

# Exposure of Irish school children to domestic water fluoridation

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## Background

The determination of each participants exposure to domestic water fluoridation is an essential component of the FACCT research project (Fluoride And Caring for Children's Teeth)\*. The aim of the overall grant is to evaluate the impact and outcome of the change in policy on water fluoridation and on the use of fluoride toothpaste on dental caries and enamel fluorosis in Irish school children with and without lifetime exposure to water fluoridation.

In 2002 the Forum on Fluoridation<sup>1</sup>, which was established to review the fluoridation of public water supplies in Ireland, concluded that water fluoridation was safe and effective. The increase in the availability of fluoride from other sources, such as toothpaste, coupled with evidence of an increase in enamel fluorosis, led to the Forum recommending the lowering of the fluoride level in drinking water<sup>2</sup> to a range of 0.6 to 0.8 ppm (mg/l), with a target of 0.7 ppm (mg/l)<sup>1</sup>. This change was brought into effect on July 1<sup>st</sup> 2007 (Fluoridation of water supplies regulations, 2007)<sup>3</sup>.

In addition, the Forum<sup>1</sup> recommended that "Parents should be advised not to use toothpaste when brushing their children's teeth until the age of 2 years" and that after this age, toothpaste containing at least 1000 ppm F should be used. The combination of these two measures aimed to strike a balance between the risk of fluorosis and caries prevention.

It is estimated that approximately 73% of the population in Ireland receive a fluoridated domestic water supply<sup>4</sup>. Previous research and measurement of effectiveness have compared the population that always resided in a fluoridated location with the population in a non fluoridated location, this however does not take account of individuals who move from place to place. Such participants were then excluded from some analyses.

The aim of this research process is to measure the duration and pattern of exposure to domestic water fluoridation of the 5- year-old and 12-year-old participants in FACCT from Counties Cork and Dublin.

## Methods

A cross-sectional study was conducted in the counties of Dublin, Cork and Kerry. In total 2380 children; 1184 male and 1196 female were examined, in Dublin 92 primary schools participated and in Cork 134 schools participated.

Legislation and Regulation: The Health (Fluoridation of water supplies) Act, 1960<sup>2</sup>, Section 4: (c) states that every sanitary authority shall, notwithstanding anything contained in the Local Government (Sanitary Services) Acts, 1878 to 1952, or in any local Act relating to the supply of water to the public, comply with any regulations made under this subsection which are applicable to that sanitary authority

SI 42 of 2007: The amount of fluoride which may be added to public water supplies shall be such that the water, after the addition of the fluoride, shall contain not more than 0.8 milligrams of fluoride per litre (mg/l) of water, and not less than 0.6 milligrams of fluoride per litre (mg/l) of water.

Schools were selected based on whether or not they received a fluoridated public piped water supply; the school indicated the fluoridation status of the general area, the home address(es) of participants dictated their ultimate domestic water fluoridation status. Each child's exposure to domestic water fluoridation was based on their place of residence, the duration of residence at that location and the monthly figure returned for the concentration of fluoride in the public piped water supply (Table 1),(Figure 1),(Figure 2). Each participants exposure was mapped (Figure 3). Ireland does not use a system of post or zip codes in the address.

Table 1: Classification used to determine participant's domestic water fluoridation status

Fluoridation Status	Description	Age in years	Rules
FULL	Lifetime exposure to domestic water fluoridation	5	<ul style="list-style-type: none"> <li>Must be continuously fluoridated at &gt; 0.4 ppm from at least 6 months old to date of examination</li> <li>The 1<sup>st</sup> ≤ 6 months continuous without water fluoridation at &gt; 0.4 ppm is acceptable</li> </ul>
		12	<ul style="list-style-type: none"> <li>Must be continuously fluoridated at &gt; 0.4 ppm from at least 6 months old to at least 6 months before the date of examination</li> <li>The 1<sup>st</sup> ≤ 6 months continuous without water fluoridation at &gt; 0.4 ppm is acceptable</li> <li>The last ≤ 6 months continuous before date of examination without water fluoridation at &gt; 0.4 ppm is also acceptable</li> </ul>
NON	No exposure to domestic water fluoridation	5	<ul style="list-style-type: none"> <li>Must be continuously non-fluoridated at &lt; 0.4 ppm from at least 6 months old to date of examination</li> <li>The 1<sup>st</sup> ≤ 6 months continuous with water fluoridation at &gt; 0.4 ppm is acceptable</li> </ul>
		12	<ul style="list-style-type: none"> <li>Must be continuously non-fluoridated at &lt; 0.4 ppm from at least 6 months old to at least 6 months before the date of examination</li> <li>The 1<sup>st</sup> ≤ 6 months continuous with water fluoridation at &gt; 0.4 ppm is acceptable</li> <li>The last ≤ 6 months continuous before date of examination with water fluoridation at &gt; 0.4 ppm is also acceptable</li> </ul>
PART	Some exposure to domestic water fluoridation, but does not meet criteria for FULL or NON	All	<ul style="list-style-type: none"> <li>Does not meet the criteria for FULL because &gt; 6 months continuous without water fluoridation at &gt; 0.4ppm at any age</li> <li>Does not meet the criteria for NON because &gt; 6 months continuous with water fluoridation at &gt; 0.4ppm at any age</li> <li>Participants with multiple shorter periods without fluoridation at &gt; 0.4 ppm will be classified on an individual basis considering the timing and duration of the fluctuations of their exposure to domestic water fluoridation</li> </ul>
UNKNOWN	Unknown exposure to domestic water fluoridation	All	<ul style="list-style-type: none"> <li>Lived abroad (do not include holidays abroad unless &gt; 6 months continuous duration)</li> <li>Parents refused to complete residential history</li> </ul>

