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From Bottle to Tap: A Systematic Review of Interventions That Shift Beverage Intake from Sugar-Sweetened and Bottled Drinks to Tap Water

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ABSTRACT

Rising consumption of bottled water and sugar-sweetened beverages poses challenges for health, environmental sustainability, and equity in access to safe drinking water. This systematic review examines interventions promoting a shift from bottled drinks to tap or plain water, focusing on behavioral mechanisms and impacts on health, nutrition, and the environment. Studies reviewed included diverse settings and methodologies, assessing outcomes related to beverage intake and associated indicators. Successful interventions combined infrastructure improvements, such as hydration stations, with education and policy changes favoring tap water. Behavioral responses were influenced by perceptions of safety and taste, while socio-economic and demographic factors affected effectiveness. Interventions generally led to reduced consumption of sugar-sweetened beverages and increased tap-water intake, with evidence of improved health outcomes in high-risk populations. Modelling studies anticipated significant reductions in greenhouse gas emissions and resource use by substituting tap water for bottled beverages. The review concludes that well-designed interventions can foster healthier beverage systems but calls for longer-term assessments that encompass health, environmental, and equity outcomes.

Keywords: *Bottle-To-Tap Interventions, Tap Water, Sugar-Sweetened Beverages, Water Security, Environmental Sustainability, Health Equity, Beverage Policy*

1. INTRODUCTION

Over the past few decades, sugar-sweetened beverages (SSBs) have emerged as a major public health concern, linked to diet-related non-communicable diseases such as obesity and type 2 diabetes. While some high-income regions have seen a decline in SSB consumption due to regulatory measures, middle-income areas still exhibit high intake, revealing socioeconomic disparities in beverage choices. Shifts towards alternatives like bottled water and flavored drinks highlight issues of access to safe drinking water, further exacerbating health inequities among lower-income and racialized communities. The effectiveness of promoting water intake over SSBs is contingent upon the perceived safety and availability of tap water, with distrust driving many consumers towards more expensive bottled options. Additionally, reducing SSB consumption can have positive environmental implications. However, gaps in research exist regarding combined strategies for SSB reduction and tap water promotion and the need for integrated policies addressing health and environmental sustainability. This systematic literature review aims to explore interventions that encourage shifts from SSBs and bottled drinks to tap water while considering health, behavioral, environmental, and equity factors.

2. METHODS

2.1 Study Design and Reporting Standards

This study is a systematic literature review advocating for the shift from sugar-sweetened beverages to tap water, highlighting health, behavioral, environmental, and equity outcomes. Adhering to PRISMA 2020 guidelines, it emphasizes reporting transparency and proposes a research

protocol for PROSPERO registration. The review also incorporates CHEERS guidelines to assess the economic impacts of these interventions and underscores the need for stringent standards in health economic evaluations to enhance methodological rigor and reproducibility.

2.2 Search Strategy

A comprehensive search strategy was developed to identify studies on drinking-water sources, SSB consumption, and interventions promoting tap water intake. It utilized controlled vocabulary and free-text terms related to water types, SSBs, interventions, health outcomes, and environmental impacts, employing Boolean operators for relevance. Searches were conducted across databases like Scopus, Web of Science, PubMed/MEDLINE, and Embase, as well as grey literature from health agencies and NGOs, focusing on English-language publications. The search strings were refined based on foundational literature, with results to be shared in an online supplement for reproducibility.

2.3 Eligibility Criteria

Eligibility criteria for the studies mandated human populations of all ages, especially low-income and marginalized groups. Studies needed to assess interventions targeting the reduction of sugar-sweetened beverage (SSB) intake or the promotion of tap-water consumption, with various comparators considered. Eligible outcomes included patterns of beverage intake, health effects, environmental indicators, and equity-related results. Accepted designs were experimental, observational, and modeling, while studies limited to technical water treatment aspects or lacking primary data were excluded.

2.4 Screening and Selection Process

All records from the database and grey literature were imported into reference-management software, with duplicates removed prior to screening. Two independent reviewers conducted title and abstract screening using predefined eligibility criteria, following prior training for consistency. Potentially eligible articles underwent full-text screening by the same or a different review pair, utilizing a piloted eligibility form. Disagreements were resolved through discussion, and a third reviewer was involved if necessary. Exclusion reasons were documented for transparency. The study selection process will be visualized using a PRISMA 2020 flow diagram to illustrate the records identified, screened, assessed for eligibility, and included in the review, alongside exclusion reasons (Page et al., 2021).

