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THE ETHICAL QUANDARY OF WATER FLUORIDATION

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Abstract: *Water fluoridation is a population –level public health intervention widely endorsed by health authorities; it's ethical justification remains contested. Water fluoridation is considered scientifically safe and effective by the proponents of water fluoridation. However, the opponents of water fluoridation regularly raise concerns about efficacy and ethics of water fluoridation which culminates in a debate.*

This paper is an attempt to elucidate on the key issues of the ethical considerations of water fluoridation, based on the principles of bioethics. In particular, it raises questions about which of the competing values of the health authorities, the community, and the individual values; one must uphold in the consideration of fluoridation of the water.

This paper provides a perspective on the key principles of bioethics regarding the pros and cons of water fluoridation, highlighting the considerations of non-maleficence, beneficence, autonomy and justice. The justificatory and the stewardship model are two types of ethical frameworks used to evaluate public health interventions. The application of ethical frameworks in the evaluation of water fluoridation in a particular place, are discussed in this paper.

An intervention such as water fluoridation explicates the benefits of equity and justice as it ensures that the opportunity to be free from caries and dental morbidity is distributed equally among all members of society. This paper concludes that continuing the practice of water fluoridation for the prevention of caries and dental morbidity, can be ethically justifiable, and provided a balanced and progressive approach is applied, underpinned by strong scientific evidence.

Keywords: *Water Fluoridation, Bioethics, Dental caries, Ethical Frameworks.*

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INTRODUCTION

Water fluoridation is a widespread method of delivering fluoride systemically to a large population to reduce the incidence and severity of dental caries.[1] Water fluoridation is practiced in many countries throughout the world,[2] and is considered scientifically safe and effective by the proponents of water fluoridation. Water fluoridation requires that the authorities fluoridate the water and for the population to actively use water from the fluoridated supply.[3,4] Public water fluoridation has been celebrated as one of the greatest successes in public health in the twentieth century for its success in preventing and controlling dental caries,[1, 4] however it is increasingly coming under scientific, policy, and ethical scrutiny.

ANTI-FLUORIDATION

Recently there has been a growing resistance to water fluoridation, with opponents to water fluoridation questioning the efficacy and effectiveness of water fluoridation.[5, 6] Opponents to water fluoridation challenge the water fluoridation proponents belief that water fluoridation benefits outweigh the risks as this has been subject to considerable scientific debate, which has intensified recently due to the readily availability of fluoridated toothpaste.[6,8,9]

Opponents cite scientific reports which highlight concerns regarding the safety, fluorosis and possible negative health effects of water fluoridation and advocate for fluoridation to be discontinued from communities where it has been implemented.[7,8,9] The major contentious issue surrounding the water fluoridation debate are the moral and ethical arguments,[7,9,10] which questions if it is morally and ethically justifiable to administer a potentially harmful chemical via public utilities, without individual consent? Opponents of water fluoridation assert that public health authorities undermine the individual's right to choose by fluoridating public water and this policy provides no mechanism for opt-out except through purchasing alternate water sources or intentional filtration initiatives.[8, 9, 10]

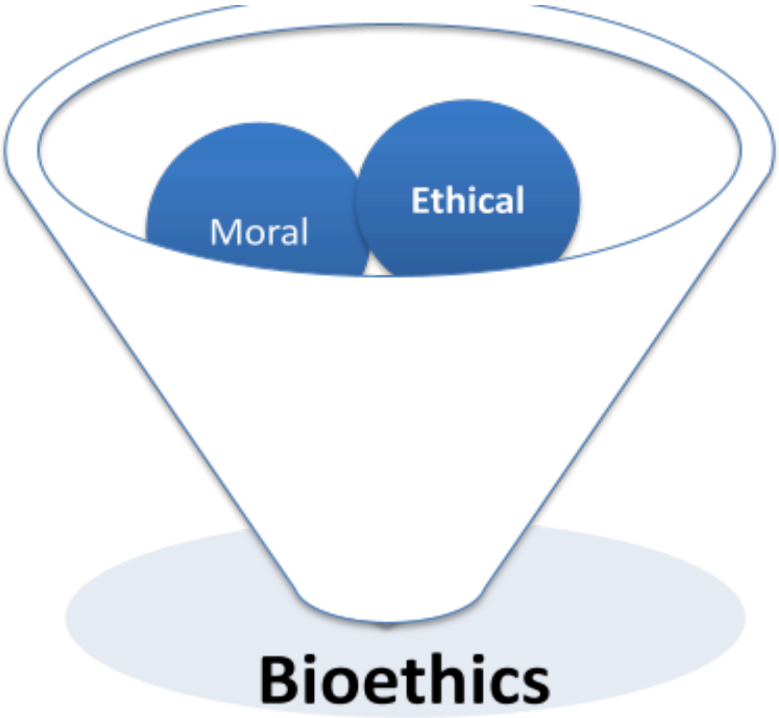
PRO-FLUORIDATION

Proponents of water fluoridation maintain that it has been scientifically proven that water fluoridation is a safe and effective public health intervention,[11] Proponents indicate that research proves that water fluoridation plays a significant role in reducing health inequities by preventing disease at the lower end of the income distribution.[11] Pro-fluoridation scientists regularly report the benefits of community water fluoridation and encourage authorities to fluoridate as needed,[12,13]since water fluoridation treats all individuals identically, irrespective of personal preferences, age or preexisting conditions.[12,13,14] Proponents further emphasize the compulsion for health professionals , authorities, and the public to be informed and guided in water fluoridation advocacy and debating.[11,13,14]

BIOETHICS

Bioethics is the study of human well-being encompassing the moral, socio- political and ethical issues that manifest from the life sciences [15, 16] [Figure I].