\* Cases not covered by these rules will be reviewed and classified on an individual basis.

Figure 1: Cork City and Harbour monthly fluoride concentration (ppm), 2001 to 2014

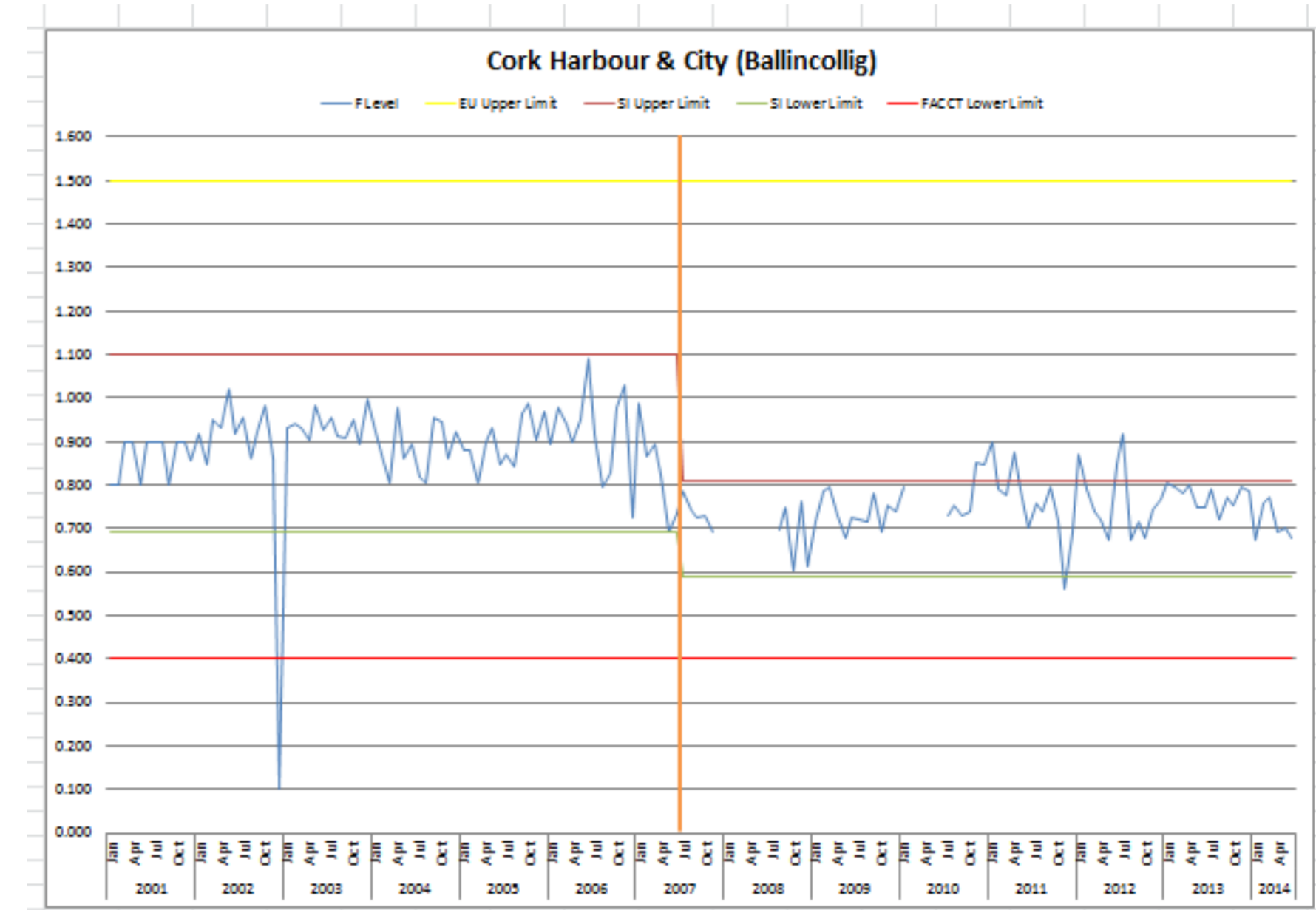


Figure 2: Cork county council (sanitary) authority area with public piped water supplies and study schools mapped