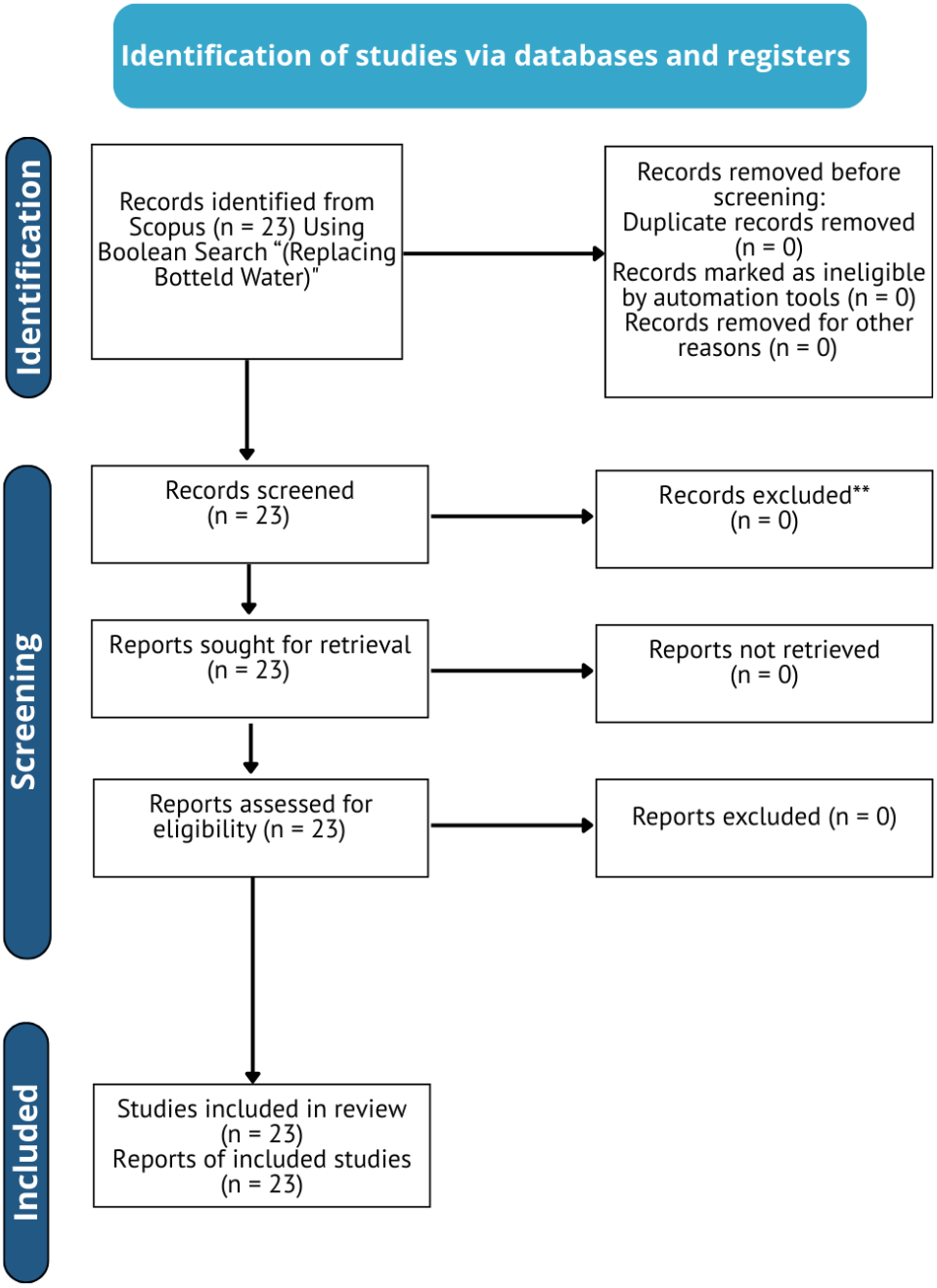

Figure 1. PRISMA 2020 Flow Diagram of Study Selection

Flow diagram depicting the number of records identified through database and other sources, the number remaining after removal of duplicates, the number excluded at title/abstract and full-text stages with reasons, and the final number of studies included in the qualitative and, where applicable, quantitative synthesis.

2.5 Data Extraction and Management

A standardized data-extraction form was developed to collect key information from studies, including bibliographic details, population characteristics, study design, interventions, outcome measures, and authors' conclusions. Metrics on environmental and economic outcomes, such as greenhouse-gas emissions and costs, were specifically noted. Qualitative studies had contextual and behavioral data extracted thematically. Two independent reviewers conducted the data extraction,

addressing discrepancies collaboratively and seeking additional information from authors when necessary, using systematic-review software for data management and synthesis.

