

## Appendix 2: Summary of potential benefits of expanding water fluoridation in Nottingham and Nottinghamshire and overview of concerns or risks

### Estimates of quantifiable benefits of water fluoridation:

Impact	Scale	Local Analysis
<b>Children have fewer decayed, missing or filled teeth (dmft)</b>	35% fewer decayed, missing and filled baby teeth and 26% fewer decayed, missing and filled permanent teeth.	At the last survey, five-year-olds in Nottinghamshire had an average of 0.62 decayed (d), missing due to dental decay (m) and filled (f) teeth (t) (dmft) (Nottingham City had an average of 1.3). If all areas were fluoridated, this could result in 35% fewer dmft in 5-year-olds, equating to an average of 0.4 (Nottinghamshire) and 0.85 (Nottingham City) dmft. <sup>1</sup>
<b>Children experience less tooth decay</b>	15% increase in children with no decay in their baby teeth at five years of age.	In non-fluoridated areas of Nottinghamshire, a 15% increase represents 805 extra children per year who could have no decay in their baby teeth at age five, a combined total of 1215 children across Nottingham and Nottinghamshire. <sup>2</sup>
<b>Reduction in hospital admissions for caries-related dental extractions in children in the most deprived 20% areas</b>	Incidence of admissions is 56% lower in the most deprived fluoridated areas and 37% lower in children from indices of multiple deprivation (IMD) quintile 3 (average deprivation quintile).	In 2021/22 a total of 375 Nottinghamshire residents aged under 19 years old had teeth extracted under general anaesthetic. Of these, 237 (63.2%) lived in non-fluoridated areas (less than 0.7 mg/l). Following methodology used in [Water Fluoridation, Health monitoring report for England 2022], and applying preventive fractions by national IMD quintile, an estimated 115 or 30.8% of these procedures could have been avoided if water fluoridation had been in place in all areas. <sup>3</sup>

<sup>1</sup> Modelling based on:

a) Office for Health Improvement and Disparities (OHID), 2023, National Dental Epidemiology Survey of five-year olds, 2021/22

b) Cochrane Review, 2015, Water Fluoridation to prevent tooth decay

<sup>2</sup> Ibid

<sup>3</sup> Modelling based on:

a) OHID, 2022, Water Fluoridation: Health Monitoring Report for England 2022

b) [Hospital tooth extractions in 0 to 19 year olds: 2022 - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/statistics/hospital-tooth-extractions-in-0-to-19-year-olds-2022)

c) Community Dental Services-CiC tooth extraction data 2021/22

		Around a 56% reduction in hospital admissions for tooth extractions in children from the most deprived 20% of areas of Nottingham City would result in approximately 89 fewer extractions a year in children aged 0-19 years old. This equates to 204 avoided hospital admissions across Nottingham and Nottinghamshire in total.
<b>Reduced tooth decay in adults</b>	27-35% reduction among those who have spent their whole life in fluoridated areas.	There is no local data available on prevalence of decay amongst Nottinghamshire adults and/or those born in fluoridated parts of North Nottinghamshire.
<b>Reduced root surface decay in older people</b>	This condition can arise following gum recession in older people. Increased cohort of older people potentially vulnerable to this condition, owing to anticipated demographic changes, alongside more people keeping their natural teeth for longer. This growing group of adults aged over 65 could potentially benefit from fluoridation to help reduce their risk of root surface decay – both in terms of prevalence and severity.	There are currently around 90,000 people aged over 65 living in non-fluoridated areas of Nottinghamshire (of whom 15,535 are over 85) and around 40,000 people aged over 65 living in Nottingham City.  Projected increases in older demographic groups in Nottinghamshire County would increase this by 36,308 people (based on a 30% increase in 65 to 84-year-olds and a 90% increase in 85+ year olds), to a total of 126,262 over 65-year-olds by 2030. In Nottingham City, projected increases would increase this by 8,100, to a total of 47,400 over 65s by 2030. <sup>4</sup>

Additional benefits of having improved oral health:

- Reduction in days lost from school
- Improvement in school performance

d) Nyakutsikwa, Blessing (2021): Water fluoride concentrations (mgF/L) per Lower Super Output Area (LSOA) in England (2009 - 2020). University of Manchester.

<sup>4</sup> Modelling based on:

a) Nyakutsikwa, Blessing (2021): Water fluoride concentrations (mgF/L) per Lower Super Output Area (LSOA) in England (2009 - 2020). University of Manchester.

b) Nottinghamshire County Council, 2019, Adult Social Care and Public Health Strategy

c) Office for National Statistics, 2021, Census 2021

- Reduction in days lost from work
- Reduction in avoidable costs for dental treatment in adults – both in terms of dental charges falling on individuals and in terms of costs to the wider health system.