Figure I. Bioethics

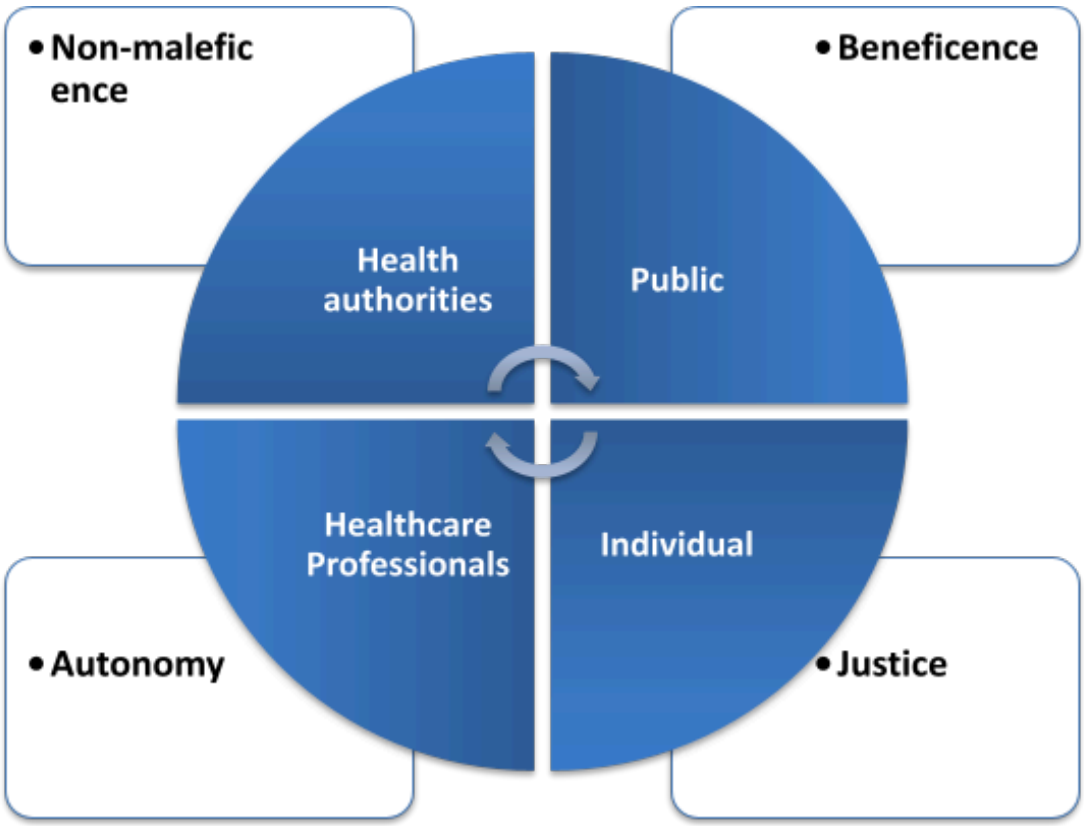


The ethics of water fluoridation debate is a dynamic of science and power divided between pro-fluoridation and anti-fluoridation and even if the efficacy and effectiveness of water fluoridation was proved beyond reasonable doubt, water fluoridation as a public health strategy would still be subject to a moral and ethical debate .[10,17]
This moral debate is fueled by attitudes towards public health initiatives which are informed by our values and culture [15,16,19] Beauchamp and Childress state that the four basic principles of bioethics that ideally must be respected for an intervention to be considered "ethical" and these are: non-maleficence, beneficence, autonomy, and justice.[15,16]

BIOETHICS IN HEALTHCARE

Bioethics in healthcare is the study of ethical, social and legal issues that arise in healthcare and is grounded on the founding principles of non-maleficence, beneficence, autonomy, and justice.[15,19,20] These founding principles typically govern the interaction and decision making between health authorities, healthcare professionals, the public and the individual within the existing contexts [3,16] [Figure II].

Figure II. Bioethics in healthcare



NON-MALEFICENCE

Non-Maleficence is the principle of doing no harm to persons or society, [15,20] and the intention of water fluoridation is not to do harm, but rather to do good. Health authorities that make the decision to fluoridate water believe they are minimizing harm and pursuing the greater good of reducing the socioeconomic morbidity of dental caries in society.[24,25,26] Proponents emphasize that benefits to society from water fluoridation far outweigh the possible negative consequences of fluorosis, and other conditions[25,26]

BENEFICENCE

Beneficence is the principle of doing good and signifies an obligation to benefit others or seek their good, and its application is relative to the recipient of the good deed.[14,15] Opponents argue that, in advocating for the addition of fluoride to drinking water, health authorities are making moral decisions about the well-being of individuals often relative to their own perceptions of good, [16,17] whereas the basis of beneficent acts must be embedded in the preferences, perceptions, and values of self-determining, autonomous individuals.[10,21] The

implementation of water fluoridation is considered by proponents, as a moral choice determined by the health authorities, regarding the welfare of the population, by applying the principle of beneficence to improve the oral health, social and economic status of the population.[8,10,13] This is underlined by the fact that dental caries has the potential to develop into serious and sometimes life-threatening infections that can cause immense pain and suffering in people. [10,13] The proven benefit of tooth exposure to fluoride from water fluoridation is the reduction in the prevalence and severity of dental caries which is a socio economic benefit to society.[10,13] Proponents further emphasize that socio economic benefit of water fluoridation is based on its ability to significantly reduce caries and dental morbidity, which also eliminates the need for expensive treatment during a person's lifetime, thus saving the enormous cost of dental treatment and consequently reducing the public health burden.[4,10, 22]

AUTONOMY

Autonomy highlights the capacity of an individual to make informed, self-directed decisions and act on those decisions without undue external influence.[15] It is a fundamental principle that emphasizes respect for a person's right to self-determination and their ability to make choices about their own life, including healthcare, personal values, and actions.[15,19] Opponents contend that water fluoridation is ethically and legally inappropriate since it involves medicating an entire population via the water supply without explicit consent and thus undermines the principle of autonomy.[8,10] Opponents argue that it is costly for individuals to opt out of a water fluoridation public health strategy, and hence water fluoridation does not uphold the principle of autonomy.[16, 17, 18]

