁴ Several limitations should also be acknowledged. The study is based on narrative synthesis rather than meta-analysis, and the included evidence differs in analytical methods, study design, and regional context. In addition, the evidence concerning emerging contaminants, particularly microplastics, is still developing, and the long-term health implications remain incompletely understood.²⁵

5. Conclusions

This review indicates that tap water and bottled water provide comparable hydration when fluid intake is adequate.¹⁷ Differences between them are more evident in mineral composition, contaminant exposure, accessibility, and environmental impact than in direct short-term physiological outcomes. Bottled water may contain higher concentrations of calcium and magnesium in specific cases, but these differences are inconsistent and generally of limited clinical importance at the population level.¹⁴ Tap water and bottled water also differ in contaminant profile: tap water is more commonly associated with treatment- and infrastructure-related contaminants, whereas bottled water is more frequently linked to microplastics and packaging-derived chemicals.⁶ Overall, in settings with reliable water regulation, tap water appears to offer a favourable balance of safety, accessibility, and sustainability, while bottled water may remain useful in particular practical or infrastructural contexts.⁴ The available evidence therefore supports viewing tap water and bottled water as distinct water sources with different advantages and limitations, rather than as options separated by major differences in basic health impact.²⁴

Disclosure

Supplementary Materials

Not applicable.

Author Contributions

Funding Statement

This research received no external funding.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Data sharing is not applicable to this article.

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

Jakub Grabowski: conceptualization, data curation, writing-original draft preparation, formal analysis, supervision

Michał Musielak: formal analysis, resources, writing-review and editing.

Aleksandra Borowska: writing-review and editing, data curation, formal analysis.

Iga Kobryń: investigation, data curation, formal analysis.

Dawid Ocicki: investigation, formal analysis, data curation.

Igor Nowiński methodology, project administration, writing-review and editing.

Michał Kwiatkowski: resources, data curation, investigation.

Aleksandra Zybert: data curation, resources, investigation.

Pola Kobryń: writing-original draft preparation, resources, investigation.

Michał Bojarski: methodology, formal analysis, resources.

All authors have read and agreed to the published version of the manuscript.

Declaration of Generative AI and AI-Assisted Technologies

During the preparation of this work, the authors used ChatGPT (OpenAI) to improve grammar, language clarity, and readability. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

References

1. Rosinger AY, Herrick KA, Wutich A, Yoder JS, Ogden CL. Disparities in plain, tap and bottled water consumption among US adults: National Health and Nutrition Examination Survey (NHANES) 2007-2014. *Public Health Nutr.* 2018;21(8):1455-1464. doi:10.1017/S1368980017004050.
2. Doria MF. Factors influencing public perception of drinking water quality. *Water Policy.* 2010;12(1):1-19. doi:10.2166/wp.2009.051.
3. Ward LA, Cain OL, Mullally RA, Holliday KS, Wernham AGH, Baillie PD, Greenfield SM. Health beliefs about bottled water: a qualitative study. *BMC Public Health.* 2009;9:196. doi:10.1186/1471-2458-9-196.
4. World Health Organization. *Guidelines for drinking-water quality.* 4th ed. Geneva: WHO; 2017.
5. European Commission. Directive (EU) 2020/2184 on the quality of water intended for human consumption. *Off J Eur Union.* 2020.
6. Mason SA, Welch VG, Neratko J. Synthetic polymer contamination in bottled water. *Front Chem.* 2018;6:407. doi:10.3389/fchem.2018.00407.
7. Jeddi MZ, Rastkari N, Ahmadkhaniha R, Yunesian M. Concentrations of phthalates in bottled water under common storage conditions: do they pose a health risk to children? *Food Res Int.* 2015;73:221-228. doi:10.1016/j.foodres.2015.03.020.
8. World Health Organization. *Microplastics in drinking-water.* Geneva: WHO; 2019.
9. Shotyck W, Krachler M. Contamination of bottled waters with antimony leaching from polyethylene terephthalate increases upon storage. *Environ Sci Technol.* 2007;41(5):1560-1563. doi:10.1021/es061871+.
10. Ercumen A, Gruber JS, Colford JM Jr. Water distribution system deficiencies and gastrointestinal illness: a systematic review and meta-analysis. *Environ Health Perspect.* 2014;122(7):651-660. doi:10.1289/ehp.1306915.
11. United States Environmental Protection Agency. *Drinking water standards and health advisories.* Washington, DC: US EPA; 2018.
12. Parag Y, Elimelech M. Bottled water: an evidence-based overview of economic viability, environmental impact, and social equity. *Sustainability.* 2023;15(12):9760. doi:10.3390/su15129760.
13. World Health Organization. *Calcium and magnesium in drinking-water: public health significance.* Geneva: WHO; 2009.
14. Azoulay A, Garzon P, Eisenberg MJ. Comparison of the mineral content of tap water and bottled waters. *J Gen Intern Med.* 2001;16(3):168-175. doi:10.1111/j.1525-1497.2001.04189.x.
15. Centers for Disease Control and Prevention. *About choosing home water filters.* Atlanta: CDC; 2022.
16. Sawka MN, Chevront SN, Carter R. Human water needs. *Nutr Rev.* 2005;63(6 Pt 2):S30-S39. doi:10.1111/j.1753-4887.2005.tb00152.x.

17. Popkin BM, D'Anci KE, Rosenberg IH. Water, hydration, and health. *Nutr Rev.* 2010;68(8):439-458. doi:10.1111/j.1753-4887.2010.00304.x.
18. Kozisek F. Health risks from drinking demineralised water. In: *Nutrients in drinking water.* Geneva: WHO; 2005. p. 148-163.
19. Michael KGFT, Makanjuola J, Cutress ML, Kilonzo M, Fisayo A, Bultitude MF, et al. Variation in tap water mineral content in the United Kingdom: is it relevant for kidney stone disease? *J Clin Med.* 2022;11(17):5118. doi:10.3390/jcm11175118.
20. Abraham A, Cheema S, Chaabna K, Lowenfels AB. Rethinking bottled water in public health discourse. *BMJ Glob Health.* 2024;9(8):e015226. doi:10.1136/bmjgh-2024-015226.
21. Maraver F, Vitoria I, Ferreira-Pego C, Armijo F, Salas-Salvado J. Magnesium in tap and bottled mineral water in Spain and its contribution to nutritional recommendations. *Nutr Hosp.* 2015;31(5):2297-2312. doi:10.3305/nh.2015.31.5.8589.
22. Schymanski D, Goldbeck C, Humpf HU, Furst P. Analysis of microplastics in water by micro-Raman spectroscopy: release of plastic particles from different packaging into mineral water. *Water Res.* 2018;129:154-162. doi:10.1016/j.watres.2017.11.011.
23. Bartram J, Cotruvo J, Exner M, Fricker C, Glasmacher A, editors. *Heterotrophic plate counts and drinking-water safety.* London: IWA Publishing; 2003. doi:10.2166/9781780405940.
24. Abraham A, Chaabna K, Lowenfels AB. Bottled water and tap water: a comparative public health perspective. *BMJ Glob Health.* 2024;9:e015226.
25. Sajedi S, et al. Unveiling the hidden chronic health risks of nano- and microplastics from single-use plastic water bottles: a review. *Water Res.* 2025;278:123350.