**Concerns or risks associated with water fluoridation:**

<p><b>Fluorosis</b></p>	<p>Dental fluorosis (mottling of teeth) is one of a number of different conditions that can affect the appearance of teeth. There is a well-established adverse association between levels of fluoride in water and the prevalence of dental fluorosis. Dental fluorosis is cosmetic and does not indicate or result in any harm to general health. It is usually seen as paper-white flecks or fine white lines, but it can vary in appearance from barely visible white lines to patches which may be of aesthetic concern.</p> <p>The risk period for the development of dental fluorosis in permanent (adult) teeth is when the teeth are growing in the jaws; dental fluorosis cannot develop after teeth are formed. A small minority of children in both non-fluoridated and fluoridated areas of the UK have noticeable dental fluorosis, though severe dental fluorosis is rare.</p> <p>In a PHE study, dental fluorosis was observed in 10.3% of children examined in two fluoridated cities compared to 2.2% in two non-fluoridated cities. However, there was no significant difference between children surveyed in fluoridated and non-fluoridated areas when asked their opinion about the appearance of their teeth, taking into account concerns that have resulted from any cause (e.g. poor alignment, decay, trauma etc.).<sup>5</sup></p> <p>Skeletal fluorosis is a health condition characterised by skeletal abnormalities and joint pain, common in regions of the world which have extremely high naturally occurring fluoride levels in the water and hot, dry climates.<sup>6</sup> For example, fluoride occurs naturally at up to 18 parts per million (ppm) in 15 states of India, where skeletal fluorosis can be found.</p> <p>For comparison, both the World Health Organisation (WHO) guideline limit for fluoridation and the maximum permitted value in English fluoridation schemes is 1.5 ppm. In temperate climates, no cases of clinical skeletal fluorosis have been seen with natural fluoride levels up to 4 ppm in drinking water. There is no evidence of clinical skeletal fluorosis arising from exposures in the UK or from levels of fluoride found in water fluoridation schemes worldwide.<sup>7</sup></p>
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<sup>5</sup> PHE, 2018, Water Fluoridation: Health monitoring report for England

<sup>6</sup> Committee on Toxicity (COT), 2003, COT Statement on Fluorine in the 1997 Total Diet Stud

<sup>7</sup> Committee on Toxicity (COT), 2003, COT Statement on Fluorine in the 1997 Total Diet Stud

<b>Alleged harmful effects of fluoridation on other aspects of health</b>	Studies have investigated hip fracture, Down’s syndrome, kidney stones, bladder cancer, osteosarcoma (a cancer of the bone) and found either no evidence of any difference in rates between fluoridated and non-fluoridated areas. For a few conditions, some evidence suggested that rates were lower in fluoridated than in non-fluoridated areas (kidney stones, bladder cancer). <sup>8</sup>
<b>Safety of fluoridation operations</b>	<p>The independent Drinking Water Inspectorate regulates and monitors the quality of public water supplies in England. Water quality is monitored by water companies in line with regulations and standards, which include maximum concentrations for chemicals that may be found in water. Water companies comply with a Technical Code of Practice for water fluoridation.</p> <p>Only specified chemicals are allowed to be used which comply with British Standards. Water companies must establish any variation in natural fluoride concentration in the raw water and take this into account when designing control mechanisms. Continuous fluoride monitoring, linked to alarm monitoring and automatic shut-down, is a requirement for all dosing installations, to eliminate the possibility that concentrations could be above the permitted level.</p>
<b>Toxicity of fluoride</b>	At high concentrations, fluoride can be toxic. This is why the health warning on fluoride toothpastes says not to swallow, but these toothpastes contain fluoride at over 1000 ppm, a thousand times the level in fluoridated water. The WHO guideline limit of 1.5 ppm is intended to protect against potential harmful effects over a lifetime of exposure to fluoride from all sources. Water fluoridation schemes in the UK seek to achieve a level of 1.0 ppm, with the maximum permitted level stipulated by the Drinking Water Inspectorate at 1.5 ppm.
<b>Ethics</b>	The topic of fluoridation can prompt debates about ethics. Dental and health professionals argue that combating tooth decay using a safe and effective public health measure is a necessary and highly ethical course of action to take. However, ethical concerns can focus on issues around the population being unable to choose whether or not to drink fluoridated water. Nevertheless, fluoride already occurs naturally in water supplies. Water fluoridation schemes adjust fluoride levels to replicate a naturally occurring benefit that would occur where fluoride is already present at the optimal level of 1.0 ppm.

<sup>8</sup> PHE, 2018, Water Fluoridation: Health monitoring report for England