The balance beneficence and autonomy are considerably complicated when proponents attempt to strike a balance between moral autonomy given that research has indicated that water fluoridation is beneficial however, it but could also be regarded as the involuntary medication of populations.[15,16] Opponents point out that fluoride is available from other sources, such as toothpaste, fluoride mouth rinses and, the alternate option of salt fluoridation can be implemented thus its benefits can be realized without violating the principle of autonomy. [17, 21] However, proponents argue that this presumes that everyone in society can access these alternative sources and this discriminates against the most vulnerable members of society who, would surely miss out on the benefits of fluoride.[8,13] The point of reference for proponents is society and the benefits accruing to society through reductions in dental caries which outweighs any perceived infringement to individual autonomy.[4,13]

The competing values of the health authorities, the community and the individual must be considered in order for an informed decision to be made on water fluoridation. The conflict of beneficence and autonomy remains unresolved in the case of water fluoridation despite the societal benefit for those most at risk for dental caries and the minimal risk of increasing the prevalence and severity of fluorosis.[7,9,11] Proponents point out that contrary to what is suggested, by opponents, fluoride is not a drug and water fluoridation is not mass medication as fluoride has the similar benefits as a nutrient.[21]

JUSTICE

Justice designates the social cooperation between different people with competing needs and demands and the subsequent fair distribution of burdens and benefits.[13,14] Distributive justice entails the specification of the weight to be given to various kinds of relevant considerations and the provision of an acceptable description of the standpoint from which judgments are formed. [15, 16, 3]

Distributive justice would provide an explanation or understanding of the political justification of water fluoridation [6,17] as not everyone in society can afford or have access to these alternative fluorides , thus making it ethically and morally wrong to suggest that people must use the other options to obtain the benefits of fluoride.[11,30] To ensure equitable distribution of social goods, considerations of equality, fairness, justice, entitlement, efficiency, and community are prioritized,[11,12,30] and an intervention such as water fluoridation ensures that the opportunity to be caries-free is distributed equally among all groups in society [11,29,30] Water fluoridation satisfies the fair distribution. A

further consideration in this regard is its effectiveness in caries prevention which reduces the need for expensive treatments, thus freeing up financial and other resources for other programs that would have been used to treat dental caries. [15, 16, 19]

DISTRIBUTIVE JUSTICE

Distributive justice emphasizes fair allocation of benefits and the burdens are fairly distributed among the stakeholders. In the case of community water fluoridation, not only professionals in oral health, but also diverse stakeholders such as bioethicists, public health advocates, human rights activists, and environmentalists should be encouraged to participate in the decision-making process.[19, 30, 31]

Procedural justice enables decision making that is acceptable to the community through considering and evaluating the diverse options available.[30] According Song et al. procedural justice, maintenance of trust and, social contexts are necessary for the ethical justification of the public health intervention such as water fluoridation.[30] Procedural justice that is implemented with accountability for reasonableness, can be a means to resolve the issue of infringement by water fluoridation and the integration of maintenance of trust and social contexts can allow water fluoridation to be transparently communicative for the dental profession and apt for the community.[30,31]

INFORMED CONSENT

Opponents contend that through compulsory water fluoridation schemes, public health officials have been conducting community experiments for nearly sixty years, and a major flaw in these experiments have been a lack of informed consent due to non-disclosure of the risks, benefits, and alternative treatment options to fluoridate.[27,28,29]

The Nuremberg Code is a set of ethical research principles for human experimentation published in 1947.[32] The Nuremberg Code enunciates the requirement of voluntary informed consent of the human subject is absolutely essential in research and routine medical procedures, and the subjects must be fully informed of the risks and benefits of the medical procedures in which they are involved.[32]

The capacity to comprehend the relevant information, and the ability to understand the nature of a situation and its possible repercussions, and the skill to reason through the information, and weigh the options logically; and the capability to communicate the choice enables an individual to give informed consent.[33,34,35] Informed consent is compromised when inadequate information is provided or is difficult to comprehend or it is highly technical, or legalistic.[33,34,35]

Opponents suggest that water fluoridation constitutes a form of mass medication implemented without the regulatory and ethical oversight typical of pharmaceutical interventions. Unlike prescription drugs, fluoride administered via drinking water does not undergo dose individualization, safety screening, or monitoring for side effects.[27,28,29] Cross and Carton point out that fluoride is a medicine however; fluoride is not governed by the Nuremberg Code, rendering it unethical.[36] The authors assert that there is a problem of deception in water fluoridation, as passive consumption prevents the consumer from being fully informed of the risks and benefits thus consent is usually compromised.[36]

HARMS

While the traditional view portrayed water fluoridation a clear-cut choice between benefits and harms, modern considerations suggest the decision is more complex due to evolving evidence on its effectiveness and potential risks. In recent times policy-makers are not always presented with a clear cut moral choice when considering the benefits and harms associated with water fluoridation. Earlier water fluoridation studies indicated a substantial favourable outcomes[37,38] however; recent studies indicate that the effects of water fluoridation are

reduced. [39-41] Recent studies report that there is little evidence that water fluoridation reduces social inequalities in oral health, though water fluoridation continues to be beneficial.[8, 18,40, 41]

FLUOROSIS

Dental fluorosis is the result of systemic overexposure to fluoride caused by a prolonged ingestion of high doses of fluoride at 2 ppm or higher.[42,43,44] An optimum fluoride intake of 1 mg/day (from one litre of 1 ppm fluoridated water) ,[43,44] was initially suggested, however there is no safe limit for fluoride ingestion in relation to dental fluorosis. [42,43,44] This is compounded by the introduction of new sources of fluoride through dental care products, processed foods, and commercial beverages, but fluoridated levels exceeding 0.3 ppm (3 mg/day) have been associated with teeth mottling and discolouration.[43, 44, 45]

Chronic fluoride ingestion or inhalation of large amounts of fluoride has been associated with cases of skeletal fluorosis,[42] a chronic metabolic bone disease and is also commonly associated with hyperkalaemia,[46] and consequent ventricular fibrillation.[47] It has also been reported that high doses of sodium fluoride for osteoporosis treatment may increase the risk of vertebral fractures neither does an increase in bone mass due to fluoride ingestion or treatment (for osteoporosis) does not translate into improved bone strength.[46,47] The potential threat of fluorosis and the risk of other systemic conditions adds weight to the opponents argument.

