

The extent of water fluoridation

1. Fluoridation in the UK

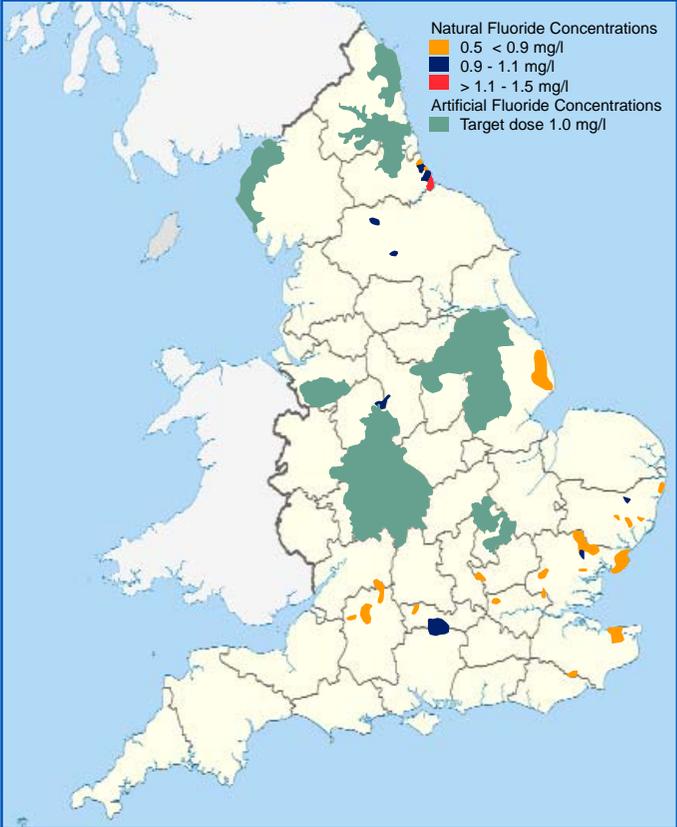
Number of people supplied with artificially fluoridated water:	5,797,000
Number of people supplied with naturally fluoridated water:	330,000
Total (artificial and natural):	6,127,000
Percentage of population with optimally fluoridated water:	10%

Just over 6.1 million people in the UK receive water with a fluoride content, whether naturally occurring or added, that is sufficient to benefit oral health. This means that about 10% of the total population is supplied with optimally fluoridated water.

The number of people whose water supplies contain naturally occurring fluoride at the optimum level (around one part of fluoride per million parts of water) is estimated at around 330,000, including those living in Hartlepool and Easington in the north east of England, Uttoxeter in Staffordshire and parts of north Hampshire and south Berkshire. These areas are marked in dark blue and red on the map on this page.

Around 5.8 million people in different parts of England are supplied with artificially fluoridated water. In these communities, the naturally occurring fluoride is too low to protect teeth from decay and has therefore been supplemented at the water treatment works to bring it up to the 1 ppm concentration. These areas are marked in green on the map.

Fluoride concentrations in water supplies



Parts of the country with fluoridation schemes include Cumbria, Cheshire, Tyneside, Northumbria, Durham, Humberside, Lincolnshire, Nottinghamshire, Derbyshire, the West Midlands and Bedfordshire. Full details of the extent of population coverage in these areas are given later in this section of *One in a Million*.

Some areas receive water with naturally occurring levels of fluoride that is below the optimum for oral health but can afford some degree of protection against tooth decay. However, in many instances the level of fluoride varies over time. For example, in some places it may range from as low as 0.1 ppm to as high as 0.9 ppm. The benefits are therefore not sustained.

Areas marked in yellow on the map – mainly in the east and south of England – are reported to have naturally occurring fluoride levels at between 0.5 ppm and 0.9 ppm.

Local fluoridation maps

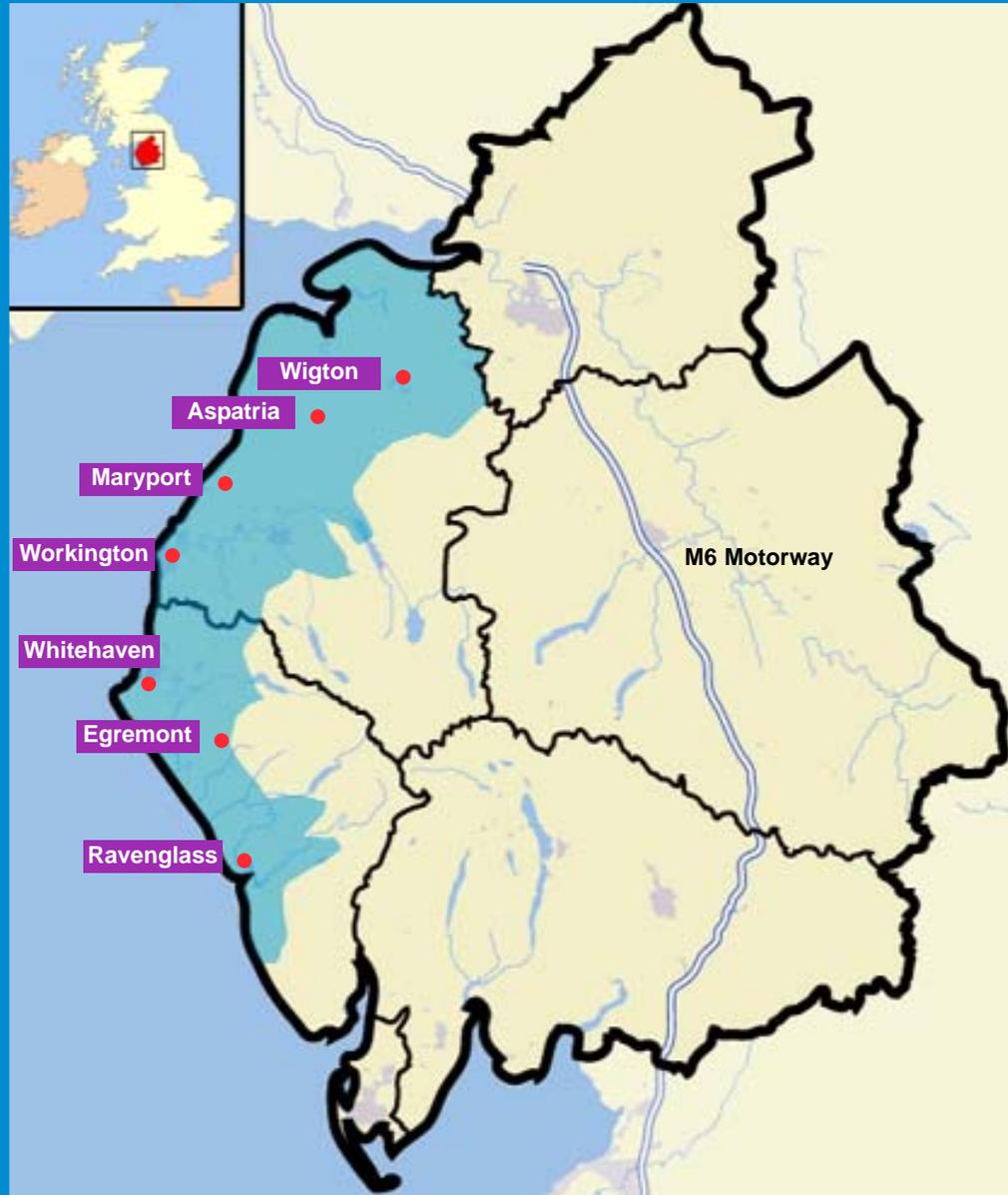
On pages 3 to 18, there are local maps indicating the geographical coverage of artificial water fluoridation schemes in particular parts of England. It should be borne in mind, however, that fluoridation mapping on small scale, surface-level maps may not always be entirely accurate.

Anyone wishing to find out whether their water supply is fluoridated - especially in rural areas of the country - should double-check with their water company, Strategic Health Authority or Primary Care Trust. Many water company websites contain a section on water quality in which the average fluoride level in samples of water taken from consumers' taps over the previous year is recorded by postcode.

The British Fluoridation Society would like to hear from anyone who believes that there may be inaccuracies in any of the maps of fluoridation in the UK. It would be helpful if, in contacting the Society, you could cite the source of your information.

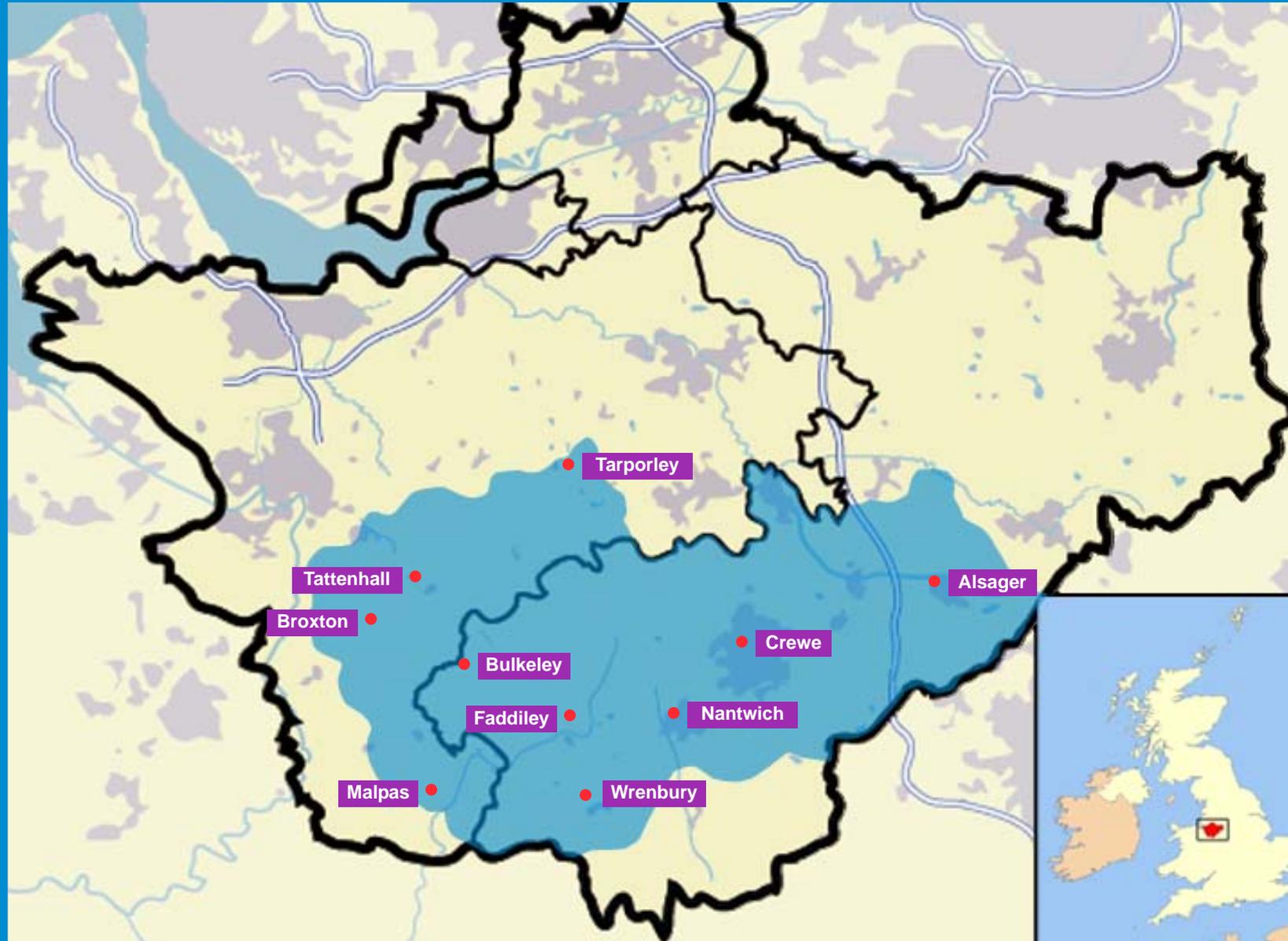
Cumbria

Around 120,000 people live in areas of west Cumbria covered by legal agreements for the supply of artificially fluoridated water. Communities covered by those agreements include Workington, Maryport, Aspatria, Wigton and Cockermouth in the Allerdale Borough Council area and the communities of Whitehaven, Egremont and Ravenglass in the Copeland Borough Council area. These fluoridation schemes were initiated in the period between 1969 and 1971. For technical reasons, the fluoridation plant at the Cornhow water treatment works serving areas in the north west of the county is reported not to have been in operation since 2006.