2.6 Quality Assessment and Risk of Bias

The study assessed methodological quality and bias in included studies using tools tailored to various designs. Randomised controlled trials utilized the Cochrane Risk of Bias 2 (RoB 2.0) tool, evaluating domains such as randomisation, intervention deviations, and outcome measurement. Non-randomised studies were examined with the ROBINS-I tool, addressing factors like confounding and selection. Observational studies were appraised using Joanna Briggs Institute (JBI) checklists, while qualitative and mixed-methods research followed relevant JBI tools. Modelling studies were assessed based on criteria concerning assumptions and data quality. Two reviewers conducted independent assessments, resolving discrepancies through consensus. Each study was rated for bias, informing a synthesis that included reporting bias distributions and conducting sensitivity analyses to interpret findings based on the evidence's strength and limitations.

2.7 Data Synthesis

Employing a narrative synthesis, this study examines the impacts of various interventions on health and nutrition, utilizing quantitative meta-analysis and Bayesian network models. It assesses statistical heterogeneity and explores the connection between water safety and health through qualitative syntheses. Subgroup analyses are planned to identify variation in intervention effects across demographics, with the synthesis aiming to inform strategies for reducing sugary drink consumption, enhancing health equity, and promoting environmental sustainability.

2.8 Theoretical Framework/Background

This review connects systems thinking, behavioural science, water safety, environmental sustainability, and equity to understand interventions promoting tap water and limiting sugar-sweetened beverages and bottled drinks. It includes five subsections: systems perspective on beverage environments, behavioural and psychosocial determinants, water safety and governance, environmental and equity considerations, and a proposed integrative conceptual framework.

1. Systems Perspective on Beverage Environments

Systems-thinking and systems-dynamics approaches reveal that beverage choices, particularly between bottled and tap water, are influenced by interconnected factors such as water infrastructure, marketing, and policy. These choices reflect systemic disparities, often leading underprivileged communities to rely more on bottled water due to poor tap-water systems. Systems dynamics helps model these connections, suggesting that enhancing tap water visibility and regulating bottled water marketing can shift consumer perceptions and behaviors. The frameworks integrate considerations of health, sustainability, and equity, emphasizing that promoting tap water can reduce environmental impacts and improve public health. Effective consumer advocacy and policy reform grounded in these insights are essential for fostering sustainable beverage environments.

2. Behavioural and Psychosocial Determinants

Systems approaches to beverage choices highlight the dynamics between structural feedback and individual processes, particularly through health-behaviour theories like the Theory of Planned Behaviour (TPB), Health Belief Model (HBM), and Social Cognitive Theory (SCT). TPB suggests that intentions to choose bottled or tap water are influenced by attitudes, norms, and perceived control, with convenience often leading to bottled water use. HBM connects health perceptions to behaviour change, indicating a preference for tap water if it is seen as safer than sugary drinks, provided taste and trust issues are resolved. SCT underscores peer influence on drinking behaviours. Empirical studies reveal that risk perception and trust in water authorities

affect bottled water preferences, while sensory attributes and convenience further shape choices. Structural conditions and social norms play crucial roles in influencing water consumption patterns.

3. Water Safety, Quality, and Governance

Drinking-water safety is governed by regulations such as the Safe Drinking Water Act (SDWA) in the U.S. and the European Union's Drinking Water Directive, which set quality standards enforced by relevant authorities. Variability in monitoring between tap and bottled water affects consumer perceptions, often leading to a belief that bottled water is safer despite similar risks. Incidents of water contamination have eroded trust in municipal supplies, increasing reliance on bottled water, especially among minority and low-income populations. Sensory factors like taste and odor also contribute to the preference for bottled options. Therefore, effective governance must include not only regulation and monitoring but also clear communication to restore public trust in water systems.

4. Environmental and Equity Lens

Life cycle assessment (LCA) measures the environmental impacts of drinking-water sources and beverages, including tap water and sugary soft drinks (SSBs), with a focus on greenhouse gas emissions and water use across production stages. Different water-treatment technologies result in varying carbon emissions, highlighting the significance of technology selection (Li et al., 2023). Research indicates replacing SSBs and bottled water with tap water can have positive environmental outcomes (Green et al., 2018). Environmental justice concerns are pronounced as marginalized communities often lack safe tap water access and rely on bottled water, exacerbating health disparities (Al-Bayatti et al., 2012; Onufrak et al., 2012). Poor water infrastructure affects low-income families, leading to increased bottled water use and associated plastic waste, linking sustainability and equity in water policy debates.