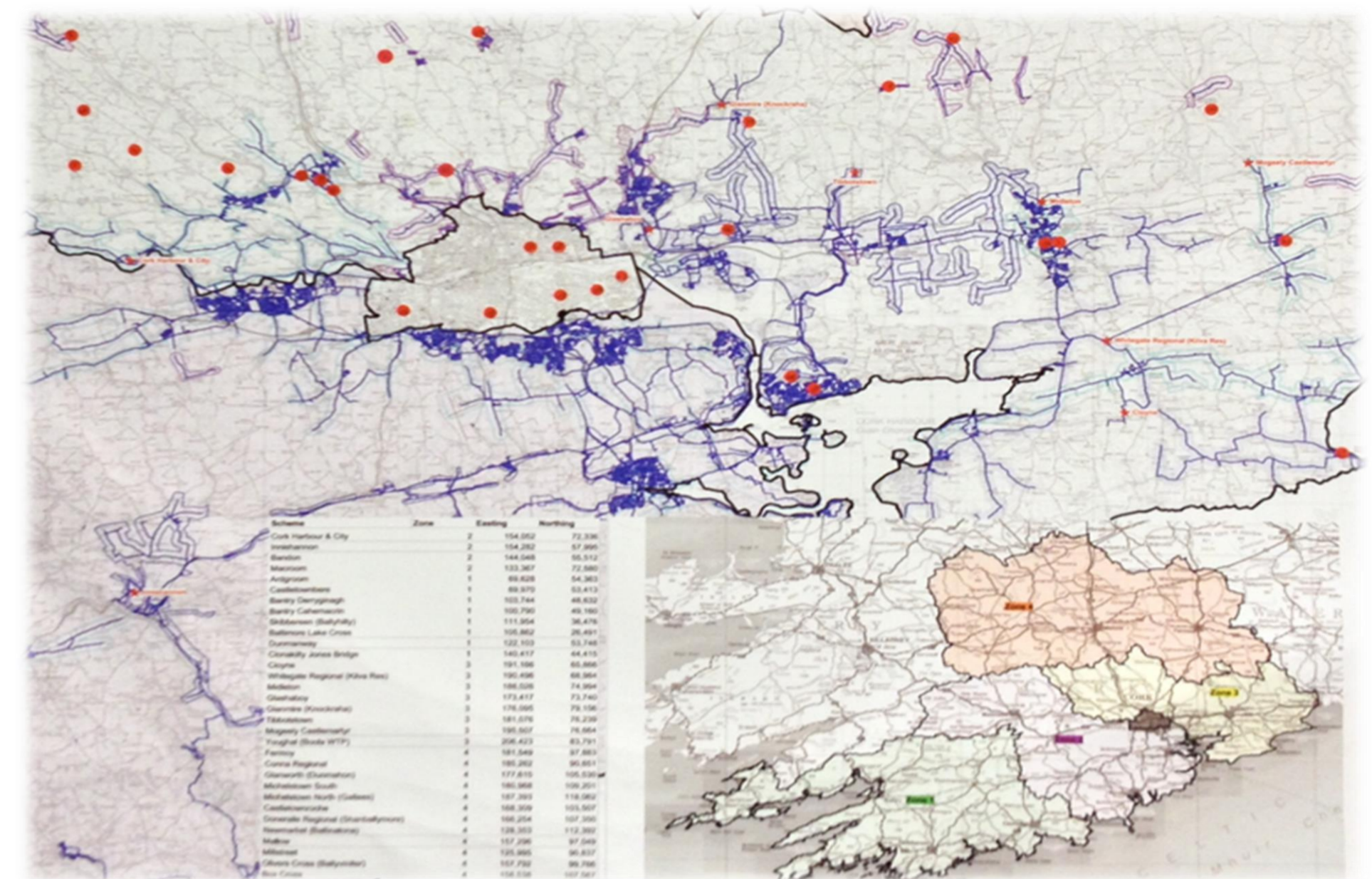
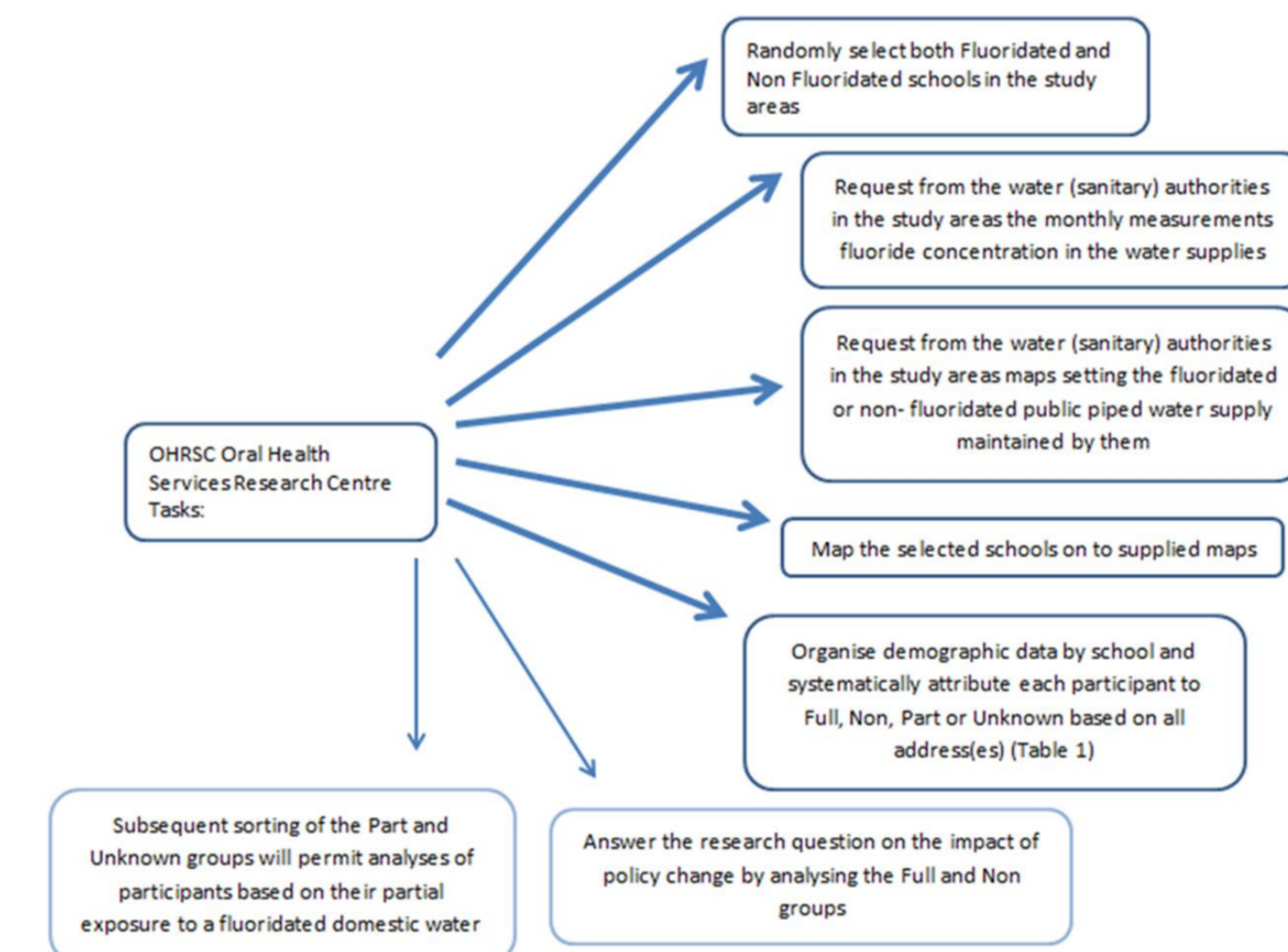


Figure 3: Steps required to assign the domestic water fluoridation status for each participant



## Results

Thus far five individuals working over four months were required to classify the fluoridation status of FACCT participants. In Dublin the proportion classified with a full fluoridation status was 89.2%, in Cork the proportion to date is 30.2% with 11.8% having some exposure (Table 2)

Table 2: The outcome of classification in the Counties of Cork and Dublin

Status	Cork % and (n)	Dublin % and (n)
Fluoridated	30.2 (816)	82.9 (1551)
Non Fluoridated	42.2 (1141)	0.1 (1)
Part	11.8 (318)	0.1 (1)
On going Classification	15.8 (429)	17 (319)

## Conclusion

Investigating exposure to domestic water fluoridation is an essential but complex and resource intensive multi-level process. This research facilitates continual oral health surveillance and caries preventive strategies. The oral health implications of the current level of exposure to domestic water fluoridation among Irish schoolchildren will be explored by the FACCT study.

\*FACCT is a collaborative project between the Oral Health Services Research Centre, UCC and the HSE dental service, with funding from the Health Research Board awarded under a competitive Collaborative Applied Research Grant in Population Health and Health Service Research. (HRB/CARG/2012/34).

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