OPT-OUT

A number of recent studies have questioned whether water fluoridation is effective with studies suggesting negligible differences in the level of dental caries between children who drink fluoridated water as compared to those who drink non-fluoridated water.[8,22,23] Opponents believe that dentists should dismiss the misconception that there is a balance between dental caries and fluorosis, because patients can accrue the benefits of topical fluorides without developing fluorosis and without systemic intake.[9,23]

Opponents point out that disadvantaged groups bear a disproportionate burden as they are least able to avoid fluoride exposure when they desire to opt out of water fluoridation.[12,14,18] Reliance on bottled water and water filters to remove fluoride from their drinking water such as reverse osmosis systems is expensive.[21,22] Opponents further argue that fluoridation may inadvertently deepen health inequities rather than reduce them especially, as in most cases, the costs of opting out is for the individuals account however; proponents argue that water fluoridation is to protect disadvantaged groups, who are less likely to access professional dental care or fluoridated toothpaste.[21,22,23]

BENEFIT MEASURES

Klugman ethically appraised fluoridation by applying principilism using concepts of efficacy, solidarity, integrity and dignity.[48] Klugman suggested that efficacy, which refers to an interventions scientific rigor and its ability to attain objectives, may be vague and questions whether it is feasible in the prevailing political and social climate, while acknowledging its evidence of effectiveness.[48] In terms of solidarity which refers to how the community comes together he saw fluoridation as favourable for solidarity. Integrity considers inclusion of the community and was found to be blurred as it depends on the level of community engagement in decision-making.[48] Dignity which refers to respecting the community using the least restrictive principle was found to be unclear as there are other, less restrictive means of fluoride delivery.[48] These shortcomings in upholding community engagement and community engagement lends credence to the opponents argument. In a different approach, Ateş and Özer considered the ethical arguments related to fluoridation with focus on the impacts of different social, cultural and religious philosophies in Turkey.[49] In consideration of autonomy, they questioned whether responsibility should be shared, individual, professional, or state, concluding that the crucial importance of any policy includes

both ongoing engagement with the public and the transparency of government intent,[49] which further amplify the views of opponents.

COST - BENEFIT ANALYSIS

American Dental Association in commemorating the 60th anniversary of community water fluoridation reiterated the stance that studies prove water fluoridation continues to be effective in reducing tooth decay by 20–40%,[50] though it was noted that earlier studies [4,18,39], showed that water fluoridation reduced the amount of cavities in primary teeth as much as 60% and reduced tooth decay in permanent adult teeth nearly 35%. [50]

Recent studies, such as the LOTUS[8] and CATFISH[51] studies shed more light on the cost effectiveness of water fluoridation compared to past studies[4,18,39] that were conducted prior to the availability of fluoride toothpaste. [8, 51] The LOTUS study (fLuOridaTion for adUltS) investigated the cost-effectiveness of water fluoridation and its clinical outcomes such as mean DMFT, missing teeth and number of invasive treatments using a natural experiment design.[8] This study found the mean DMFT was 2% lower in the optimally fluoridated group, invasive treatments were less in the optimally fluoridated group, the number of NHS fillings and extractions received was 3% lower in people who received fluoridated water and that there was no difference in numbers of missing teeth between groups.[8] This study concluded water fluoridation made a very small difference to each person between 2010 and 2020, neither did the DMFT exhibit the expected relationship with social gradient.[8] The CATFISH (Cumbrian Assessment of Teeth a Fluoride Intervention Study for Health) study was to address the cost-effectiveness of community water.[51] The CATFISH study concluded that the prevalence of caries and the impact of water fluoridation was much smaller than previous studies such as the York and Cochrane reviews [52,53] have reported, and has a small beneficial impact on preventing caries in the primary dentition.[51] This reduction in effectiveness is likely to be due to the low caries prevalence seen following the widespread use of toothpaste containing fluoride.[51] The LOTUS and CATFISH studies concluded that water fluoridation remains a cost saving public health intervention further supporting the argument of proponents.[8,51]