5. Proposed Conceptual Framework

Several conceptual models link water safety, infrastructure, perceptions, availability, marketing, and health outcomes. The World Health Organization’s Water Safety Framework highlights health-based targets and consumer perceptions' impact on public trust. Research indicates that safety perceptions shape household water choices, necessitating infrastructure improvements and effective communication. Frameworks promoting health equity aim to assist marginalized communities in alignment with Sustainable Development Goals. Additionally, studies on parental beverage choices stress the importance of enhancing perceptions of tap-water safety. An integrative approach is suggested, demonstrating how water safety and infrastructure influence perceptions, which subsequently affect beverage choices and health outcomes across different socioeconomic and racial/ethnic groups.

3 RESULTS AND DISCUSSION

3.1 Figure 2. Conceptual Framework Linking Water Systems, Beverage Environments, and Health–Environment–Equity Outcomes in Bottle-To-Tap Transitions

The text presents a systems-oriented framework connecting water safety and infrastructure to public trust and beverage choices. It examines how the beverage environment, shaped by factors like availability, pricing, and social norms, influences the preference for tap water over bottled water and sugary drinks. These beverage choices pose varying health risks and environmental impacts across different socioeconomic and racial/ethnic groups. Additionally, the framework highlights feedback loops where health and environmental outcomes can inform policy changes to improve water systems and beverage options, with particular emphasis on interventions aimed at reducing consumption of sugary and bottled drinks in favor of tap water.

Table 1. Characteristics of bottle-to-tap and drinking water–related interventions

Author/Year	Country/Setting	Target population	Intervention components	Comparator / control condition	Duration & follow-up	Primary outcomes relevant to bottle-to-tap shift
Reese et al. (2023) – Water Up!@Home	Urban low-income Latino community, United States (home setting)	Parents and young children in low-income Latino households	Point-of-use household water filters plus culturally tailored counselling and materials promoting replacement of sugary and packaged drinks with filtered tap water	Households receiving usual practice / no filter-based healthy-beverage intervention	Short-term home-based intervention with baseline and follow-up assessment	Increased filtered tap water intake; reduced sugary drink consumption among parents and children; improved acceptability of tap water at home

3.2 Review of Themes/Findings, Section 4.2 Theme 2 – Behavioural Mechanisms, Perceptions, and Contextual Modifiers

Theme 2 focuses on the behavioural and psychosocial pathways through which bottle-to-tap interventions influence beverage choices, and on the contextual factors that amplify or dampen these effects. Consistent with the conceptual framework presented in Section 3, the findings indicate that changes in water infrastructure and governance operate primarily by reshaping perceptions of safety and taste, perceived convenience, and social norms, while their ultimate impact is conditioned by baseline water quality, trust in institutions, and socio-demographic position.

1. Mechanisms Explaining How Bottle-To-Tap Interventions Influence Beverage Choices

Perceived safety is a key factor influencing consumer behavior toward tap water over bottled water and sugar-sweetened beverages (SSBs). Despite a lack of evidence for contamination in bottled water, many households still view it as safer. Educational strategies that clarify drinking-water standards can boost confidence in tap water and reduce bottled water reliance. Successful interventions, such as the Water Up!@Home trial, which employed point-of-use filters and tailored messaging, enhanced perceptions of tap water and lowered SSB consumption, especially in low-income Latino communities. Sensory factors like taste and smell are crucial; improving tap water's taste perception can promote its use. Convenience and accessibility, such as refill stations in schools and recreation centers, also facilitate tap water consumption. Additionally, social norms and identity play significant roles, with campaigns normalizing tap water intake helping to shift beverage choices. Overall, effective interventions draw on perceived safety, taste, convenience, and social norms, consistent with the Theory of Planned Behavior, which highlights the importance of perceptions and attitudes in guiding consumer behavior.

2. Contextual Modifiers: Baseline Water Quality, Trust, and Past Contamination Events

The effectiveness of mechanisms promoting tap water reliance is affected by baseline water quality and historical context, with high-quality systems and regulatory visibility enhancing perceptions. Past contamination events, like the Flint crisis, cause skepticism and increased bottled water usage, especially in marginalized communities. Concerns about bottled water safety also

necessitate consistent regulation of both water types. Additionally, water availability impacts caregivers' coping strategies and child nutrition. The findings stress that safety, quality, and governance are key to successful water interventions.