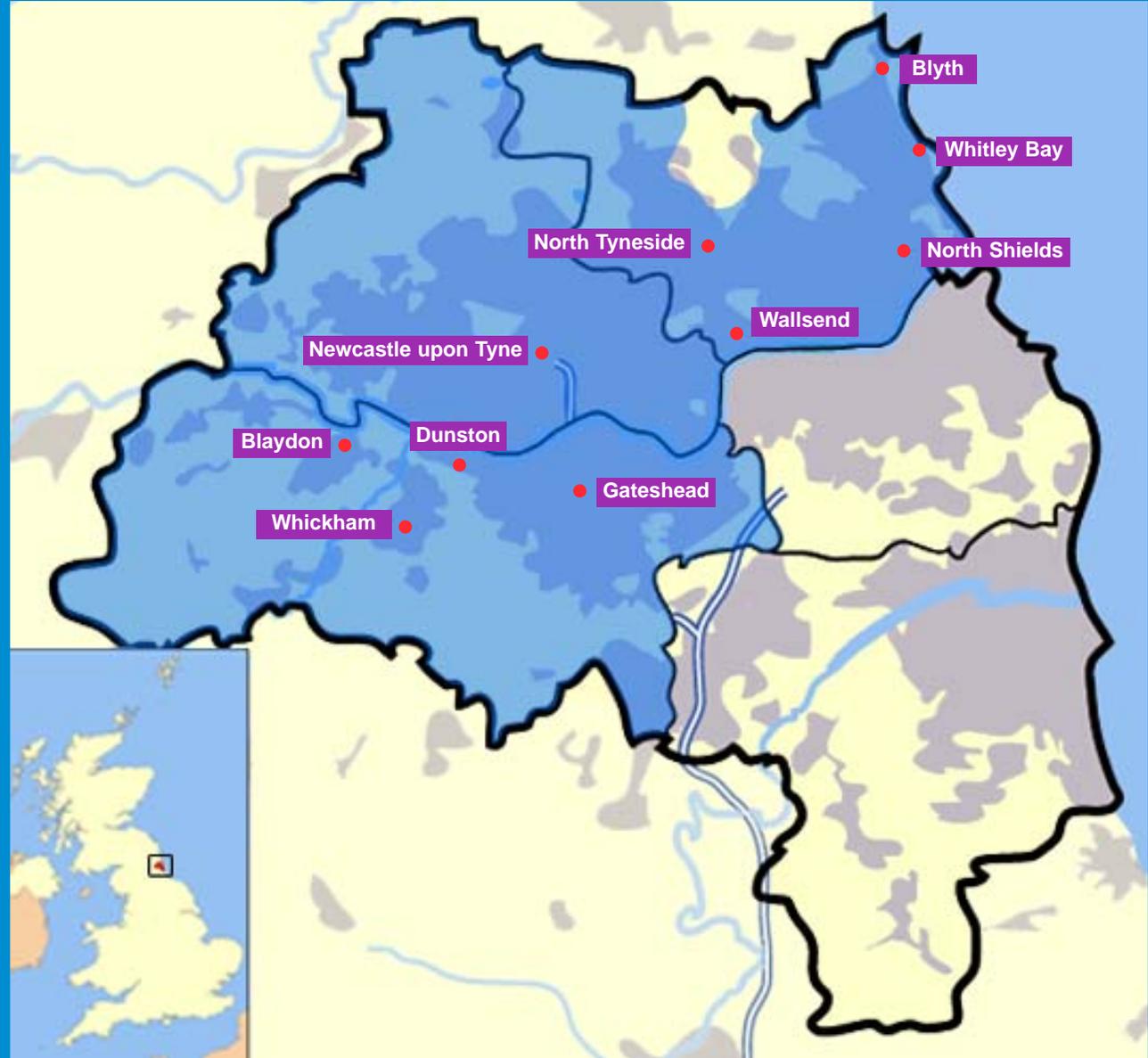
Cheshire

Around 137,000 people are supplied with artificially fluoridated water in Cheshire. Fluoridated communities include Crewe, Nantwich, Alsager, Bickerton, Bulkeley, Burland, Wrenbury, Egerton Green, Faddiley, Beeston, Broxton, Handley, Huxley, Malpas and Tarporley. The vast majority of the people benefiting from fluoridation in the county live in the Cheshire East Council area, with just a few thousand in neighbouring areas of Cheshire West Council. These fluoridation schemes were initiated in 1968.



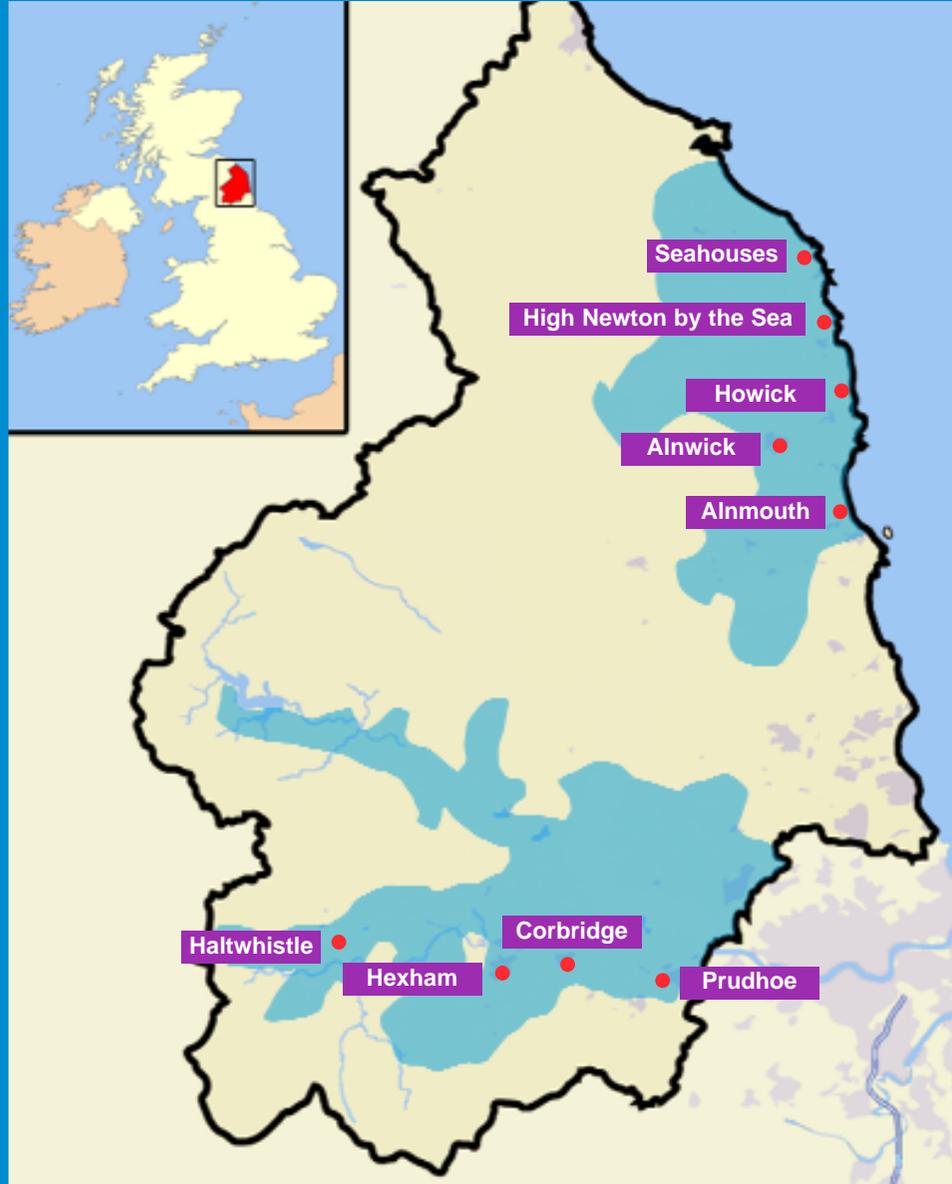
Tyneside

Around 643,000 people are supplied with artificially fluoridated water in and around Tyneside. Fluoridated communities include Newcastle upon Tyne, Gateshead, Wallsend, North Shields, Tynemouth and Whitley Bay. These fluoridation schemes were initiated in 1968.



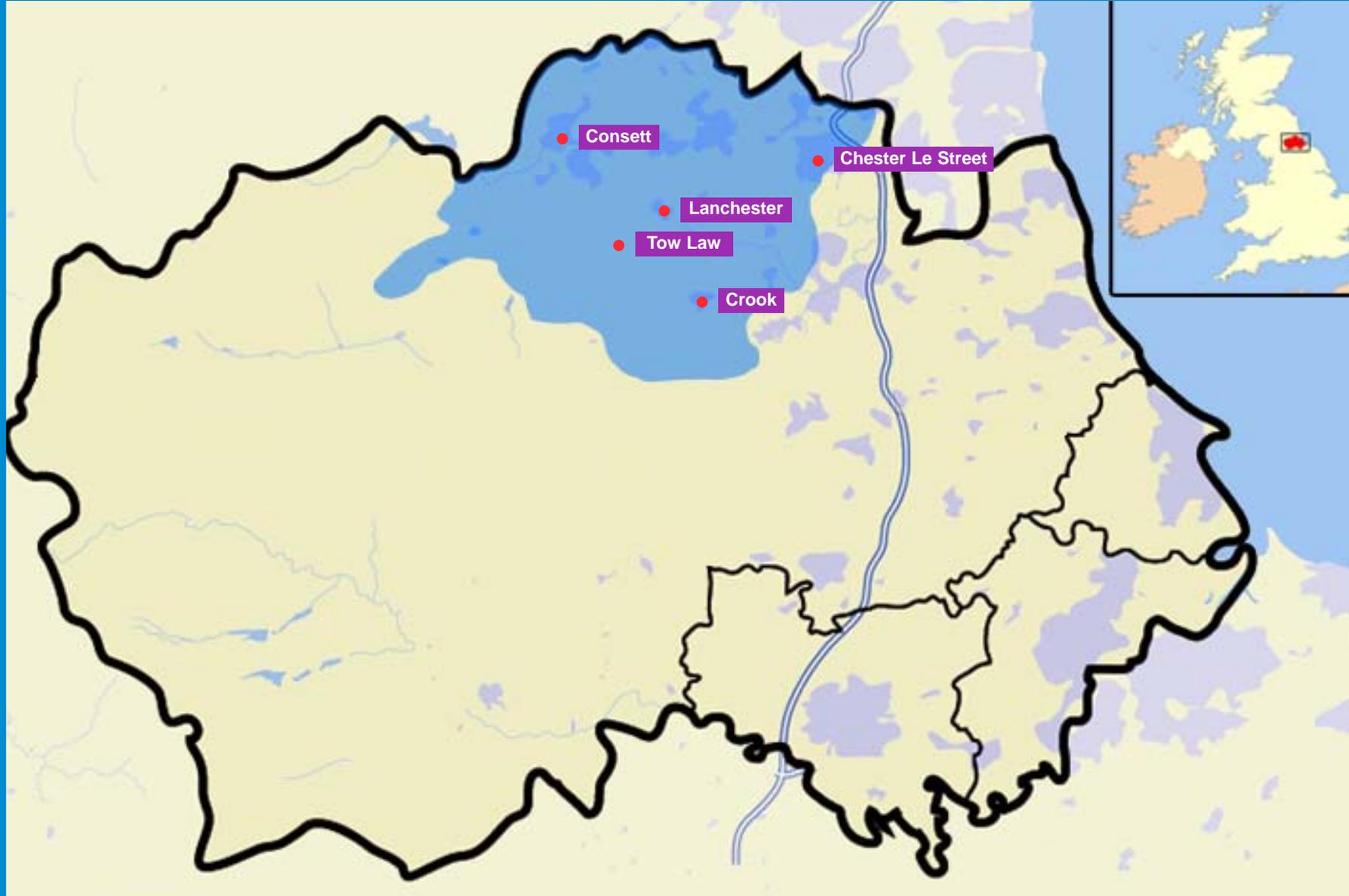
Northumberland

Around 101,000 people are supplied with artificially fluoridated water in Northumberland. In the east and north of the county, fluoridated communities include Alnwick, Alnmouth, Howick, Embleton, High Newton by the Sea and Seahouses. In areas of the county to the west of Newcastle upon Tyne, fluoridated communities include Haltwhistle, Henshaw, Haydon Bridge, Corbridge, Haddon on the Wall and Prudhoe. These fluoridation schemes were initiated in 1968.



Durham

Around 85,000 people are supplied with artificially fluoridated water in parts of County Durham to the south and south east of Newcastle upon Tyne. Fluoridated communities include Consett, Crook, Tow Law, Lanchester and parts of Chester le Street. These fluoridation schemes were initiated in 1968.

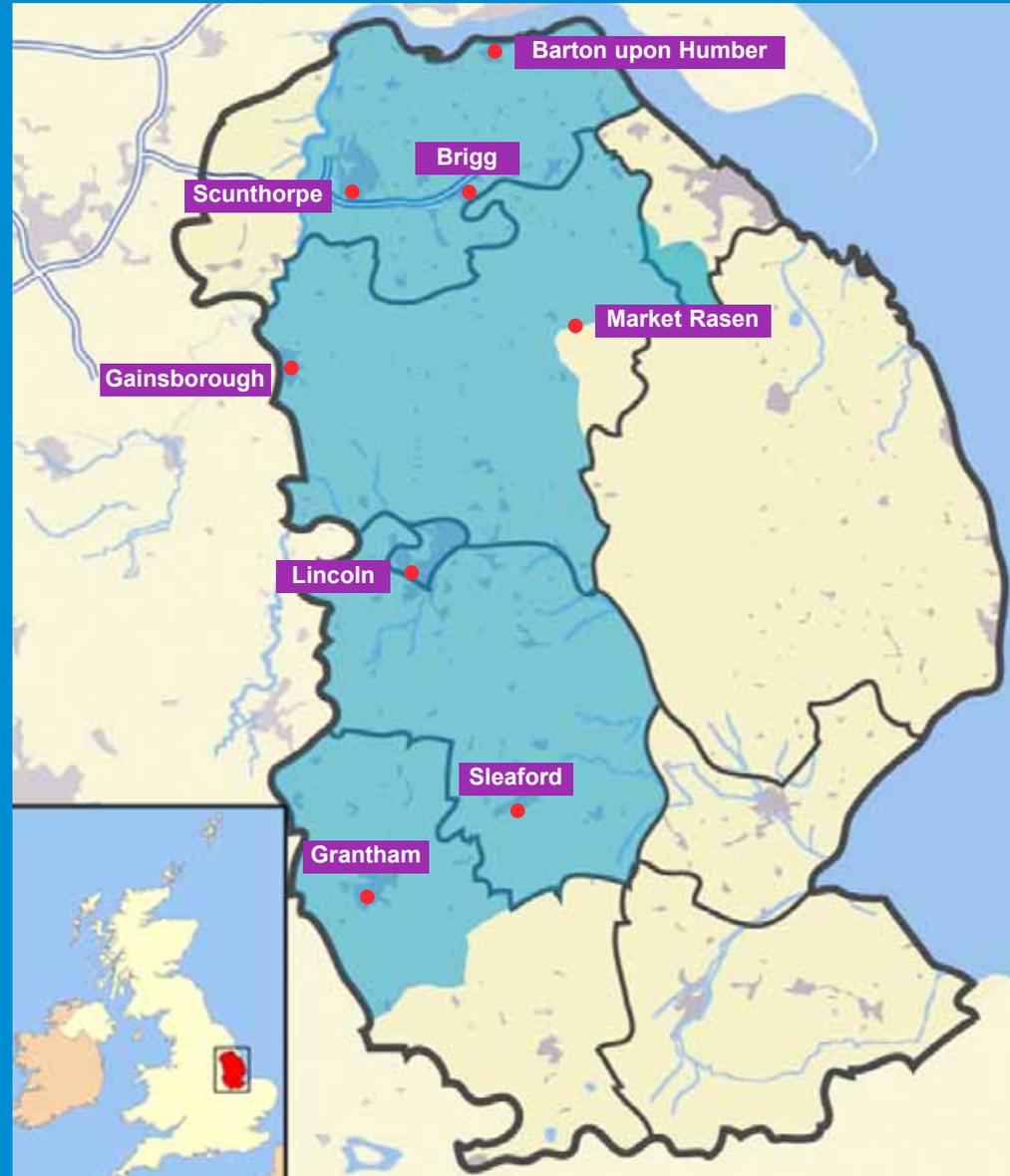


Humberside

Around 136,000 people are supplied with artificially fluoridated water in Humberside. Fluoridated communities include Scunthorpe, Barton upon Humber, Brigg and other places in the North Lincolnshire Council area that are located to the north and east of Scunthorpe. Some rural communities to the south west of Grimsby in the neighbouring North East Lincolnshire Council area are also fluoridated. These fluoridation schemes were initiated in 1968/69.