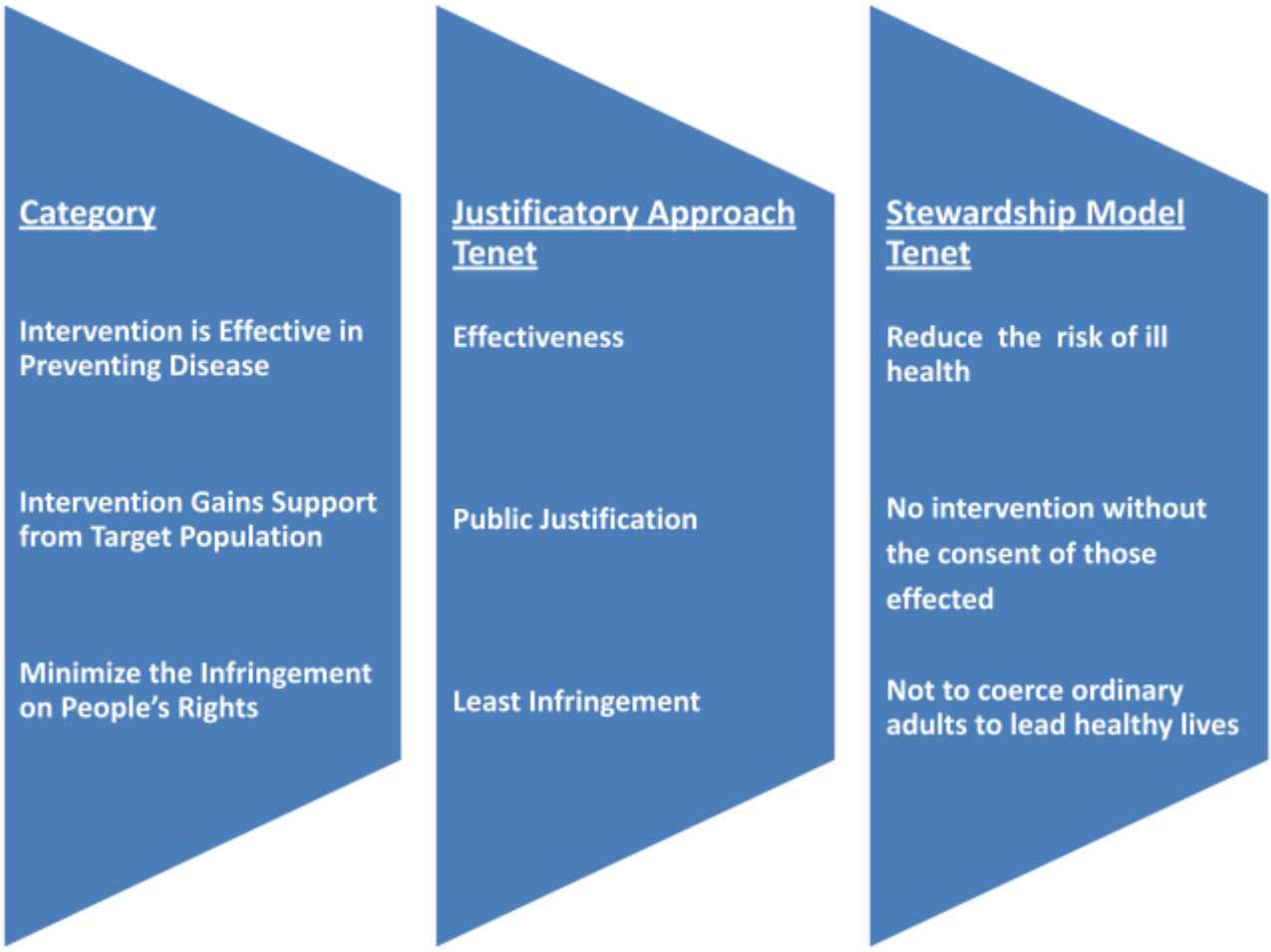
Duane et al compared life cycle assessment (LCA) data for fluoride varnish in schools, supervised tooth brushing and the provision of toothbrushes and toothpaste.[53] The authors concluded that water fluoridation had the lowest environmental impact in all 16 categories and had the lowest disability-adjusted life year's impact. This makes the option of water fluoridation more acceptable if supported by valid cost and clinical effectiveness data.[53] A recent Cochrane review[54] concluded that water fluoridation can lead to small improvements in oral health, though it is only one of the options and not necessarily the most appropriate for all populations.[54] They further concluded it does not address the underlying issues such as high sugar consumption and inadequate oral health behaviours,[54] adding further supporting to the proponent stance.[54]

ETHICAL FRAMEWORKS

A range of approaches have been taken to appraise the ethics of fluoridation in the literature[18] and, the *justificatory approach* of James Childress[19] and the *stewardship model approach* of the Nuffield Council on Bioethics,[20] are two types of ethical frameworks used to evaluate public health interventions.[21]

The justificatory approach upholds of the following tenets: effectiveness, proportionality, necessity, least infringement and public justification.[19,21] The stewardship model considers these principles: reduce the risk of ill health, address the health of children, reduce health inequalities, not intervene without the consent of those affected, minimize the interventions that affect important areas of personal life and not coerce ordinary adults to lead healthy lives[20, 21] [Figure III] .

Figure III. Justificatory approach and Stewardship model tenets



The justificatory approach and stewardship models overlap and to some extent agree, even though they are fundamentally different. The stewardship model places a particular interest in the health of children and focuses on health inequalities in the population.[19,20,21] Despite these differences, ethical analyses of water fluoridation shows that similar, even identical frameworks can lead to opposite ethical judgments. In the consideration of coercion, water fluoridation is inherently not coercive as it does not require any changes in standard of living or way of life,[22] however the coercion argument against public water fluoridation is supported by the availability and near universal, non-coercive use of fluoridated toothpaste.[22,23] In addition, evidence within the past decade has shown that low chronic daily intake of fluoride is a health risk associated with dental fluorosis and unhealthy fluoride accumulation levels within the body.[23] The argument for water fluoridation though once hailed as a public health success with noble intentions,[4] has been substantially weakened by newer evidence indicating that fluoride's primary benefit is topical and not systemic and that its ingestion could carry significant risks.[10,23]

UTILITARIANISM

Utilitarianism considers acts and omissions that benefit few people and harm more people as morally wrong, while acts and omissions that harm fewer people and benefit more people, are considered morally right.[15,16] In making the case for water fluoridation, a reduction in dental caries and its associated socioeconomic morbidity in society is an action that produces more pleasure or happiness than pain or unhappiness.[13] Water fluoridation has been championed to produce an increased net benefit that far outweighs the possibility of developing fluorosis, which occurs very rarely and is treatable.[1,13,27]

TRANSPARENCY

Transparency is a proactive choice to provide awareness into processes and intentions, which instills better understanding in relationships and processes. Transparency plays a pivotal role in reaching a legitimate conclusion through pluralistic democracy and is a key concept of public justification,[19,55] therefore democratic decision-making with transparency and participatory discussion is, by all means, the premise to resolving conflicts in values.[19, 55, 56] Transparency entails a proper appraisal of the benefits and risks and opponents assert that there is a lack of transparency regarding the benefits and risks of water fluoridation and suggests that the benefits of water fluoridation are exaggerated and the risks are minimized particularly by the characterization of dental fluorosis as a "cosmetic" problem.[20,21]