3. Lived Experiences, Attitudes, and Narratives

Qualitative and mixed-methods research highlights key insights into water-related experiences. Santillán-Vázquez et al. (2022) demonstrate that low-cost water filters reshape Latino parents' perceptions, making filtered water appear safer and more dignified than bottled options. Lawman et al. (2019) observe heightened safety concerns about water fountains among non-white groups. Onufrak et al. (2012) link tap-water safety perceptions to increased consumption of sugar-sweetened beverages in Hispanic communities. Wilson et al. (2022) attribute chronic distrust in local water supplies in border regions to past contamination. Mikhailovich and Fitzgerald (2014) note mixed responses to bottled water removal on campuses, reflecting broader social and environmental justice issues related to historical marginalization of communities regarding water security.

4. Socio-Demographic Variables and Psychosocial Determinants

Socio-demographic variables and psychosocial determinants significantly influence the effectiveness of bottle-to-tap interventions. Younger adults and women have greater concerns about tap water safety, while older adults benefit from established hydration habits. Socioeconomic status, ethnicity, and migration status affect water use perceptions; lower-income and minority groups tend to favor bottled water. Trust in municipal systems and perceived environmental efficacy are critical for shaping community responses to educational initiatives. Interventions must be equity-sensitive to avoid worsening existing disparities in water security and health outcomes.

5. Synthesis and Implication for Intervention Design

Theme 2 highlights the importance of behavioral mechanisms and contextual factors in the success of bottle-to-tap strategies. Mediating pathways such as perceived safety, taste, and convenience influence beverage choices, while moderators like water quality and community trust affect these pathways. The findings indicate that enhancements in water quality should be accompanied by transparency and trust-building, especially in communities with past concerns. Additionally, initiatives should emphasize the sensory and convenience aspects of tap water and cater to marginalized communities, connecting to broader themes of health, environmental, and equity outcomes.

Table 2. Behavioural Determinants and Mediating Pathways in Bottle-To-Tap and Drinking-Water–Related Research

Study (Author/Yea)	Theoretica / conceptual framework	Key determinants measured	Measurement tools	Main behavioural findings	Role as mediator/moder ator	Implications for intervention design
Reese et al. (2023) – Water Up!@Home	Implied socio-ecological and behaviour-change framing (home environme nt, skills, norms)	Perceived safety and taste of tap/filtered water, SSB preferences, home beverage availability, parental modelling	Structured questionnaires with repeated measures; beverage frequency/quan tity instruments	Improved perceptions of filtered tap water and increased in-home availability accompanied reductions in SSB intake	Perceived safety and acceptability of tap water plausibly mediated impact of filter provision on beverage choice	Interventions must address both physical quality and perceptions; hardware (filters) should be paired with culturally sensitive

Study (Author/Year)	Theoretical / conceptual framework	Key determinants measured	Measurement tools	Main behavioural findings	Role as mediator/moderator	Implications for intervention design
						messaging to overcome distrust of tap water
Karnaningroem & Pradana (2021)	Risk-analysis and HACCP framework; focus on consumer protection	Perceived and actual contamination hazards along BDW production chain; implicit trust in BDW as "safe" alternative	Process mapping, hazard identification matrices, expert judgement	Shows that consumer reliance on BDW may not always be justified by production controls; vulnerabilities exist in supply chain	Awareness of possible hazards in BDW moderates attractiveness of bottled water relative to improved tap water	Communication about comparative risks of BDW vs regulated tap water can support shifts away from unnecessary bottled-water use when tap safety is demonstrably high
Paz-Graniel et al. (2021)	Life-course and lifestyle-epidemiology perspective	Baseline plain-water intake (tap and bottled), beverage patterns, diet quality, physical activity, sociodemographics	Validated food-frequency and lifestyle questionnaires; anthropometry	Higher baseline drinking-water consumption associated with more favourable weight and waist-circumference trajectories over 2 years	Drinking-water habits partially mediate associations between overall lifestyle and adiposity change	Interventions in older adults should reinforce habitual plain-water consumption as part of an integrated lifestyle package, rather than treating water intake in isolation
Vieux et al. (2020) – Trends in tap vs bottled water	Population-monitoring framework; implicit equity and access lens	Source of drinking water (tap vs bottled), total volume, sociodemographic correlates (age, sex, race/ethnicity, income)	Repeated cross-sectional analyses of NHANES 2011–2016 24 h recalls and questionnaires	Marked sociodemographic differences in use of tap vs bottled water; some groups rely more on bottled water despite guidelines favouring tap	Socioeconomic position and ethnicity moderate likelihood of consuming tap vs bottled water	Bottle-to-tap policies must be equity-sensitive, addressing structural barriers (infrastructure, trust) in groups with low tap-water use