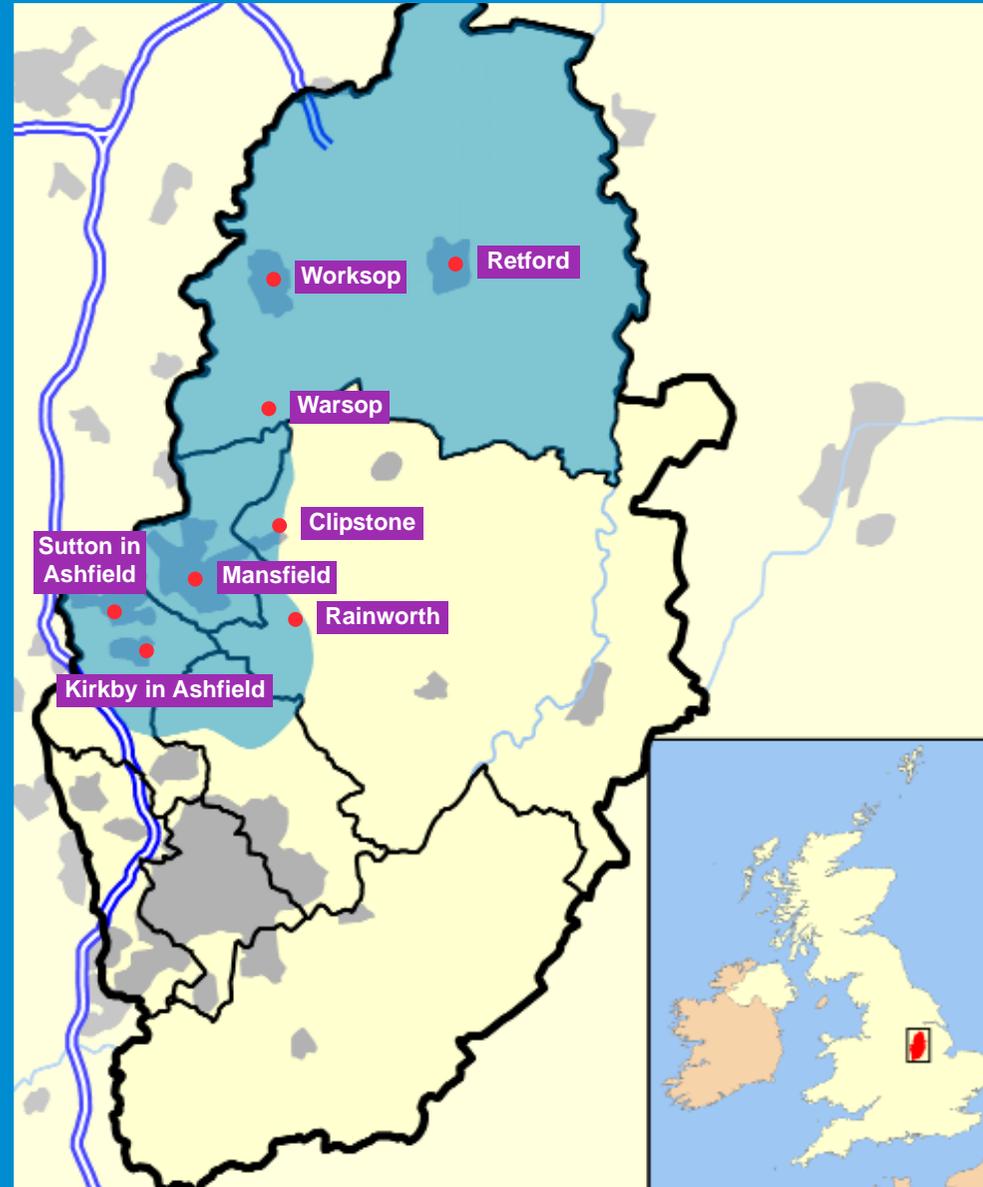
Lincolnshire

Around 250,000 people are supplied with artificially fluoridated water in Lincolnshire. Fluoridated communities include Lincoln, Gainsborough, Sleaford, Grantham, parts of Market Rasen and a large number of rural communities across the west and central areas of the county.



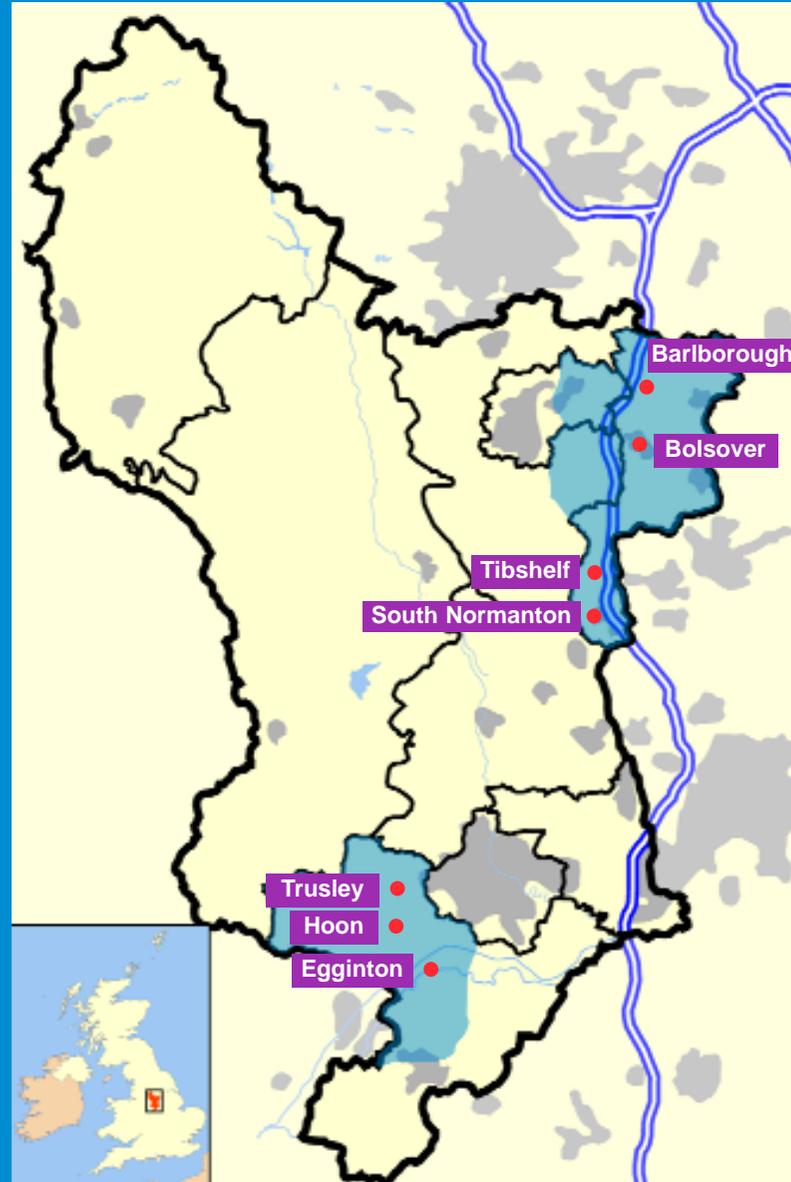
Nottinghamshire

About 287,000 people are supplied with artificially fluoridated water in northern and western areas of Nottinghamshire. Fluoridated communities include Worksop, Retford, Mansfield, Sutton in Ashfield and Kirkby in Ashfield. These fluoridation schemes were initiated in the mid-1970s.

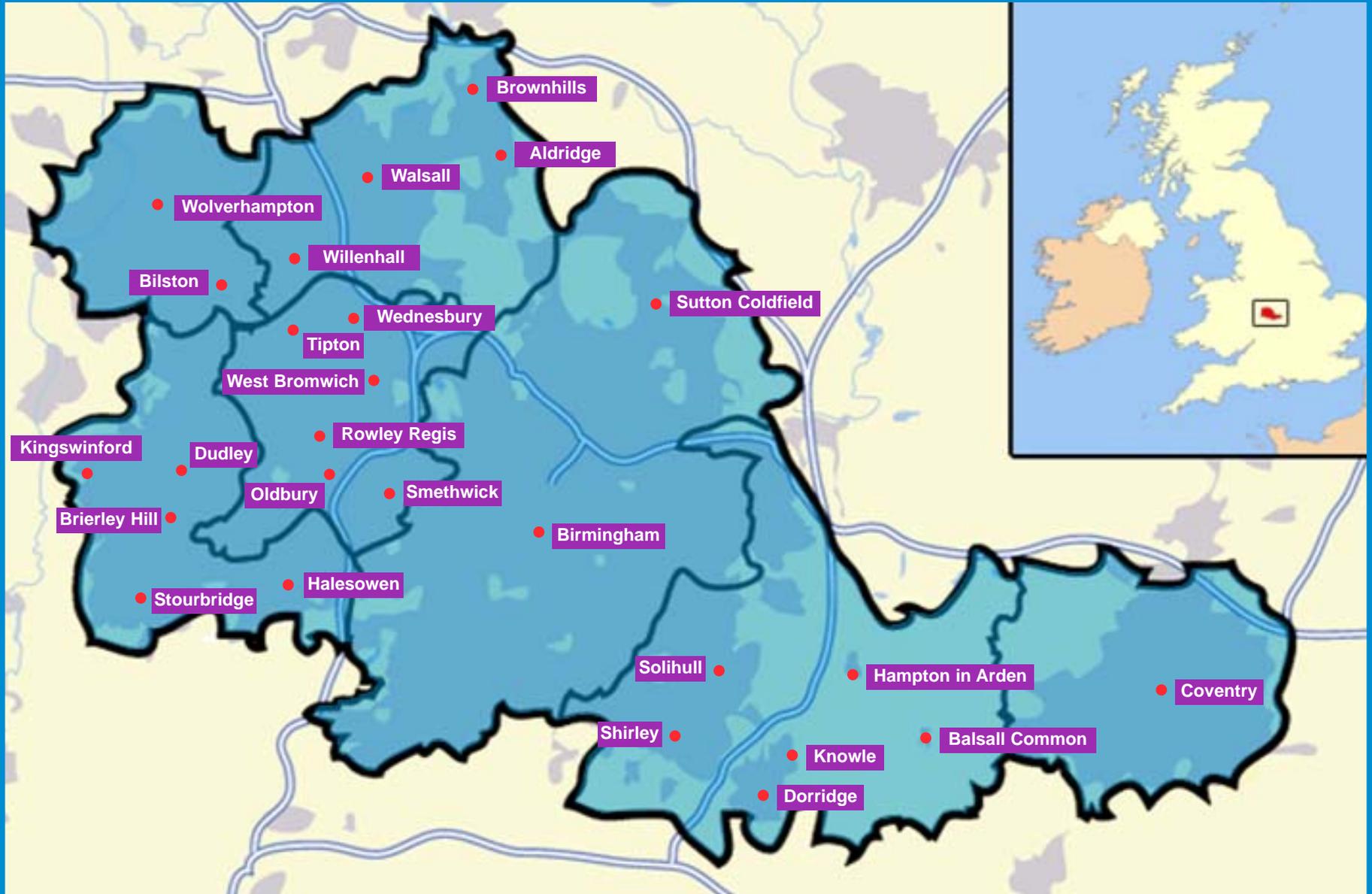


Derbyshire

About 43,000 people are supplied with artificially fluoridated water in Derbyshire. Fluoridated communities include parts of Bolsover District bordering Nottinghamshire, and parts of South Derbyshire District bordering Staffordshire.



Fluoridation in the West Midlands



Birmingham

Around 1 million people in Birmingham – the whole of the city’s population – are supplied with artificially fluoridated water. Birmingham’s first fluoridation scheme started in 1964, serving not only the city itself but also neighbouring parts of Solihull. In the mid-1980s a second scheme was introduced to serve the area of Sutton Coldfield, which became part of Birmingham in the local government reorganisation of 1974.

Solihull

Around 200,000 people in Solihull – the whole of the borough’s population – are supplied with artificially fluoridated water. Solihull’s first fluoridation scheme started in 1964 when Birmingham’s water was fluoridated. Further schemes were introduced in the early to mid-1980s to serve the south and east of the metropolitan borough that had been created in 1974, including Knowle, Dorridge, Meriden and Balsall Common.

Coventry

Around 300,000 people in Coventry – the whole of the city’s population – are supplied with artificially fluoridated water. Fluoridation schemes were introduced in stages between 1981 and 1989.

Sandwell

Around 300,000 people in Sandwell – the whole of the metropolitan borough’s population – are supplied with artificially fluoridated water. Fluoridated communities include West Bromwich, Wednesbury, Tipton, Oldbury, Smethwick and Rowley Regis. The fluoridation scheme serving Sandwell was initiated in 1986.

Dudley

Around 305,000 people in Dudley – the whole of the metropolitan borough’s population – are supplied with artificially fluoridated water. Fluoridated communities within the borough include Dudley itself, Halesowen, Stourbridge, Brierley Hill, Coseley, Cradley, Amblecote, Kingswinford, Sedgley and Wordsley. Fluoridation schemes were introduced between 1986 and 1988.