TRUTHFULNESS

Truthfulness is a fundamental ethical principle, which emphasizes the need for accuracy and honesty in communication and actions.[19,20] It requires individuals to provide truthful information to those who have a right to know, and to avoid deception or misrepresentation.[19,20] The principle of truthfulness, emphasizes that health authorities and policymakers have a duty to be honest with society,[16,31] and it would appear that both proponents and opponents appear to be presented with a delicate moral choice when weighing the benefits and harms associated with water fluoridation.[21]

Current studies indicate that water fluoridation continues to be beneficial,[24,26,28] though there has been reports of a marked reduction in rates of dental caries in some communities.[23,27] The availability of high-quality evidence with respect to the benefits and risks of water fluoridation, the moral status of advocacy for water fluoridation can be considered to be justifiable, however water fluoridation overrides individual consent and imposes risk if implemented without mechanisms for opt-out.[23,27,28]

EQUITY

Equity compels that fair distribution of scarce resources, taking into account the competing needs of society, rights and responsibilities of society, and potential conflicts within existing legislation.[15,16] Proponents contend that water fluoridation promotes social equity considering the benefit that it brings to disadvantaged groups in society,[29] and supplies should be fluoridated on the grounds that everyone, regardless of socioeconomic status can benefit.[27,28,29]

Dental caries is a major global public health problem affecting 60–90% of schoolchildren and the vast majority of adults and the World Oral Health Report 2003 concluded that water fluoridation reduces the prevalence of dental caries by about 15% [57] further reinforcing the fluoridation position.

Proponents argue that not everyone can afford or have access to fluoride, particularly the most vulnerable groups in society who are most affected by non-fluoridation and cannot afford fluoride supplements,[3,13, 22] They

further argue that the societal benefits of reducing dental caries outweigh any infringement on individual sovereignty.[3,13]

CONCLUSION

These themes illuminate the complexities of water fluoridation and highlight the imperativeness of the public health authorities, the community and oral health professionals, to make a properly informed decision whether or not to fluoridate, and if so, at what level, on the basis of their own values, regarding the balance of benefits and risks.

Water fluoridation presents a very ethically and morally controversial public health intervention and proponents maintain that the complex nature of public healthcare creates a landscape where authorities have limited ability to enact broader changes that could address oral health disparities and reliance on proven population-wide measures becomes inevitable. Opponents however suggest that public health authorities should refrain from taking coercive action upon those with less power instead of employing preventative or structural interventions that could meaningfully address oral health. Despite this community water fluoridation is endorsed by the World Health Organization (WHO), the US Public Health Agency, NHS, most dental organizations and public health authorities, as a safe and effective method of reducing dental caries. Water fluoridation is governed by principles of bioethics and is delivered en masse to populations rather than individuals and any ethical or moral challenges need to be adjusted for context. It is imperative for health authorities to recognize the competing needs, the rights and responsibilities of the individual and society, which are subject to potential conflicts within existing laws, such as the right to self-determination, which is a constitutional right in most countries.

Public health paternalism, even if it would make people better off, must consider any undue infringement on autonomy, though in consideration of the benefits of water fluoridation a small loss of autonomy could be justified for the sake of gains in oral health improvement. Ethical considerations of involuntary fluoridation raise questions regarding consent, autonomy, public health governance and risk. Public health governance questions whether it is appropriate for governments to administer a biologically active compound to entire populations without individual consent despite the possibility of substantial health risks. This further highlights the principle of informed consent as fluoridation of public water by public health authorities undermine the individual's right to choose regarding consuming a pharmacologically active substance irrespective of preexisting conditions, personal preferences, or age. The principle of informed consent is one of the key tenants of modern bioethics, especially in the context of medical or quasi medical interventions, thus water fluoridation requires continuous updating the public, based on the latest scientific evidence. Respect for bodily autonomy and transparent risk communication are cornerstones of modern public health ethics thus, interventions and policies that obscure risks or impose irreversible exposures without consent, run counter to these principles. The justification of water fluoridation with the expectation of societal approval requires consideration of the contextual information and careful consideration of the ethical issues and moral implications which must be subjected to scientific scrutiny.

Public health policy, however noble, is not absolute but is relative to the circumstances and it is more the case in the consideration of water fluoridation which has its complicit ethical dilemmas. A balanced and progressive approach, underpinned by strong scientific evidence, must be applied in attempts to justify water fluoridation as a public health measure. Furthermore, different stages of societal progress necessitate a different perspective of policy and practice, and with regards to water fluoridation incorporating scientifically sound evidence to address the ethical and moral issues is imperative. It is suggested that further research needs to be undertaken regarding the caries experience of various communities to elucidate further information on the benefits and risks of fluoridation, the possibilities of alternate fluoride sources and a caries vaccine.

REFERENCES

1. Aoun, A., Darwiche, F., Al Hayek, S., & Doumit, J. (2018). The Fluoride Debate: The Pros and Cons of Fluoridation. *Preventive nutrition and food science*, *23*(3), 171–180. https://doi.org/10.3746/pnf.2018.23.3.1712.

2. Madléna M, Lipták L. Prevention of dental caries with fluorides in Hungary. *Paediatrics Today.* 2014;10:84–94. doi: 10.5457/p2005-114.94. [CrossRef] [Google Scholar]

3. O'Mullane DM, Baez RJ, Jones S, Lennon MA, Petersen PE, Rugg-Gunn AJ, Whelton H, Whitford GM. Fluoride and oral health. *Community Dent Health.* 2016;33:69- 99. [PubMed] [Google Scholar]

4. Centers for Disease Control and Prevention. Achievements in public health, 1900–1999: fluoridation of drinking water to prevent dental caries. *JAMA*. 2000;283:1283–6. Article Google Scholar

5. Shaw D. "Weeping and wailing and gnashing of teeth: the legal fiction of water fluoridation," *Medical Law International*, vol. 12, no. 1, pp. 11–27, 2012.View at: Google Scholar