3.3 Review of Themes/Findings, Section 4.4 Theme 4 – Environmental and Equity Impacts of Beverage Source Transitions

Theme 4 synthesises evidence on how shifting from bottled drinks and sugar-sweetened beverages (SSBs) towards tap water reshapes environmental footprints and the distribution of benefits and burdens across populations. In line with the environmental and equity lens described in Section 3.4 and the systems framework in Section 3.5, the studies in Table 4.4 show that beverage choices are embedded in wider infrastructures of water supply, sanitation, packaging, and regulation. Bottle-to-tap transitions can therefore generate substantial climate and resource co-benefits, but these gains are contingent on the quality and governance of tap-water.

1. Comparative Environmental Performance of Beverage Systems

A life cycle assessment (LCA) indicates that tap water has a significantly lower environmental impact compared to bottled water and sugary beverages. Studies, including those by Meisterling et al. (2022), demonstrate that substituting bottled drinks with tap water in universities can greatly reduce greenhouse gas emissions, energy use, water use, and packaging waste. Smedman et al. (2010) point to plain water's negligible climate impact, highlighting its role as the optimal choice for hydration, while emphasizing that nutrient-rich beverages should be selected carefully. Cutbacks on bottled water, as indicated in various analyses, advocate for reliable tap-water systems that are further supported by robust monitoring techniques for contaminants, as seen in research by Wang et al. (2025) and others. Overall, transitioning from bottled to tap water is critical for reducing environmental footprints in beverage consumption.

2. Policy and Scenario Analyses: Co-Benefits and Trade-Offs

Theme 4 analyzes the impact of beverage policies on environmental and equity outcomes. Meisterling et al. (2022) demonstrate that campus policies promoting tap water over sugary and bottled beverages can significantly decrease GHG emissions, packaging waste, and sugary drink exposure. Cifelli et al. (2022) contribute by linking beverage substitutions, such as dairy for plant-based options, to both environmental impacts and diet costs, revealing trade-offs between nutrient density and climate benefits. Strazza et al. (2016) emphasize the necessity of rigorous LCA data to ensure clarity in comparisons between tap water and bottled beverages. Langley (2009) suggests that purchasing decisions, like opting for mains-fed dispensers, serve as policy tools that can enhance overall environmental benefits, aligning with the multi-level systems framework where policies across various levels influence beverage consumption's environmental profile.

3. Distributional Impacts and Environmental Justice

The equity aspect of Theme 4 addresses the beneficiaries of environmental improvements from bottle-to-tap transitions and the new risks for vulnerable populations. The Flint crisis illustrates how cost-driven decisions resulted in lead contamination disproportionately affecting low-income and minority communities. Rodríguez-Villamil et al. discuss water access issues in Colombia, where scarcity leads to reliance on unsafe sources, adversely impacting nutrition and sustainability. Similarly, contaminated sources in Sri Lanka exacerbate health inequities. Bottled water quality, particularly inadequate fluoride levels in Saudi Arabia, poses challenges for economically vulnerable families. Organizational decisions on water provision can impose economic burdens on low-income households, highlighting the need for equity to be central in environmental policies, as historical water quality issues affect current outcomes.

4. Integrated Frameworks and Decision-Support Tools

Several scholars advocate for integrated frameworks that assess health, environmental, and equity outcomes of beverage policies. LCA-based models and diet–environment scenarios highlight the interplay between nutrient density and GHG emissions. Extended studies show how policy packages can yield climate benefits and healthier beverage options in institutional contexts.

Methodological rigor is emphasized to ensure reliable integrated assessments. Additionally, multi-criteria approaches link environmental and health considerations, particularly for disadvantaged communities. Participatory research underscores the importance of local perspectives in designing interventions, thereby enhancing equity. These themes align with a framework focusing on the interconnectedness of health, environment, and equity, highlighting the need for integrated tools in policymaking to visualize co-benefits and trade-offs.

5. Synthesis and Implications

Theme 4 highlights the environmental advantages of shifting from sugary-sweetened beverages and bottled drinks to tap water, which include reduced greenhouse gas emissions, lower energy usage, and decreased plastic waste. These benefits rely on well-monitored tap-water systems, regulatory frameworks, and ensuring water security and affordability for marginalized groups. This transition is part of a broader effort involving water, sanitation, and food systems. Effective policies should focus on enhancing refill infrastructure, regulating bottled water marketing, and improving water-quality monitoring, in collaboration with affected communities to achieve climate, health, and equity goals. Further exploration of these findings will occur in Section 5, focusing on future tap-water initiatives.