Walsall

Around 253,000 people in Walsall – the whole of the metropolitan borough’s population – are supplied with artificially fluoridated water. Fluoridated communities within the borough include Walsall itself, Aldridge, Brownhills, Bloxwich and Willenhall. Fluoridation schemes were introduced between 1985 and 1987.

Wolverhampton

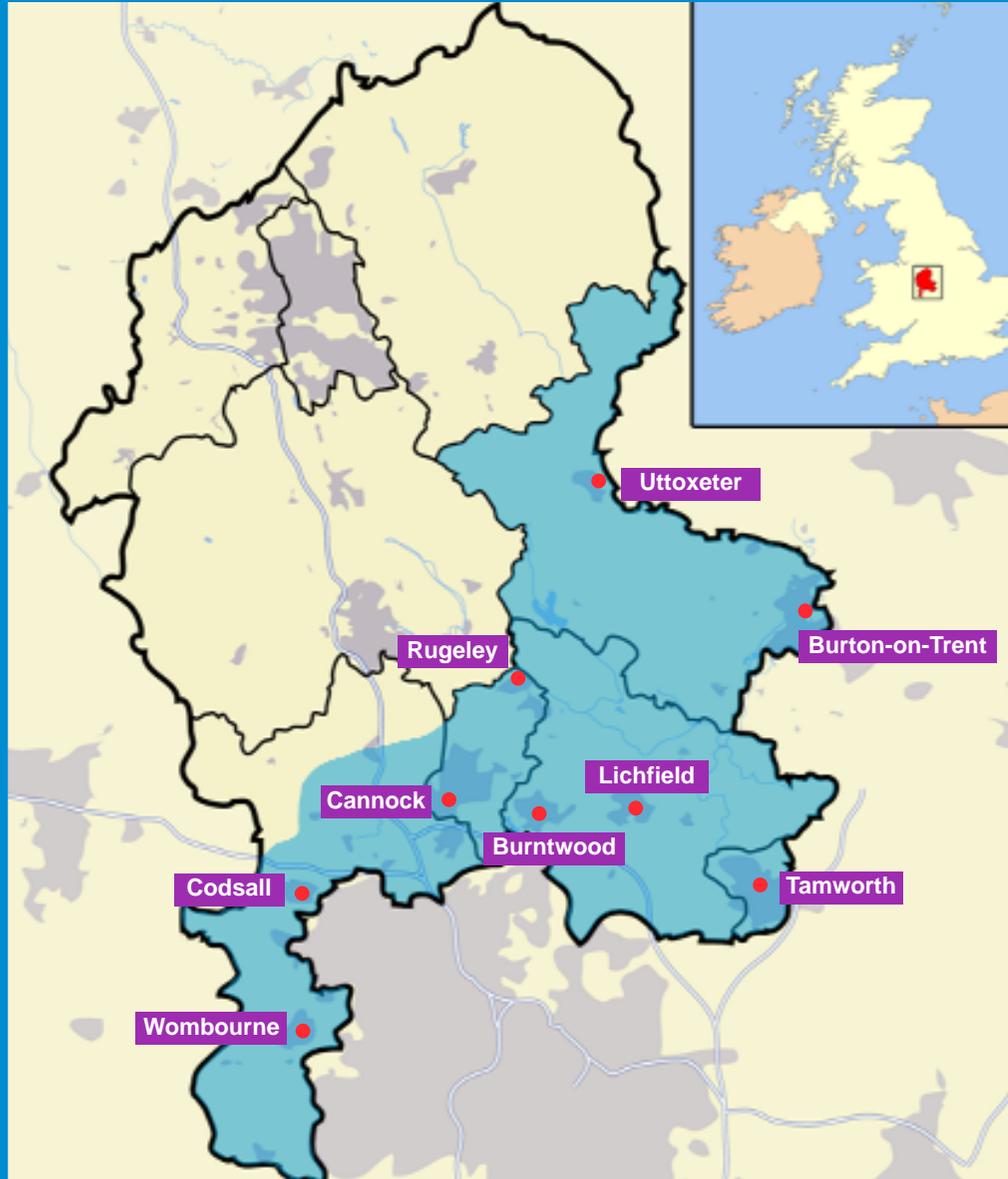
Around 236,000 people in Wolverhampton – the whole of the city’s population – are supplied with artificially fluoridated water. Fluoridation of the local water distribution network commenced in 1986.

Staffordshire

Around 497,000 people in the south and east of Staffordshire are supplied with fluoridated water, including the residents of Uttoxeter, which benefits from naturally fluoridated water at the optimum concentration. Fluoridated communities comprise:

- the whole of the Lichfield District Council area including Burntwood
- the whole Tamworth District
- the whole of Cannock Chase District, including Hednesford and Rugeley
- the whole of East Staffordshire District, including Burton on Trent, Barton under Needwood, Rocester, Yoxall and Uttoxeter
- large parts of South Staffordshire District, including Acton Trussell, Cheslyn Hay, Codsall, Great Wyrley, Penkridge, Seisdon and Wombourne.

Fluoridation was introduced across these areas between 1986 and 1988.



Shropshire

Around 22,000 people in the south eastern corner of Shropshire bordering Wolverhampton and Staffordshire. Fluoridation was introduced in the area during the mid to late 1980s. Communities receiving fluoridated water include Bridgnorth, Eardington, Quatford, Claverley, Badger, Albrighton, Cosford and Boningale.

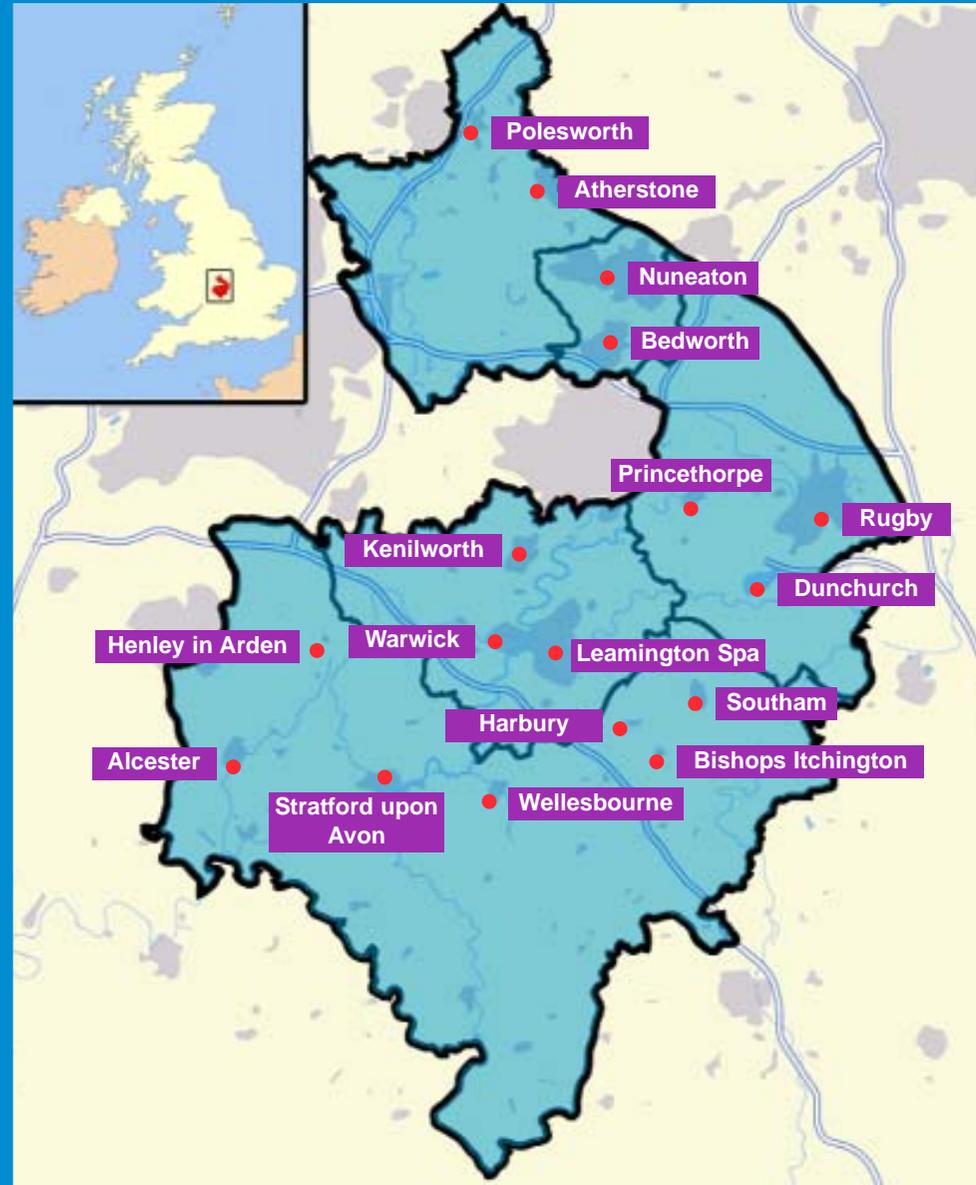


Warwickshire

The whole of Warwickshire is covered by fluoridation agreements, including:

- the whole of Rugby District, including Rugby itself, Princethorpe, Dunchurch and Ryton on Dunsmore
- the whole of Nuneaton and Bedworth Borough
- the whole of North Warwickshire Borough, including Atherstone, Bulkington, Coleshill, Filongley, Over Whitacre and Polesworth
- the whole of Warwick District, including Warwick, Leamington Spa, Kenilworth and Stoneleigh.
- the whole of Stratford on Avon District, including Stratford, Henley in Arden, Claverdon, Southam, Harbury, Bishops Itchington, Napton and Wellesbourne.

Fluoridation schemes in the county were introduced progressively between 1964 and 1987. Over recent years, the actual number of people supplied with artificially fluoridated water has been between around 431,000 and 507,000. The fluctuations in coverage have been for operational reasons, including modifications to plant.

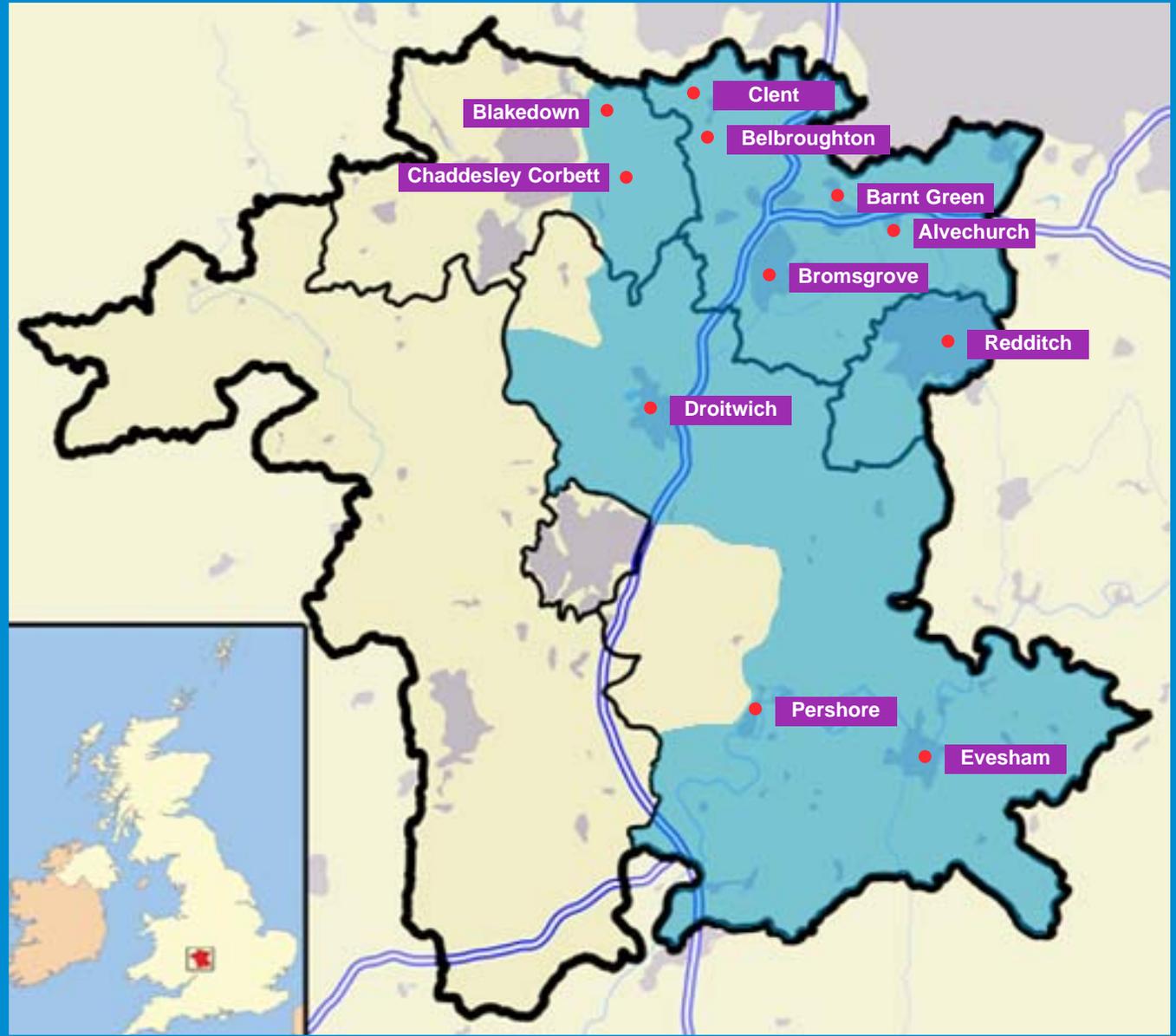


Worcestershire

Around 253,000 people in Worcestershire are supplied with artificially fluoridated water. Fluoridated communities in the county comprise:

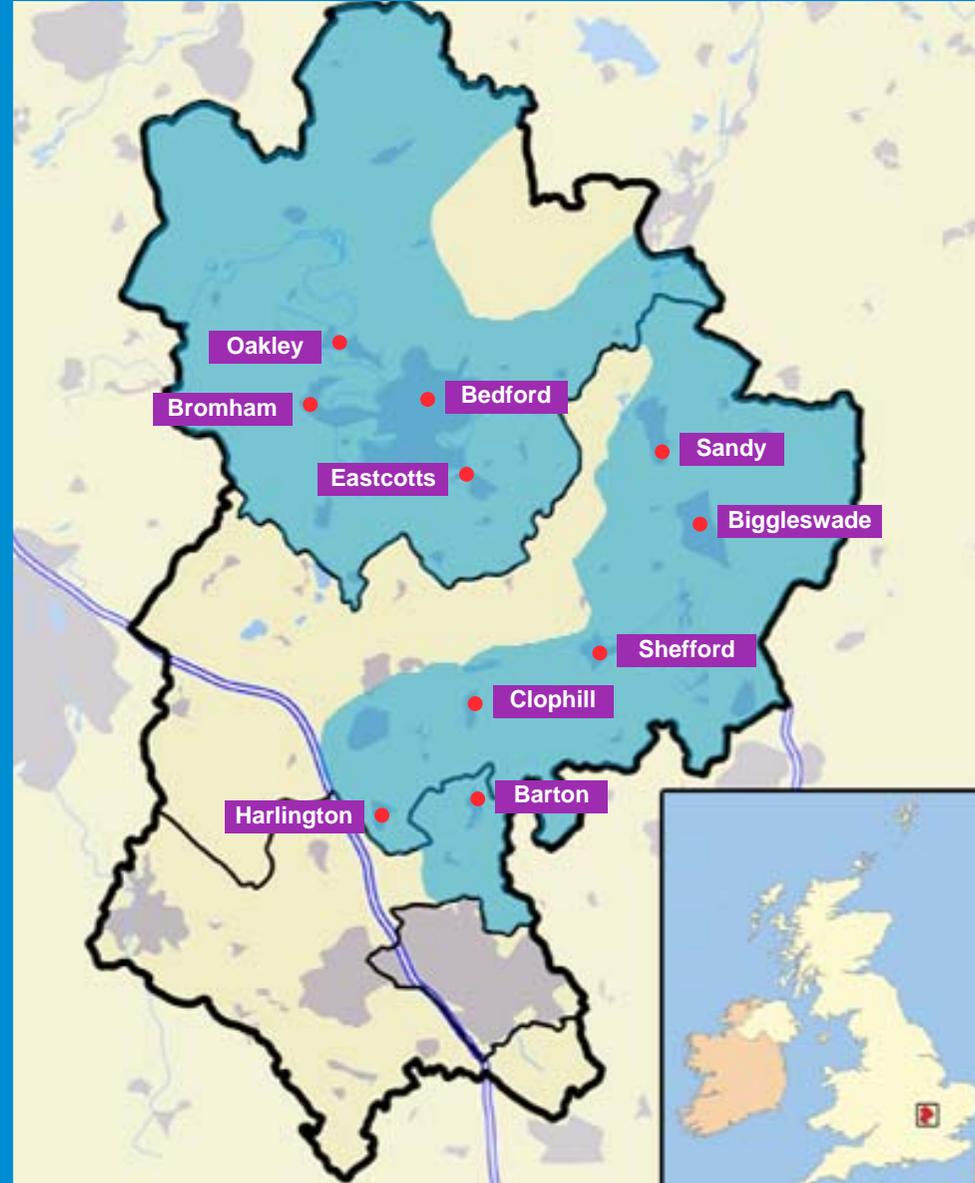
- Bromsgrove District, including Bromsgrove itself, Hagley, Belbroughton, Clent, Barnt Green, Alvechurch and Wythall
- Redditch District
- Wychavon District, including Droitwich, Evesham and some of the outskirts of Pershore
- Part of Wyre Forest District, including Blakedown and Chaddesley Corbett

Fluoridation schemes in the county were introduced between 1970 and 1991.



Bedfordshire

Around 198,000 people in Bedfordshire are supplied with artificially fluoridated water. Fluoridated communities comprise the town of Bedford, Biggleswade, Sandy and many rural areas in the north and east of the county.



Summary: artificial water fluoridation in the UK

City or area	Population receiving artificially fluoridated water
Cumbria	120,000
Cheshire	137,000
Tyneside	643,000
Northumbria	101,000
County Durham	85,000
Humberside	136,000
Lincolnshire	250,000
Nottinghamshire	287,000
Derbyshire	43,000
Birmingham	1,000,000
Solihull	200,000
Coventry	300,000
Sandwell	300,000
Dudley	305,000
Walsall	253,000
Wolverhampton	236,000
Staffordshire	497,000
Shropshire	22,000
Warwickshire	431,000
Worcestershire	253,000
Bedfordshire	198,000
Total:	5,797,000

Summary: natural fluoridation coverage in the UK

Areas of the UK where people are supplied with naturally fluoridated water at or around the optimum level include:

Area	Estimated number of people receiving naturally fluoridated water
Hartlepool, County Durham	89,000
Easington, County Durham	47,000
Uttoxeter, Staffordshire	13,000
Redbridge, London Borough	180,000
Total	329,000

In addition, there are other parts of the country where people may variably receive fluoridated water at or near optimum levels. These numbers are difficult to estimate and, in any event, the populations concerned may often be receiving sub-optimal levels of fluoride in their water. Nevertheless, it is reasonable to assume that they derive some oral health benefit. These communities include Braintree, Colchester. Epping and Harlow in the south east of England.

2. Fluoridation in North America

The United States

Number of people supplied with artificially fluoridated water:	194,206,000
Number of people supplied with naturally fluoridated water:	10,078,000
Total (artificial and natural):	204,284,000
Percentage of population with optimally fluoridated water:	66%
People receiving optimally fluoridated water as a percentage of all those who are connected to public water supplies:	74%

The latest available US Centers for Disease Control (CDC) estimates of fluoridation coverage (dated 31st December 2010) show that over 204 million US residents are supplied with naturally or artificially fluoridated water at the optimum concentration for oral health. This represents 74% of the US population whose homes are connected to public water supply systems.

Of the 204 million people receiving optimally fluoridated water, 194 million are served by artificial water fluoridation schemes, an increase of around 8.5 million people since 2008, 20.5 million since 2006 and 32.5 million since 2002. It means that, since 2002, there has been an expansion of the population coverage of artificial water fluoridation in the United States that is equivalent to nearly half the population of the United Kingdom.

In recent years, the biggest increase has taken place in California where, in 1990, only around 16% of the population served by community water systems was supplied with optimally fluoridated water. According to CDC estimates for December 2010, this figure had increased to 62%. Since then, there has been further expansion of water fluoridation in California. In February 2011, for example, San Diego (until then the largest non-fluoridated city in the United States) announced that it had commenced the fluoridation of all water supplies in the city.

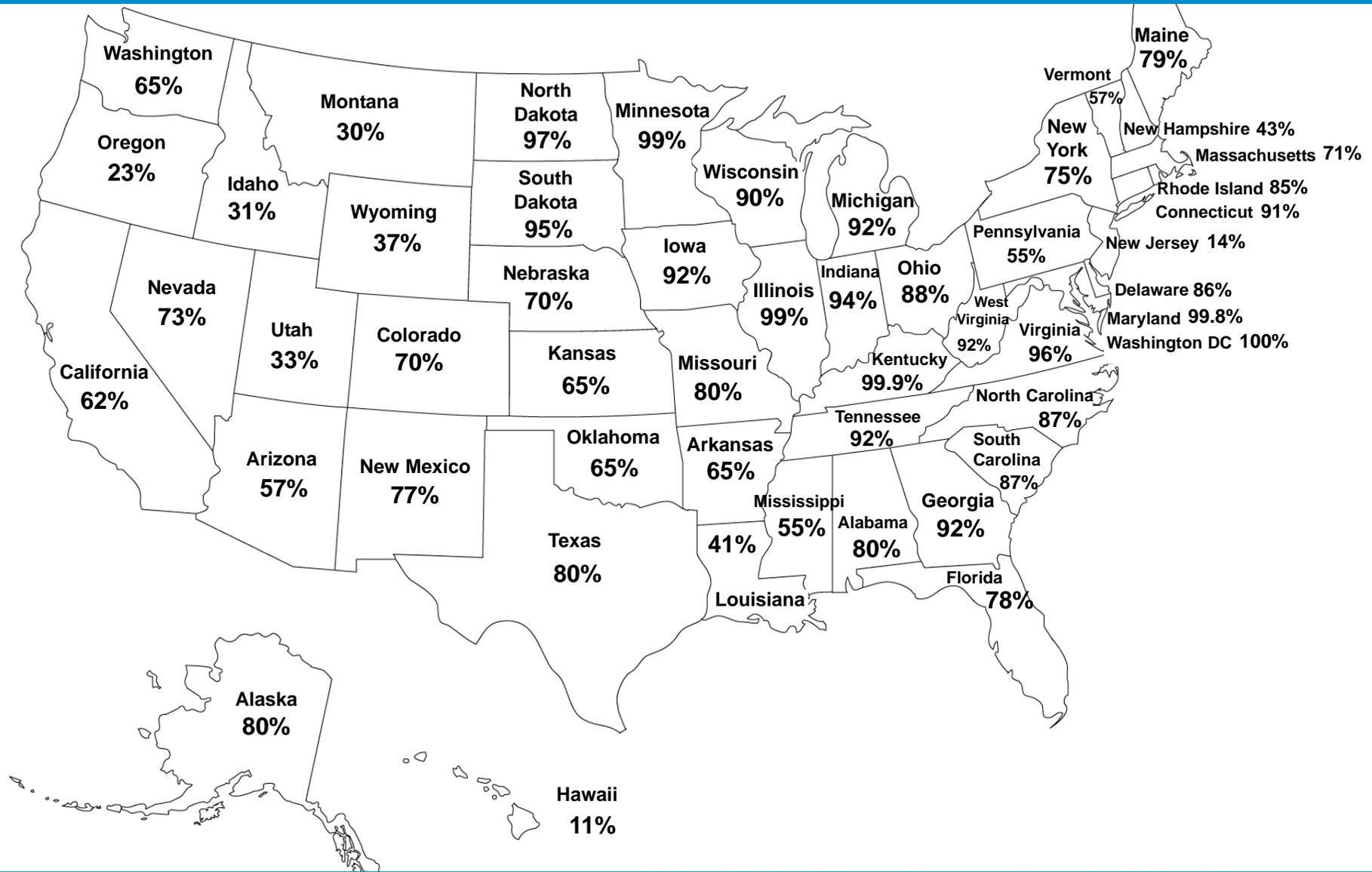
Map of fluoridation coverage in each of the 50 US States

As the map on page 23 shows, all 50 US States and the District of Columbia (Washington DC) have water fluoridation schemes serving their populations. The following States supply optimally fluoridated water to over 90% of their residents on public water supply systems: District of Columbia (100%); Kentucky (99.9%); Maryland (99.8%); Illinois (99%); Minnesota (99%); North Dakota (97%); Virginia (96%); South Dakota (95%); Indiana (94%); Georgia (92%); Iowa (92%); Michigan (92%); Tennessee (92%); West Virginia (92%); Michigan (92%); Wisconsin (90%).

Map of fluoridation coverage in the 50 largest US cities

As the map on page 24 shows, 47 of the 50 largest US cities are supplied with optimally fluoridated water, including New York, Los Angeles, Chicago, Houston and Washington DC. In 43 out of these 47 cases, optimal fluoride concentrations are achieved through artificial water fluoridation schemes.

Percentage of US State populations supplied with optimally fluoridated water



47 out of the 50 largest US cities receive optimally fluoridated water

	City	State	Population as at 2009	Artificial (A) or natural (N)	Date scheme commenced
1.	New York	New York	8,391,881	A	1965
2.	Los Angeles	California	3,831,868	A	1999
3.	Chicago	Illinois	2,851,268	A	1956
4.	Houston	Texas	2,257,926	A	1982
5.	Phoenix	Arizona	1,593,659	A	1990
6.	Philadelphia	Pennsylvania	1,547,297	A	1954
7.	San Antonio	Texas	1,373,668	A	2002
8.	San Diego	California	1,306,300	A	2011
9.	Dallas	Texas	1,299,542	A	1966
10.	Detroit	Michigan	910,921	A	1967
11.	San Francisco	California	815,358	A	1952
12.	Jacksonville	Florida	813,518	N	
13.	Indianapolis	Indiana	807,584	A	1951
14.	Austin	Texas	786,386	A	1973
15.	Columbus	Ohio	769,332	A	1973
16.	Fort Worth	Texas	727,577	A	1965

	City	State	Population as at 2009	Artificial (A) or natural (N)	Date scheme commenced
17.	Charlotte	North Carolina	704,422	A	1949
18.	Memphis	Tennessee	676,640	A	1970
19.	Boston	Massachusetts	645,619	A	1978
20.	Baltimore	Maryland	637,418	A	1952
21.	El Paso	Texas	620,456	N	
22.	Seattle	Washington	616,627	A	1970
23.	Denver	Colorado	610,345	A	1954
24.	Nashville- Davidson	Tennessee	605,473	A	1953
25.	Milwaukee	Wisconsin	605,013	A	1953
26.	Washington	DC	599,657	A	1952
27.	Las Vegas	Nevada	567,641	A	2000
28.	Louisville- Jefferson County	Kentucky	566,503	A	1951
29.	Oklahoma City	Oklahoma	560,333	A	1954
30.	Tucson	Arizona	543,910	N (partial)	
31.	Atlanta	Georgia	540,922	A	1969
32.	Albuquerque	New Mexico	529,219	A	1974

	City	State	Population as at 2009	Artificial (A) or natural (N)	Date scheme commenced
33.	Kansas City	Missouri	482,299	A	1983
34.	Fresno	California	479,918	A (partial)	1954
35.	Mesa	Arizona	467,157	A	2000
36.	Sacramento	California	466,676	A	2000
37.	Long Beach	California	462,604	A	1971
38.	Omaha	Nebraska	454,731	A	1969
39.	Virginia Beach	Virginia	433,575	A	1952
40.	Miami	Florida	433,136	A	1952
41.	Cleveland	Ohio	431,369	A	1956
42.	Oakland	California	409,189	A	1976
43.	Raleigh	North Carolina	405,612	A	1956
44.	Colorado Springs	Colorado	399,827	N	
45.	Tulsa	Oklahoma	389,625	A	1953
46.	Minneapolis	Minnesota	385,378	A	1957
47.	Arlington	Texas	380,805	A	

Notes:

1. 2009 population estimates are based on data published by the US Census Bureau.
2. San Jose in California, the tenth largest city in the United States, is set to become wholly fluoridated, following a decision announced in November 2011 by the Santa Clara Water District Board which supplies water to 1.8 million people in and around the city. The decision means that all of the 960,000 people who live in San Jose will in future be supplied with fluoridated water. Up to now only relatively small parts of the sprawling San Jose conurbation, located at the southern end of San Francisco Bay, have benefited from this public health measure.
3. Portland City Council in the US State of Oregon voted unanimously on 12th September 2012 to introduce a water fluoridation scheme to serve its population of nearly 600,000 residents, together with a further 300,000 people in neighbouring communities. After making its momentous decision, the council asked the Portland Water Bureau to devise and implement a programme to fluoridate the city's water supply to optimal levels for dental health. The scheme is expected to come into operation by March 2014.
4. After fluoridation schemes have commenced in San Jose and Portland, as many as 49 out of the 50 largest US cities (Honolulu being the only exception) will be benefiting from the supply of optimally fluoridated water.