6. Awes N. "Ethics of artificial water fluoridation in Australia," *Public Health Ethics*, vol. 5, no. 2, pp. 161–172, 2012.View at: Google Scholar

7. Peckham S."Slaying sacred cows: is it time to pull the plug on water fluoridation?" *Critical Public Health*, vol. 22, no. 2, pp. 159–177, 2012. | Google Scholar

8. Moore D, Nyakutsikwa B, Allen T, et al. How effective and cost-effective is water fluoridation for adults and adolescents? The LOTUS 10-year retrospective cohort study. *Community Dent Oral Epidemiol.*2024;52:413-423. doi:10.1111/cdoe.12930

9. Peckham S, Awes N (2014) Water fluoridation: a critical review of the physiological effects of ingested fluoride as a public health intervention. *ScientificWorldJournal* 2014:293019. https://doi.org/10.1155/2014/293019

10. Karim Chubin. (2025). Water Fluoridation Reconsidered: Minimal Benefits, Mounting Risks, and Ethical Dilemmas. *The American Journal of Medical Sciences and Pharmaceutical Research*, 7(05), 06–13. https://doi.org/10.37547/tajmspr/Volume07Issue05-02

11. Slade GD, Sanders AE. Two decades of persisting income-disparities in dental caries among US children and adolescents. *J Public Health Dent*. 2018;78(3):187-191. doi:10.1111/jphd.12261PubMedGoogle ScholarCrossref

12. McLaren L, Emery JC. Drinking water fluoridation and oral health inequities in Canadian children. *Can J Public Health*. 2012;103(7)(suppl 1):eS49-eS56.PubMedGoogle Scholar

13. Centers for Disease Control and Prevention. Recommendations for using fluoride to prevent and control dental caries in the United States. *MMWR Recomm Rep.* 2001;50:1–42

14. Mariño, R., Zaror, C. Economic evaluations in water-fluoridation: a scoping review. *BMC Oral Health* 20, 115 (2020). https://doi.org/10.1186/s12903-020-01100y

15. Beauchamp TL, Childress JF. Principles of biomedical ethics. New York (NY): *Oxford University Press*; 2009. pp. 162–4.

16. Varkey Basil Principles of Clinical Ethics and Their Application to Practice , *Med Princ Pract* 2021;30:17–28DOI: 10.1159/000509119

17. Diesendorf M, Colquhoun J, Spittle BJ, Everingham DN, Clutterbuck FW. New evidence on fluoridation. *Australian N Z J Public Health* 1997; 21(2):187-90.

18. Patel B, Dyer TA. The ethics of community water fluoridation: Part 2 – how has the ethics of community water fluoridation been appraised in the literature? A scoping review *British Dental Journal* | Volume 238 No. 5 | March 14 2025

19. Childress J.F., Faden R.R., Gaare R.D., Gostin L.O., Kahn J., Bonnie R.J., Kass N.E., Mastroianni A.C., Moreno J.D., Nieburg P. Public health ethics: Mapping the terrain. *J. Law Med. Ethics*. 2002;30:170–178. doi: 10.1111/j.1748-720X.2002.tb00384.x. [DOI] [PubMed] [Google Scholar]

20. Nuffield Council on Bioethics (2007) *Public health: ethical issues*. London, UK

21. Shakeri, Adanty, Kugathasan. Ethical framework governing water flouridation, *Voices in Bioethics*, Vol. 6 (2020).

22. 22. Jiang Y, Foster Page LA, McMillan J, et al (2014) Is New Zealand water fluoridation justified? *N Z Med J* 127:80–6 30.

23. Warren JJ, Levy SM, Broffitt B, Cavanaugh JE, Kanellis MJ, Weber-Gasparoni K. Considerations on optimal fluoride intake using dental fluorosis and dental caries outcomes—a longitudinal study. *Journal of Public Health Dentistry*. 2009;69(2):111–115. doi: 10.1111/j.1752-7325.2008.00108.x. [DOI] [PMC free article] [PubMed] [Google Scholar]

24. Sanders AE, Grider WB, Maas WR, Curiel JA, Slade GD. Association Between Water Fluoridation and Income-Related Dental Caries of US Children andAdolescents.*JAMAPediatr*.2019;173(3):288290.doi:10.1001/jamapediatrics.2018.5086

25. Slade GD, Grider WB, Maas WR, Sanders AE. Water fluoridation and dental caries in US children and adolescents. *J Dent Res*. 2018;97(10):1122-1128. doi:10.1177/0022034518774331PubMedGoogle ScholarCrossref

26. O'Connell J, Rockell J, Ouellet J, Tomar SL, Maas W. Costs and savings associated with community water fluoridation in the United States. *Health Aff (Millwood)*.2016;35(12):2224-2232.doi:10.1377/hlthaff.2016.0881PubMedGoogle ScholarCrossref

27. Armfield JM. When public action undermines public health: a critical examination of antifluoridationist literature. *Aust New Zealand Health Policy.* 2007;4:25. doi: 10.1186/1743-8462-4-25. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

28. Howard Pollick (2015) Current issues in the science of community water fluoridation.https://www.ada.org/~/media/*ADA*/PublicPrograms/Files/Pollick.pdf
29. McLaren L, Emery JC. Drinking water fluoridation and oral health inequities in Canadian children. *Can J Public Health*. 2012;103(7)(suppl 1):eS49-eS56.PubMedGoogle Scholar

30. Song Y, Kim J. Community Water Fluoridation: Caveats to Implement Justice in Public Oral Health. *Int J Environ Res Public Health*. 2021 Mar 1;18(5):2372. doi: 10.3390/ijerph18052372. PMID: 33804357; PMCID: PMC7967766.

31. Calman K. Beyond the 'nanny state': Stewardship and public health. *Public Health.* 2009;123:e6–e10. doi: 10.1016/j.puhe.2008.10.025. [DOI] [PMC free article] [PubMed] [Google Scholar]

32. The Nuremberg Code, 313 *BRIT. MED. J.* NO. 7070 1448, 1448–49 (1996), available at http://www.cirp.org/library/ethics/nuremberg/, archived at http://perma.cc/RG9Q-9A7K.