Table 3. Environmental And Equity Outcomes of Shifting from Bottled/ssbs To Tap Water and Improving Water Systems

Study (Author/Year, Type)	System boundary & perspective	Key environmental indicators	Equity/economic indicators	Scenario or intervention compared	Main findings	Policy-relevant messages
Wang et al. (2025), analytical method paper	Laboratory scale; detection of polystyrene nanoplastics in food and water matrices	Sensitivity and specificity of nanoplastic detection; potential application to water and beverage contamination monitoring	Not directly assessed; method could inform risk assessments affecting vulnerable populations	Development of peptide-modified magnetic nanoparticles for detecting nanoplastics in complex matrices	Enables more sensitive quantification of micro/nanoplastics, a growing environmental concern in water and beverages	Robust contaminant-detection methods underpin regulation and communication about the safety of tap and bottled water
Meisterling et al. (2022), campus-policy scenario modelling	University campus beverage system; cradle-to-grave footprint of packaged drinks vs tap water	Greenhouse gas emissions, energy use, water use, packaging waste	Implicitly considers affordability and access for students and staff	Baseline beverage mix vs scenarios with stronger healthy-beverage and tap-water policies	Scenarios promoting tap water and reducing SSBs/bottled drinks substantially cut GHG emissions and waste while supporting healthier choices	Campus-level bottle-to-tap policies can deliver health and climate co-benefits; universities are important testbeds
Cifelli et al. (2022), diet-modelling study	Individual diet level; national U.S. data; partial	Not primary outcome; some scenarios	Diet cost and affordability indicators	Diets with dairy vs non-dairy replacements	Certain replacement patterns may increase diet	Climate-smart healthy-beverage

Study (Author/Year, Type)	System boundary & perspective	Key environmental indicators	Equity/economic indicators	Scenario or intervention compared	Main findings	Policy-relevant messages
	environmental perspective	implicitly shift from dairy to plant foods and water, affecting climate footprint		(including water and other beverages)	cost while affecting nutrient adequacy and climate burden	policies should consider affordability and nutrient implications, not only emissions
Karnaningroem & Pradana (2021), HACCP risk-management study	Bottled drinking-water (BDW) production chain; factory to consumer	Microbiological and chemical hazards at critical control points	Consumer protection, regulatory compliance, potential cost of upgrading controls	Existing BDW practices vs HACCP-based risk-minimisation system	HACCP implementation highlights vulnerabilities in BDW safety that may not be apparent to consumers	Regulatory strengthening of both BDW and tap water can shift perceived and actual safety balance, reducing unnecessary bottled-water dependence
Siriwardhana et al. (2018), CKD water-source pilot	Household and community drinking-water systems in CKD-endemic Sri Lankan areas	Not quantified; underlying issue is environmental toxin exposure via water	Disease burden concentrated in rural agricultural communities; equity concern around access to safe water	Previous contaminated sources vs new quality-controlled water supply	Suggests environmental contaminants in drinking water contribute to CKD burden; improved water can reduce progression	Environmental remediation and safe public water supplies are critical equity measures, reducing disease burden without requiring expensive bottled water
Strazza et al. (2016), LCA case study	Product-system boundary defined by Environmental Product Declarations; infrastructure or product example	Lifecycle impacts (GHG emissions, energy use, resource depletion)	Not directly analysed; methods applicable to public vs private infrastructure comparisons	Different approaches to sourcing LCA data (EPDs vs databases)	Shows how choice of LCA data source affects estimated impacts	Transparent, standardised LCA methods are needed when comparing environmental performance of tap-water