Sources of information for United States:

1. US Centers for Disease Control and Prevention: *2008 Water Fluoridation Statistics* at www.cdc.gov/fluoridation/statistics/2008stats.htm
2. US Centers for Disease Control and Prevention: *Morbidity and Mortality Weekly Report*, 11th July 2008/57(27); 737-741, *Populations receiving optimally fluoridated drinking water – United States, 1992-2006*.
3. California Dental Association, 2011, *Policy Statement on Community Fluoridation*.
4. City of San Diego website, 2011, *Water Fluoridation*. www.sandiego.gov/water/quality/fluoridation.shtml

Canada

Number of people supplied with artificially fluoridated water:	14,260,000
Number of people supplied with naturally fluoridated water:	300,000
Total (artificial and natural):	14,560,000
Percentage of population with optimally fluoridated water:	44%

The latest available estimates from Health Canada (dated 2007) show that there are around 14.26 million Canadian citizens being supplied with artificially fluoridated water.

This means that, since 2003, about another 1 million Canadians have started to benefit from fluoridation, an increase equivalent to the population of Birmingham or to the populations of Manchester, Salford and Wigan combined.

Major Canadian cities with fluoridation schemes include Toronto (Ontario), Winnipeg (Manitoba) and Edmonton (Alberta).

As the map on page 31 shows, Canadian provinces and territories where 50% or more of the population are served by water fluoridation schemes include Ontario (76%); Alberta (75%); Manitoba (70%); Nova Scotia (59%); and Northwest Territories (56%).

In addition, it is estimated that around 300,000 Canadians receive naturally fluoridated water at the optimum level, making a total of 14.56 million people (44% of the total population).

The population coverage of water fluoridation in Canadian provinces and territories is as follows:

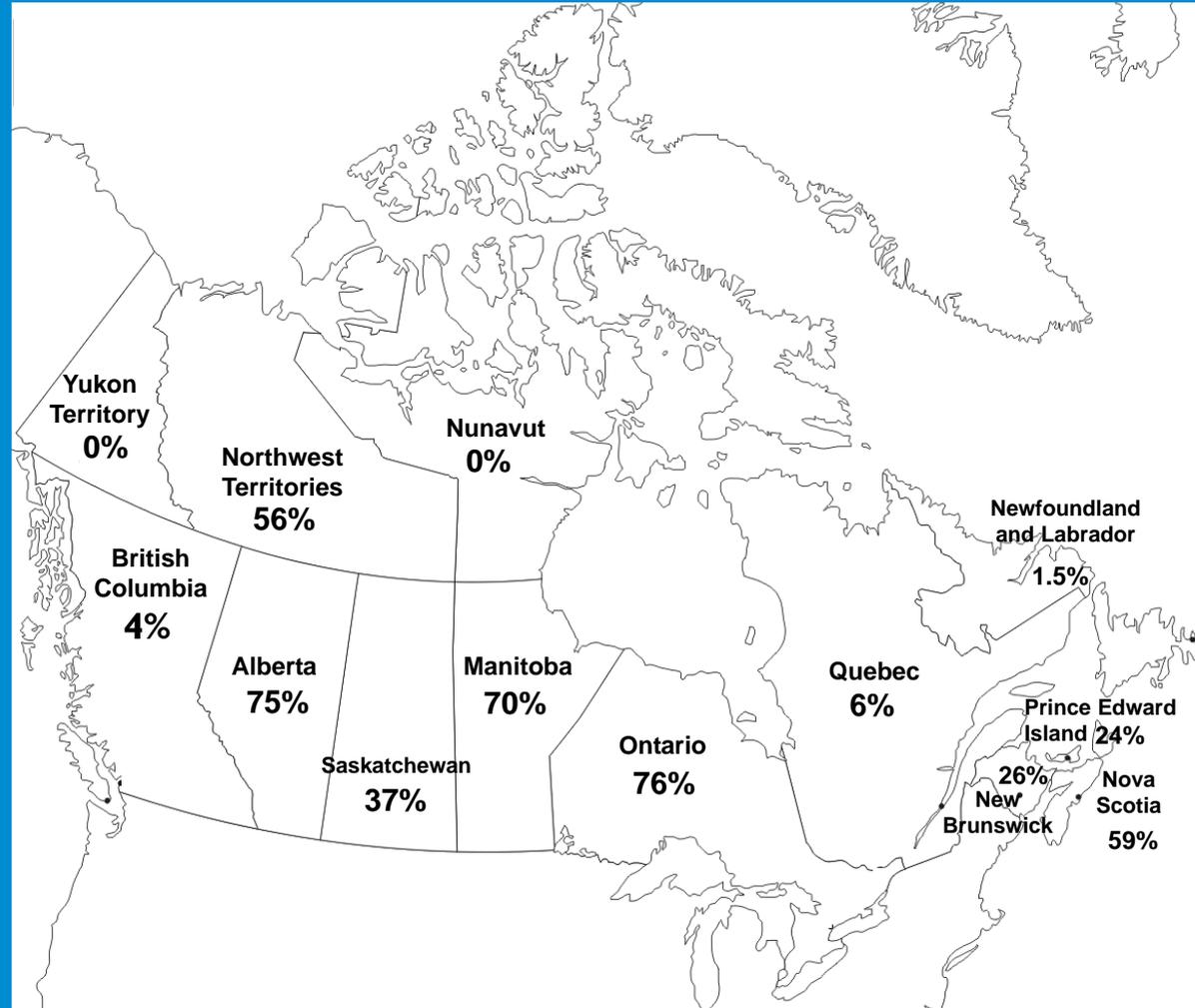
Province or territory	Population supplied with fluoridated water	% of total population
British Columbia	152,241	4%
Alberta	2,457,406	75%
Saskatchewan	356,096	37%
Manitoba	803,116	70%
Ontario	9,229,015	76%
Quebec	489,420	6%
New Brunswick	188,607	26%
Nova Scotia	509,131	59%
Prince Edward Island	32,174	27%
Newfoundland/Labrador	7,572	1.5%
Nunavut		0%
Northwest Territories	23,400	56%
Yukon		0%

Sources of information for Canada:

1. Community Dental Health Services Research Unit. *Provincial and territorial estimates for community water fluoridation coverage in 2007*. Toronto: Faculty of Dentistry, University of Toronto; 2007.

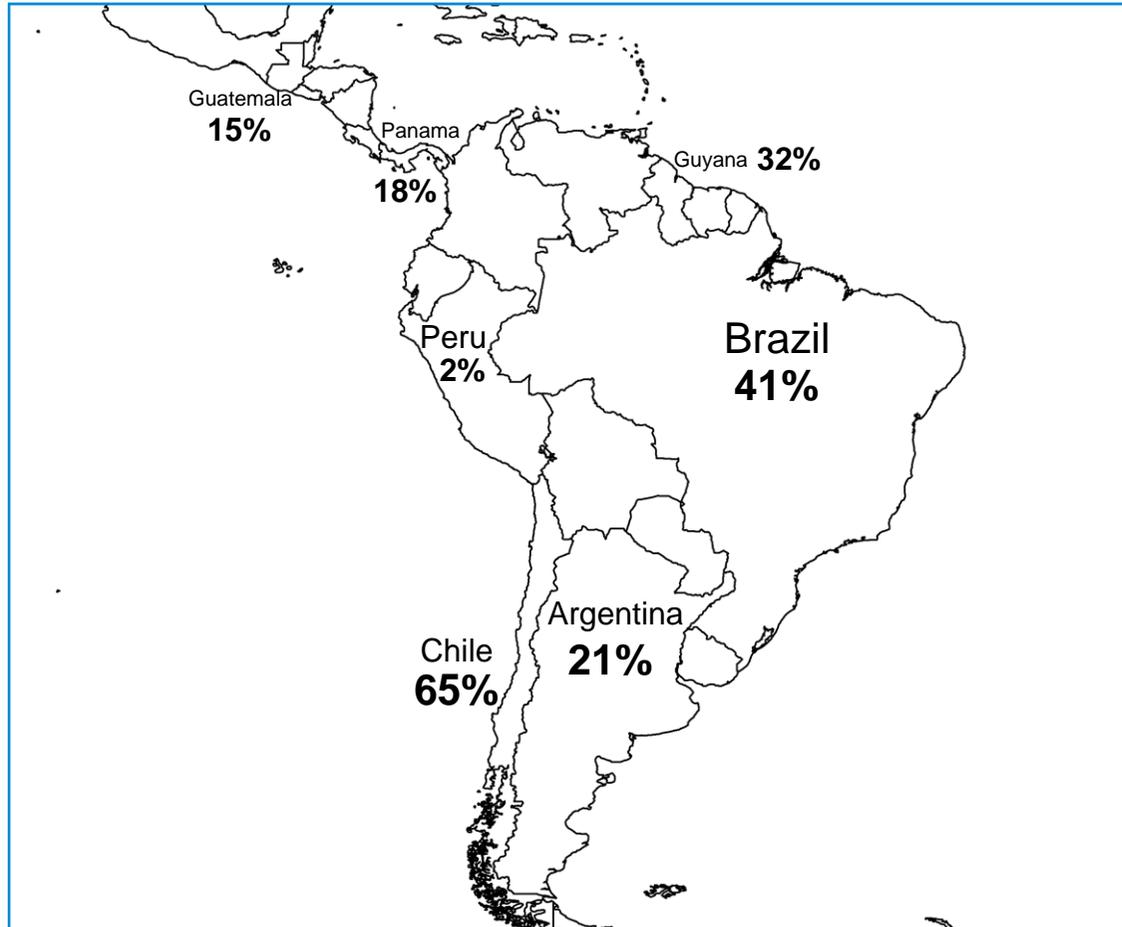
2. Rabb-Waytowich D, 2009. *Water fluoridation in Canada – past and present*. Journal of the Canadian Dental Association, July/August 2009, vol 75, no 6.

Percentages of people receiving optimally fluoridated water in Canadian provinces and territories



2. Fluoridation in Central and South America

There are extensive fluoridation schemes across Central and South America. Countries with artificial fluoridation include Brazil, Argentina, Chile, Peru, Guyana, Panama and Guatemala. The map below shows the percentage of their populations estimated to be benefiting currently from schemes. Major cities with fluoridation are shown on page 33.



Major fluoridated South American cities



Brazil

Number of people supplied with artificially fluoridated water:	73,200,000
Number of people supplied with naturally fluoridated water:	Information not available
Percentage of population with optimally fluoridated water:	41%

Brazil is the second most extensively fluoridated country in the world after the United States. As at 2008, the number of Brazilians benefiting from artificially fluoridated water was 73.2 million (41% of the population) in some 3,350 different communities. This represents an increase of around 3 million people since 2003. Major Brazilian cities with fluoridation schemes include Sao Paulo (the largest city in Brazil), Rio de Janeiro, Salvador, Recife and Manaus. These and some of the other large cities served by fluoridation schemes are shown below:

Brazilian city	Population	% supplied with fluoridated water
Aracaju	435,447	100%
Cuiaba	463,739	100%
Joao Pessoa	536,641	100%
Maceio	688,856	89%
Manaus	1,128,175	95%
Natal	658,298	89%
Porto Vehlo	320,148	47%
Recife	1,341,910	98%
Rio de Janeiro	6,385,520	100%
Salvador	2,239,226	90%
Sao Luis	758,982	100%
Sao Paulo	10,924,794	100%
Teresina	653,094	99%

Sources of information for Brazil:

1. Brazilian Institute of Geography and Statistics, 2008. *Communities with fluoridated public water supplies.*
2. Pucca Junior GA, Costa JF, Chagas L, Sivestre RM (2009). *Oral health policies in Brazil.* Brazilian Oral Research, vol 23, supplement 1.
3. Narvai PC (2000). *Dental caries and fluorine – A 20th century relationship.* Ciencia & Saude Coletiva, 5(2), 381-392.

Chile

Number of people supplied with artificially fluoridated water:	11,000,000
Number of people supplied with naturally fluoridated water:	800,000
Total (artificial and natural):	11,800,000
Percentage of population with optimally fluoridated water:	70%

Around 11 million people in Chile – 65% of the country’s population – currently benefit from artificial water fluoridation, an increase of around 6.6 million since 2003. This makes Chile the second most extensively fluoridated country in South America after Brazil. Major Chilean cities with fluoridation schemes include Santiago, the capital, and Valparaíso.

Sources of information for Chile:

Ministry of Health, Chile, 2011. *Fluoridation of drinking water.*

See www.redsalud.gov.cl/noticias/noticias.php?id_n=201

Argentina

Number of people supplied with artificially fluoridated water:	3,100,000
Number of people supplied with naturally fluoridated water:	4,500,000
Total (artificial and natural):	7,600,000
Percentage of population with optimally fluoridated water:	19%

Around 3.1 million people in Argentina (8% of the total population) are supplied with artificially fluoridated water. This makes Argentina the third most extensively fluoridated country in South America. Buenos Aires, the capital, is served by a fluoridation scheme. A further 4.5 million people in Argentina drink naturally fluoridated water at or around the optimum level for oral health.

Note: Based on pre-2003 data.