33. Taiwo OO, Kass N. Post-consent assessment of dental subjects' understanding of informed consent in oral health research in Nigeria. *BMC Medical Ethics* 2009, 10-11. doi: 10.1186/1472-6939-10-11 [PMC free article] [PubMed]

34. Helgesson G, Ludvigsson J, Gustafsson S. How to handle informed consent in longitudinal studies when participants have a limited understanding of the study. *J Med Ethics.* 2005;31:670–3. 10.1136/jme.2004.009274 [DOI] [PMC free article] [PubMed] [Google Scholar]

35. Fleming DA, Reynolds D. Ethical human-research protections: Not universal and not uniform. *Am J Bioeth*. 2008;8(11):21–2. 10.1080/15265160802516864 [DOI] [PubMed] [Google Scholar]

36. Cross DW, Carton RJ (2003) Fluoridation: A Violation of Medical Ethics and Human Rights. *Int J Occup Environ Health* 9:24–29. https://doi.org/10.1179/107735203800328830

37. Burt B, Eklund S. Dentistry, dental practice and the community. 5th ed. Philadelphia: *WB Saunders Company*; 1999.

38. Lewis DW, Banting DW. Water fluoridation: current effectiveness and dental fluorosis. *Community Dent Oral Epidemiol* 1994; 22(3):153-8.

39. Locker D. Benefits and risks of water fluoridation. University of Toronto, *Community Dental Health Services Research Unit*; 1999.

40. McDonah M, Whiting P, Bradley M, Cooper J. A systematic review of public water fluoridation. *University of York: NHS Centre for Reviews and Dissemination*; 2000.

41. Hawkins RJ, Leake JL, Adegbembo AO. Water fluoridation and the prevention of dental caries. *J Can Dent Assoc* 2000; 66(11):620-3.

42. Fisher RL, Medcalf TW, Henderson MC. Endemic fluorosis with spinal cord compression. A case report and review. *Archives of Internal Medicine*. 1989;149(3):697–700. [PubMed] [Google Scholar]

43. Thylstrup A, Fejerskov O. Clinical appearance of dental fluorosis in permanent teeth in relation to histologic changes. *Community Dentistry and Oral Epidemiology.* 1978;6(6):315–328. doi: 10.1111/j.1600-0528.1978.tb01173.x. [DOI] [PubMed] [Google Scholar]
44. Mann J, Mahmoud W, Ernest M, Sgan-Cohen H, Shoshan N, Gedalia I. Fluorosis and dental caries in 6–8-year-old children in a 5 ppm fluoride area. *Community Dentistry and Oral Epidemiology*. 1990;18(2):77–79. doi: 10.1111/j.1600-0528.1990.tb00021.x. [DOI] [PubMed] [Google Scholar]

45. Molina-Frechero N, Pierdant-Rodríguez AI, Oropeza-Oropeza A, Bologna-Molina R. Fluorosis and dental caries: an assessment of risk factors in Mexican children. *Revista de Investigacion Clinica*. 2012;64:67–73. [PubMed] [Google Scholar]

46. McIvor ME, Cummings CE, Mower MM, et al. Sudden cardiac death from acute fluoride intoxication: the role of potassium. *Annals of Emergency Medicine.* 1987;16(7):777–781. doi: 10.1016/s0196-0644(87)80573-5. [DOI] [PubMed] [Google Scholar]

47. Riggs BL, Hodgson SF, O'Fallon MW, et al. Effect of fluoride treatment on the fracture rate in postmenopausal women with osteoporosis. *The New England JournalofMedicine.*1990;322(12):802809.doi:10.1056/NEJM199003223221203. [DOI] [PubMed] [Google Scholar]

48. Klugman C M. Public health principlism. *J Health Ethics* 2007; 4: 1–29.

49. Ateş A, Özer Ç. Ethical approach to fluoridation in drinking water systems of UK and Turkey. *J Agric Environ Ethics* 2017; 30: 171–178.

50. American Dental Association. ADA Statement Commemorating the 60th Anniversary of Community Water Fluoridation. Washington, DC, USA: *ADA*; 2005. [Google Scholar]

51. Goodwin, M, Emsley, R, Kelly, MP, Sutton, M, Tickle, M, Walsh, T, et al. Evaluation of water fluoridation scheme in Cumbria: the CATFISH prospective longitudinal cohort study. *National Institute for Health and Care Research*. 2022.

52. McDonagh M, Whiting P, Sutton AJ, Wilson P, Chestnutt I. A Systematic Review of Public Water Fluoridation. *BMJ* 2000.Oct 7;321(7265) :855-9doi:10.1136/BMJ.321.7265.855URL: www.york.ac.uk/media/crd/crdreport18.pdf

53. Duane B, Lyne A, Parle R, Ashley P. The environmental impact of community caries prevention- part 3: water fluoridation. *Br Dent J.* 2022;233:303–7. https://doi.org/ 10.1038/s41415-022-4251-5

54. Iheozor-Ejiofor Z, Worthington HV, Walsh T, O'Malley L, Clarkson JE, Macey R, et al. Water fluoridation for the prevention of dental caries. *Cochrane Database Syst Rev* 2015;6:CD010856.

55. Upshur R.E. Principles for the justification of public health intervention. *Can. J. Public Health.* 2002:101–103. doi: 10.1007/BF03404547. [DOI] [PMC free article] [PubMed] [Google Scholar]

56. Calman K. Beyond the 'nanny state': Stewardship and public health. *Public Health.* 2009;123:e6–e10. doi: 10.1016/j.puhe.2008.10.025. [DOI] [PMC free article] [PubMed] [Google Scholar]

57. World Health Organization. The World Oral Health Report 2003. Geneva, Switzerland: *WHO;* 2003. [Google Scholar]