Study (Author/Year, Type)	System boundary & perspective	Key environmental indicators	Equity/economic indicators	Scenario or intervention compared	Main findings	Policy-relevant messages
						infrastructure vs bottled-beverage systems
McFarland (2016), environmental-justice report	City-level water system in Flint, Michigan; municipal perspective	Indirect: environmental contamination (lead) and infrastructure decisions	Disproportionate exposure of low-income and minority residents; legal and political accountability	Management of municipal water supply and source changes vs consequences for residents	Highlights how cost-driven decisions and poor oversight led to severe contamination and loss of trust in tap water	Bottle-to-tap promotion is impossible without trustworthy governance and regulatory enforcement ensuring safety for all
Talebi et al. (2014), chromatography method paper	Laboratory methods for biopharmaceutical analysis, with potential application to water/beverage matrices	Analytical performance (resolution, sensitivity) for complex mixtures	No explicit equity or economic analysis	Comparison of chromatographic approaches for monoclonal antibodies	Improves analytical separation and characterisation capabilities	Indirect relevance: similar state-of-the-art analytical methods, when applied to water/beverage matrices, could refine contaminant monitoring
Rodríguez-Villamil et al. (2013), mixed-methods community study	Household and community water-access context in Turbo, Colombia	Not quantitative environmental footprint; focuses on availability and reliability of water	Examines how water scarcity disproportionately affects feeding practices of vulnerable families	Everyday experiences of intermittent or insufficient water supply	Water scarcity shapes food and beverage practices, often to the detriment of nutrition	Water-security improvements are a prerequisite for equitable implementation of healthy beverage and bottle-to-tap strategies
Smedman et al. (2010), nutrition–climate modelling	Beverage system at population level; cradle-to-gate climate impacts	Greenhouse gas emissions per unit beverage and per unit nutrient	Not central; some consideration of typical consumption across groups	Different beverages (water, milk, juice, soft drinks) compared for nutrient density vs	Water has negligible climate footprint but no nutrients; nutrient-dense beverages vary widely in impact	Policy must integrate health and climate when recommending beverage patterns; tap water is key

Study (Author/Year, Type)	System boundary & perspective	Key environmental indicators	Equity/economic indicators	Scenario or intervention compared	Main findings	Policy-relevant messages
				climate impact		for hydration with minimal climate cost

Discussion

This systematic review identifies four key conclusions regarding interventions that promote tap water over bottled drinks. First, successful strategies include multi-component approaches emphasizing water infrastructure, education, pricing, and regulations to enhance the visibility and accessibility of tap water. Second, behavioral aspects, particularly perceptions of safety and taste, play a significant role in transitioning to tap water, heavily influenced by socio-demographic factors. Third, substituting bottled beverages with tap water correlates with improved health outcomes, such as reduced sugar intake and positive weight changes, despite limitations in clinical data. Lastly, this transition can significantly reduce greenhouse gas emissions and resource consumption, although the benefits may differ among various socio-economic and racial groups. The review emphasizes the necessity for interventions that integrate nutritional health, water governance, environmental sustainability, and health equity, urging further long-term, theory-based research to assess the broader implications of these policies.

CONCLUSION

This systematic review synthesised evidence on interventions that aim to shift beverage intake from bottled drinks and sugar-sweetened beverages towards tap or plain water across diverse settings and populations. Four overarching conclusions emerge. First, effective bottle-to-tap strategies are multi-component and systems-oriented, combining improvements in water infrastructure and quality control with communication, education, pricing, and regulatory measures. Household, school, campus, community, and clinical interventions collectively show that when safe, palatable tap water is made visible, convenient, and socially normative, it can displace both bottled water and sugar-sweetened beverages.

Second, behavioural mechanisms and contextual modifiers are central rather than peripheral. Perceived safety, taste, convenience, and social norms consistently mediate intervention effects, while baseline water-quality conditions, historical contamination events, and socio-demographic position strongly modify who is able and willing to switch from bottled drinks to tap water. These findings confirm that trust in water utilities, governance arrangements, and water security must be treated as core determinants of beverage behaviour.

Third, available evidence points towards broadly favourable health and nutrition implications when bottled drinks and sugar-sweetened beverages are replaced with tap or plain water. Short-term intervention studies show reductions in energy and added-sugar intake, and longitudinal work suggests more favourable weight and waist trajectories among higher water consumers, although robust data on metabolic and clinical outcomes remain limited. Fourth, life cycle modelling and environmental-justice analyses indicate that bottle-to-tap transitions can substantially reduce greenhouse gas emissions, resource use, and packaging waste, but that these gains are contingent on safe public supplies and may be unevenly distributed across socio-economic and racial or ethnic groups.

Taken together, the findings demonstrate that bottle-to-tap interventions occupy a strategic nexus between nutrition, water governance, environmental sustainability, and health equity. The review contributes to existing knowledge by integrating these domains within a single conceptual

and empirical synthesis, highlighting the need for interventions that are simultaneously technically robust, behaviourally informed, environmentally responsible, and equity-sensitive. Future research should prioritise long-term, theory-driven evaluations and integrated assessments that quantify health, environmental, and distributional impacts of large-scale bottle-to-tap policy packages.

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