Peru

Number of people supplied with artificially fluoridated water:	500,000
Number of people supplied with naturally fluoridated water:	80,000
Total (artificial and natural):	580,000
Percentage of population with optimally fluoridated water:	2%

Around 500,000 people in Peru (2% of the population) are supplied with artificially fluoridated water, with a further 80,000 estimated to be drinking naturally fluoridated water at the optimum level for oral health.

Note: Based on pre-2003 data.

Guyana

Number of people supplied with artificially fluoridated water:	45,000
Number of people supplied with naturally fluoridated water:	200,000
Total (artificial and natural):	245,000
Percentage of population with optimally fluoridated water:	32%

Note: Based on pre-2003 data.

Panama

Number of people supplied with artificially fluoridated water:	510,000
Number of people supplied with naturally fluoridated water:	Information not available
Percentage of population with optimally fluoridated water:	Over 15%

Two water fluoridation schemes in Panama serve people living in the capital, Panama City, and San Miguelito, the second largest city.

Note: Based on pre-2003 data

Guatemala

Number of people supplied with artificially fluoridated water:	1,800,000
Number of people supplied with naturally fluoridated water:	Information not available
Percentage of population with optimally fluoridated water:	13%

Note: Based on pre-2003 data.

3. Fluoridation in Europe

Fluoridation schemes operate in four countries in Europe – the UK, the Irish Republic, Spain, and Serbia:

Population coverage in Europe:

United Kingdom: 5,797,000

Irish Republic: 3,250,000

Spain: 4,250,000

Serbia: 300,000

Total: 13,677,000

Full details of schemes serving some 5.8 million people in the UK are given at the start of this section of *One in a Million*. Details of schemes in the other European countries are given on pages 39 to 41.

Irish Republic

Number of people supplied with artificially fluoridated water:
3,250,000

Number of people supplied with naturally fluoridated water:
200,000

Total (artificial and natural): 3,450,000

Percentage of population with optimally fluoridated water: 73%

Under national legislation introduced into the Irish Parliament in 1960 and finally enacted in 1964, all public water supplies in the Irish Republic are fluoridated. Major cities and communities with fluoridated water supplies include Dublin, Cork, Limerick, Galway, Waterford, Drogheda and Dundalk.

A higher percentage of the population of the Irish Republic (73%) is supplied with optimally fluoridated water than in any other European country. However, both the UK and Spain have higher overall numbers of people drinking fluoridated water.

Sources of information for Ireland:

An evaluation of the delivery and monitoring of water fluoridation in Ireland. Commissioned by the Irish Department of Health and Children from the Department of Public and Child Dental Health, Dublin Dental School and Hospital, Trinity College, Dublin.



Spain

Number of people supplied with artificially fluoridated water: 4,250,000

Number of people supplied with naturally fluoridated water: 200,000

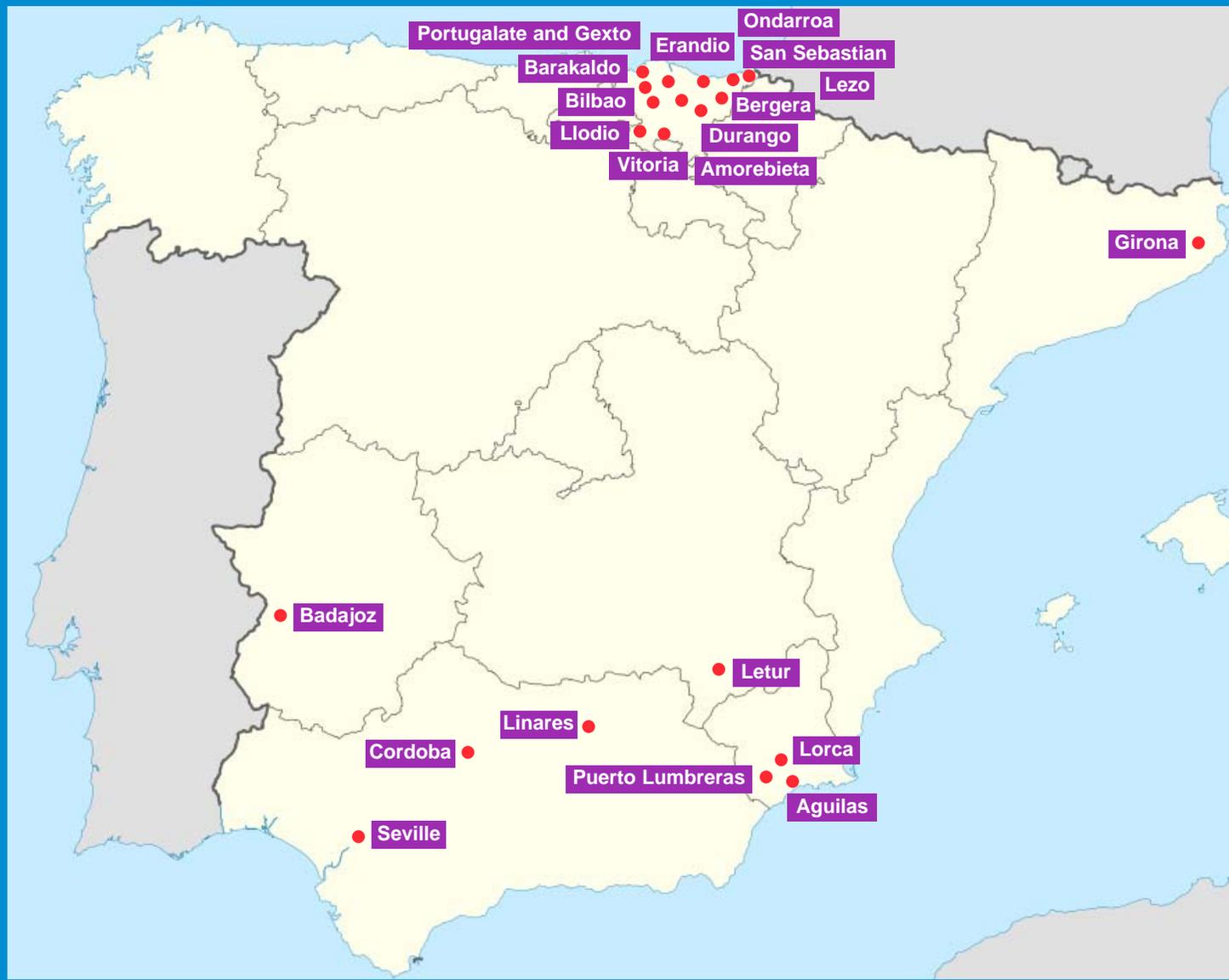
Total (artificial and natural): 3,450,000

Percentage of population with optimally fluoridated water: 11%

Around 4.25 million people in Spain (11% of the population) are served by water fluoridation schemes. The number has increased by around 250,000 since 2003. Fluoridated communities in Spain include Seville, Cordoba and Linares in Andalucia; Bilbao, San Sebastian, Vitoria and the majority of the rest of the Basque Country; Girona in north east Catalonia; Lorca, Aguilas, Puerto Lumbreras and 22 other communities in Murcia in the south east of the country; and 2 communities in the neighbouring province of Albacete.

Sources of information for Spain

Sala EC and Garcia PB, 2005: *Preventive and community dentistry – principles, methods and applications*. Masson SA, Barcelona



Serbia

Number of people supplied with artificially fluoridated water:	300,000
Number of people supplied with naturally fluoridated water:	Information not available
Percentage of population with optimally fluoridated water:	3%

Note: Based on pre-2003 data.

3. Fluoridation in Australia, New Zealand, Papua New Guinea and Fiji

Australia

Number of people supplied with artificially fluoridated water:	17,600,000
Number of people supplied with naturally fluoridated water:	144,000
Total (artificial and natural):	17,744,000
Percentage of population with optimally fluoridated water:	80%

In 2009, an estimated 80% of Australians had access to fluoridated water, compared with 61% of the population in 2002. This means that the number of people benefiting from water fluoridation in Australia increased from around 11.7 million in 2002 to around 17.6 million in 2009. The figure has continued to rise between 2009 and 2011. Australia is one of the most extensively fluoridated countries in the world.

The proportions of Australians estimated on a State by State basis to be benefiting from water fluoridation are (see map on page 44):

- New South Wales (95%)
- Queensland (92%)
- Western Australia (92%)
- South Australia (90%)
- Victoria (90%)
- Tasmania (83%)
- Northern Territory (70%)

All the major Australian cities are fluoridated, including Sydney, Melbourne, Brisbane, Adelaide, Perth, Darwin, Hobart and Canberra (see map on page 45).

Expansion of fluoridation in Queensland

In recent years, the biggest expansion of fluoridation schemes in Australia has taken place in Queensland where, in 2002, less than 5% of the total population received fluoridated water supplies. However, in 2008 the Queensland government embarked on an ambitious programme to ensure that by 2012 as many as 95% of the State's residents would be benefiting from fluoridation. By the end of 2011, a significant proportion of the Queensland government's fluoridation programme had been implemented, with fluoridation plants having been brought into operation to serve Brisbane, Cairns, Rockhampton and large parts of the Gold Coast and Sunshine Coast. Around 92% of people in the State are now served by fluoridation schemes.

Expansion of fluoridation in New South Wales

Between 2004 and 2011 the proportion of New South Wales residents receiving fluoridated water also rose - from around 90% to 95%. This followed a State-wide drive to oral health inequalities between people living in the largely fluoridated urban areas and those in non-fluoridated rural areas. During that period, a total of 16 local councils went ahead with new fluoridation schemes. The latest new scheme came into operation in February 2012 in the Port Macquarie-Hastings area. New South Wales now has the highest proportion of its population consuming fluoridated water of any State in Australia.

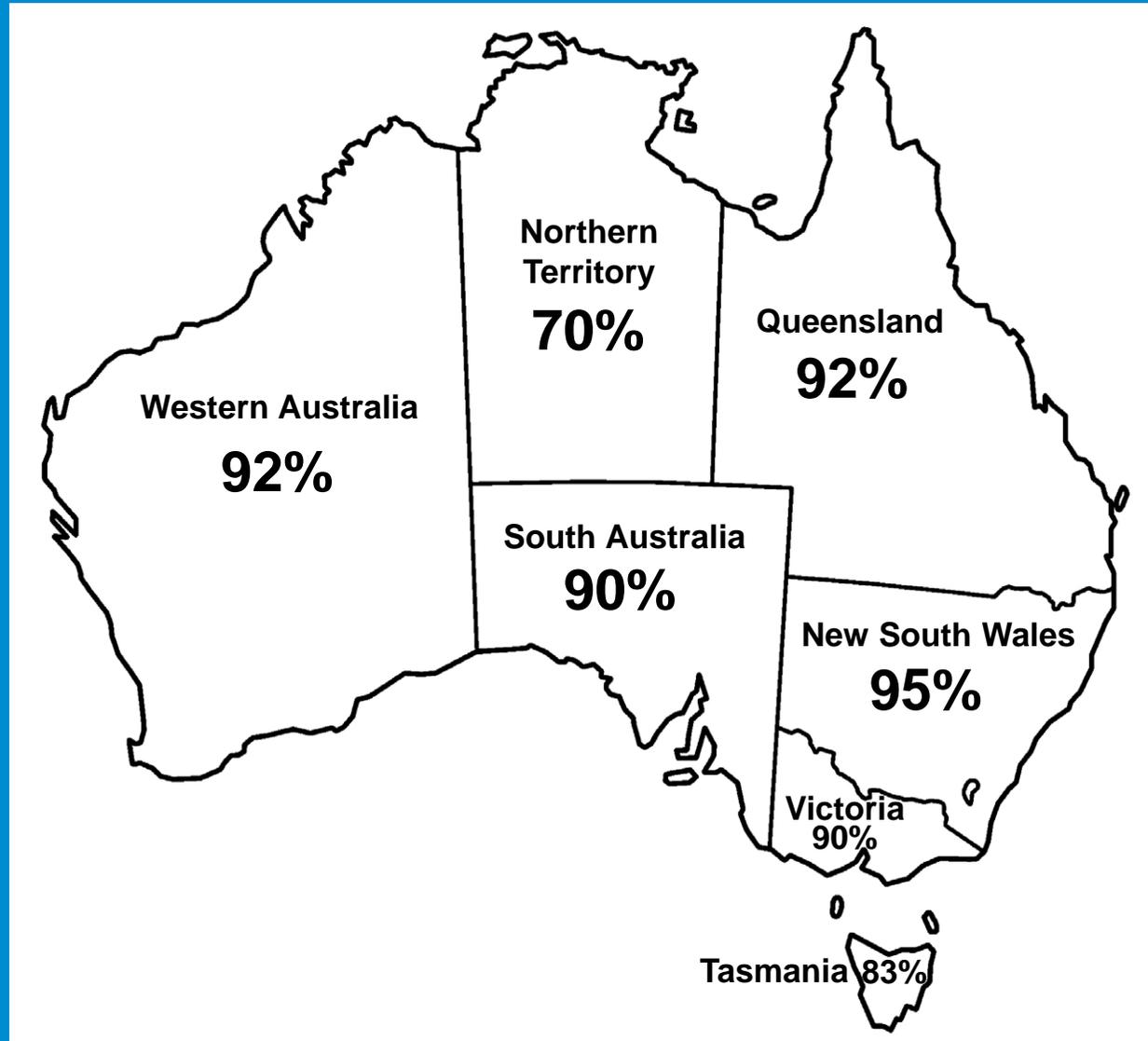
Expansion of fluoridation in Victoria

Fluoridation coverage has also been expanding in Victoria over recent years. Since 2006, the communities of Robinvale, Moe, Morwell, Sale, Warragul, Traralgon, Horsham, Wodonga, Wangaratta, Warnambool, Castlemaine, Hamilton, Yarrowonga, Benalla, Ballarat, Geelong, Colac, Seymour, Kyabram, Kerang, Swan Hill, Mildura, Bairnsdale, Lakes Entrance and Phillip Island have all had fluoride introduced to their drinking water supplies. When natural fluoridation is taken into account, around 90% of people in the State are now receiving optimally fluoridated water.

Sources of information for Australia:

1. Queensland Government, 2008: *Timetable for water fluoridation in Queensland*.
2. Centre for Oral Health Strategy, New South Wales Government. *Support for water fluoridation in New South Wales - June 2011 update*.
3. Department of Health, Victorian Government, Australia, 2010. *Water fluoridation - community information*.

Percentages of people in Australian States who are supplied with optimally fluoridated water



Major Australian cities and towns supplied with optimally fluoridated water



New Zealand

Number of people supplied with artificially fluoridated water: 2,330,000

Number of people supplied with naturally fluoridated water: Information not available

Percentage of population with optimally fluoridated water: 61%

In 2010, there were 2.33 million people supplied with fluoridated water in New Zealand, around 61% of the total population. Since 2003, there has been a small increase of around 16,000 in the number of people covered by fluoridation schemes. Fluoridated cities in New Zealand include Auckland, Wellington, Hamilton, Hastings, Palmerston North, Dunedin and Invercargill.

Sources of information for New Zealand:

1. Ministry of Health, New Zealand, 2010. *Drinking water for New Zealand – fluoridated supplies at 8th March 2010.*
2. Ministry of Health, New Zealand, 2010. *Drinking water for New Zealand – treatment plants for fluoride.*



Papua New Guinea

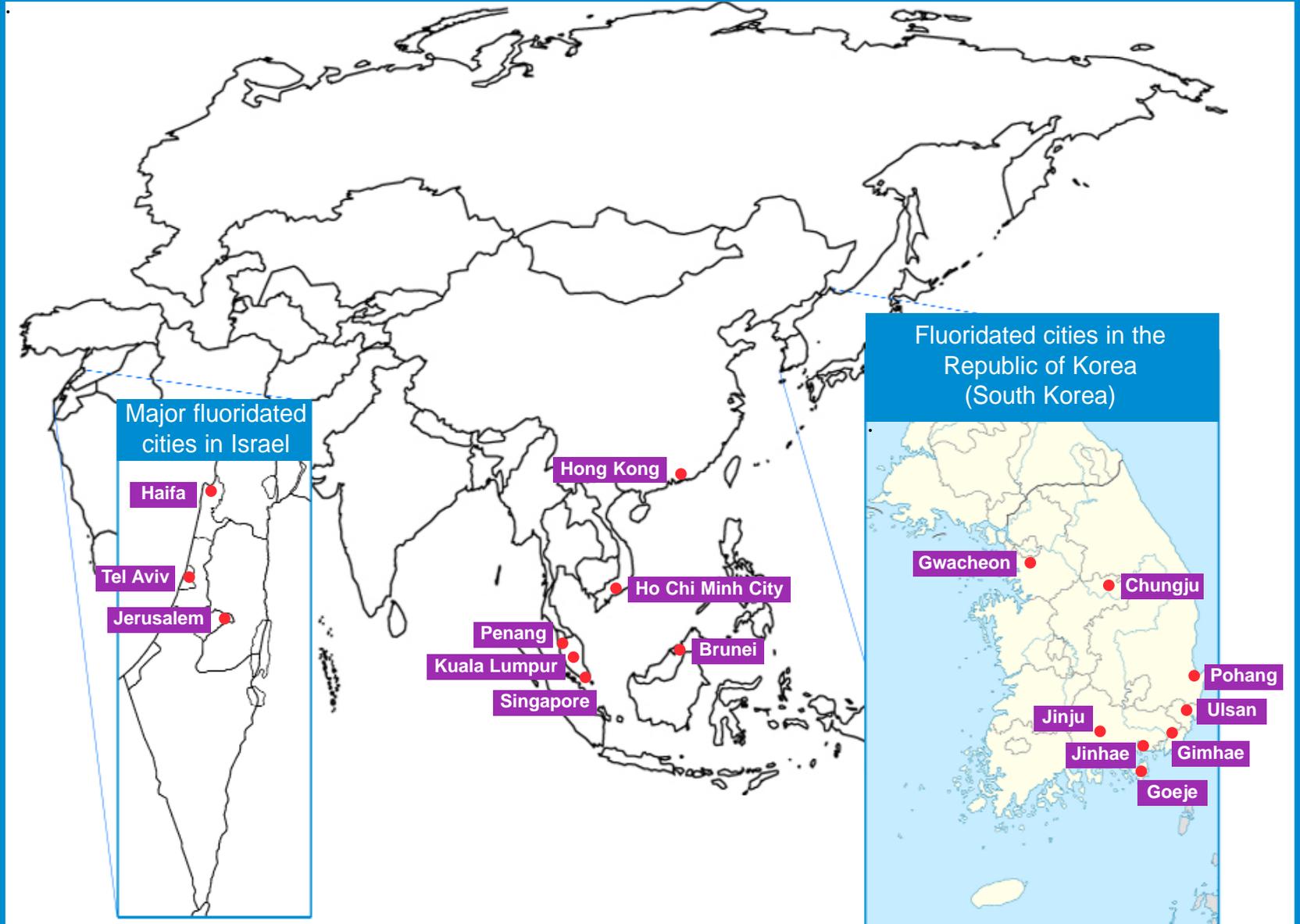
Number of people supplied with artificially fluoridated water:	102,000
Number of people supplied with naturally fluoridated water:	70,000
Total (artificial and natural):	172,000
Percentage of population with optimally fluoridated water:	6%

Note: Based on pre-2003 data.

Fiji

Number of people supplied with artificially fluoridated water:	300,000
Number of people supplied with naturally fluoridated water:	Information not available
Percentage of population with optimally fluoridated water:	36%

Note: Based on pre-2003 data.



4. Fluoridation in Asia

Malaysia

Number of people supplied with artificially fluoridated water:	20,700,000
Number of people supplied with naturally fluoridated water:	Information not available
Percentage of population with optimally fluoridated water:	75.5%

A total of 75.5% of the Malaysian population (around 20.7 million people) now drink fluoridated water. This represents an increase of some 4.9 million people since 2003. Major Malaysian cities with water fluoridation schemes include the capital, Kuala Lumpur, and Penang.

Sources of information for Malaysia:

1. Statement from the Malaysian Health Ministry, October 2010. Published in the Star online, 31st December 2010.
2. *Effective use of fluorides in Malaysia*. Paper jointly presented at a WHO/FDI/IADR scientific workshop in Thailand, March 2011, by Dato' Dr Norain bt Abu Talib, Principal Director of Oral Health, Malaysian Ministry of Health, and Professor Ishak Abdul Razak, Department of Community Dentistry, University of Malaysia, Kuala Lumpur

Singapore

Number of people supplied with artificially fluoridated water:	5,080,000
Percentage of population with optimally fluoridated water:	100%

All public water supplies in Singapore are fluoridated. Since 2000, the population has expanded from 4.1 million to around 5.08 million. Nearly an additional 1 million people are therefore now benefiting.

Sources of information for Singapore:

Public uses of fluoride in Singapore. Paper presented at a WHO/FDI/IADR scientific workshop in Thailand, March 2011, by Professor Patrick Tseng, Chief Dental Officer, Ministry of Health, Singapore and Gabriel Tse Feng Chong, Dental Officer, Ministry of Health, Singapore.

China, Special Administrative Region of Hong Kong

Number of people supplied with artificially fluoridated water:	6,968,000
Percentage of population with optimally fluoridated water:	100%

All public water supplies in Hong Kong are fluoridated. Since 2000, the population has expanded from 6.7 million to nearly 7 million. An additional 300,000 people are therefore now benefiting.

Sources of information for China, Special Administrative Region of Hong Kong:

Water fluoridation in Hong Kong. Paper presented at a WHO/FDI/IADR scientific workshop in Thailand, March 2011, by Ho TWM, Principal Dental Officer, Department of Health, Government of Hong Kong, Special Administrative Region, People's Republic of China, Wong TC, Past President, Hong Kong Dental Association and FDI Treasurer, and Lo ECM, Professor, Faculty of Dentistry, University of Hong Kong.

Vietnam

Number of people supplied with artificially fluoridated water:	3,500,000
Number of people supplied with naturally fluoridated water:	Information not available
Percentage of population with optimally fluoridated water:	4%

Around 3.5 million people in Vietnam are supplied with artificially fluoridated water, including parts of Ho Chi Minh City (Saigon) in the south east of the country and one district of neighbouring Dong Nai province. Further progress in extending the population coverage of fluoridation is limited by the fact that more than 70% of Vietnamese people are not connected to public water supplies.

Sources of information for Vietnam:

The Public Use of Fluoride for Caries Prevention in Vietnam. Paper jointly presented at a WHO/FDI/IADR scientific workshop in Thailand, March 2011, by Trinh Dinh Hai and Nguyen Thi Hong Minh, National Hospital of Odonto-Stomatology, Vietnam.

Brunei

Number of people supplied with artificially fluoridated water:	375,000
Number of people supplied with naturally fluoridated water:	Information not available
Percentage of population with optimally fluoridated water:	95%

As many as 95% of people living in Brunei are supplied with artificially fluoridated water, including the residents of Bandar Seri Begawan, the capital city. Fluoridated water is provided from four separate schemes introduced across the country between 1987 and 2000.

Sources of information for Brunei Darussalam:

Effective Uses of Fluorides in Brunei Darussalam. Paper presented at a WHO/FDI/IADR scientific workshop in Thailand, March 2011, by Mary Cheong, Head of Oral Health Promotion, Department of Dental Services, Ministry of Health, Negara Brunei Darussalam.

Republic of Korea (South Korea)

Number of people supplied with artificially fluoridated water:	2,820,000
Number of people supplied with naturally fluoridated water:	Information not available
Percentage of population with optimally fluoridated water:	6%

Just under 3 million people living in the Republic of Korea 'South Korea' are supplied with artificially fluoridated water. Communities served by fluoridation schemes include the cities of Gwacheon, Chungju, Jinju, Jinhae, Goeje, Gimhae, Ulsan and Pohang.

Sources of information for the Republic of Korea (South Korea)

Public Use of Fluoride for the Prevention of Dental Caries in Korea. Paper jointly presented at a WHO/FDI/IADR scientific workshop in Thailand, March 2011, by BH Jin and DI Paik, Department of Preventive and Social Dentistry, Seoul National University, and SG Lee, Korean Dental Association.

Israel

Number of people supplied with artificially fluoridated water:	5,272,000
Number of people supplied with naturally fluoridated water:	150,000
Total (artificial and natural):	5,422,000
Percentage of population with optimally fluoridated water:	70%

Over 5 million people in Israel are supplied with artificially fluoridated water. When some 150,000 people receiving naturally fluoridated water are also taken into account, it means that around 70% of the total population are benefiting from the protection afforded against tooth decay by optimally fluoridated water. Major cities served by fluoridation schemes include Jerusalem, Tel Aviv and Haifa.

Sources of information for Israel:

Ministry of Health, 2012

5. Fluoridation in Africa

Libya

Number of people supplied with artificially fluoridated water:	400,000
Number of people supplied with naturally fluoridated water:	1,000,000
Total (artificial and natural):	1,400,000
Percentage of population with optimally fluoridated water:	22%

Note: Based on pre-2003 data.

6. Other countries with naturally fluoridated water

Naturally occurring fluoride levels in water may be significantly in excess of the optimum in parts of China, India, Tanzania, Zambia and Zimbabwe. In the 28 countries listed on this page, the number of people with naturally occurring fluoride in their water at the optimal level is estimated to be around 39.5 million, although the variations in fluoride levels from one community to another, and over time in a particular community, make it difficult to calculate an accurate total.

	Estimated population receiving naturally fluoridated water	% of total population
Austria	160,000	2%
China (People's Republic)	Over 200,000,000	15%
Colombia	600,000	1%
Cyprus	40,000	5%
Czech Republic	15,000	0.14%
Democratic Rep of Congo	600,000	0.8%
Denmark	50,000	0.9%
Finland	200,000	4%
France	1,800,000	3%
Gabon	1,261,000	86%
Haiti	11,500	0.1%
India	Over 60,000,000	5%
Kiribati	50,000	51%
Malta	39,000	9%
Mexico	3,000,000	3%
Namibia	200,000	9%
Nigeria	20,000	0.01%
Philippines	850,000	0.9%
Senegal	1,000,000	8%
Sri Lanka	2,800,000	14%
Sweden	750,000	8%
Tanzania	12,250,000	28%
Thailand	150,000	0.2%
Uruguay	15,000	0.5%
Venezuela	100,000	0.4%
Zambia	947,000	7%
Zimbabwe	2,600,000	21%

7. Worldwide totals for populations with artificially and naturally fluoridated water

Artificial fluoridation in 25 countries

The estimated worldwide total of people supplied with artificially fluoridated water as at November 2012 is 377,655,000 in 25 countries, including the United Kingdom, the United States, Canada, Brazil, Chile, Argentina, Peru, Panama, Guyana, Guatemala, Irish Republic, Spain, Serbia, Australia, New Zealand, Fiji, Malaysia, Singapore, Vietnam, Brunei, China (Special Administrative Region of Hong Kong), Papua New Guinea, Republic of Korea (South Korea), Israel and Libya.

Natural fluoridation in the 25 countries operating artificial fluoridation schemes

In the 25 countries with water fluoridation schemes serving around 377,655,000 people there are also an estimated 17,910,000 people drinking naturally fluoridated water at or around the optimal level. That brings the total consuming optimally fluoridated water in those countries to around 395,565,000 million.

Other countries with natural fluoridation

In addition, there are a further 28 countries with naturally fluoridated water supplied to more than 280 million people. Whilst some of these people may have access to water with optimal naturally occurring levels of fluoride, it should be stressed that in many instances the level is in excess of the optimum - for example, in parts of China, India, Tanzania, Zambia and Zimbabwe. It is estimated that the worldwide figure for those with access to naturally fluoridated water at the optimal level is around 39.5 million, although the variations in fluoride levels from one community to another, and over time in a particular community, make it difficult to calculate an accurate total.

Total worldwide population drinking optimally fluoridated water

The number of people around the world whose water supplies contain naturally fluoridated water at the optimum level for oral health is estimated to be around 57.4 million. This figure is derived from countries with and without artificial water fluoridation schemes.

When the numbers of people with artificially fluoridated water supplies (377.7 million) and naturally fluoridated water supplies at the optimum level (57.4 million) are added together, the estimated worldwide total is 435.1 million.

Further information

If you have more up to date information about water fluoridation around the world, please email it to the British Fluoridation Society at bfs@bfsweb.org citing the published sources of that information.