

# Association Between 0.7ppm Water Fluoridation and Caries in Primary Teeth

#1343



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## Background

Water fluoridation commenced in the Republic of Ireland in 1964. Currently 73% of the population have domestic water fluoridation. In response to evidence that levels of fluorosis in fluoridated areas in Ireland increased between 1984 and 2002, fluoride levels in water were lowered from 0.8-1.0ppm to 0.6-0.8ppm in 2007.

The FACCT (Fluoride And Caring for Children's Teeth) study is a 5-year research programme to evaluate the impact on caries and fluorosis of lowering the dose of fluoride in Irish water in 2007 alongside the issuing of guidance for parents in 2002 on the rational use of fluoride toothpaste. Data for the Cork and Kerry sample are presented here.

**Objective:** To assess the relative contribution of water fluoridation at 0.6-0.8ppm to the prevention of caries in primary teeth.

## Methods

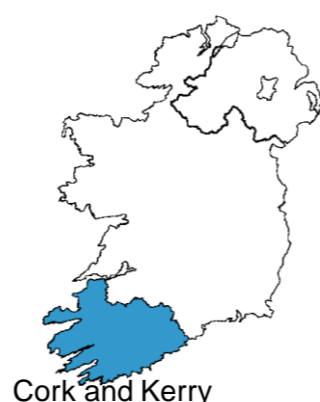
This is a subset of a larger study involving children age 5 and 12 at baseline and children in the Dublin region. This analysis is limited to 5-year-old children in Cork and Kerry, examined at baseline in 2013/'14.

Water fluoride level lowered to 0.6-0.8ppm in Ireland in July 2007  
Prospective cohort study, 2007-'08 birth cohort  
Caries measured at age 5 in 2013/'14 and caries and fluorosis in 2016/'17  
Representative random sample  
Children in their first year in primary school in Cork and Kerry in Ireland  
Sample stratified by:  
fluoridation status  
administrative areas  
school size (small, medium and large).

Fieldwork carried out in the 2013-14 school year.  
Clinical examination by a team of trained and calibrated examiners, Caries was recorded at the dentinal level according to modified WHO criteria which included visible non cavitated caries.  
Questionnaire was completed on behalf of each child by their parents or guardians, data collected included: demographic variables, brushing, toothpaste use and sugar frequency  
Personalised fluoridation status: based on the fluoride content of domestic water supplies for both current and previous addresses.  
Analysis focuses on children who have resided in households with water fluoridation from birth (Full-Fl) and those who have resided in a household with no water fluoridation from birth (Non-Fl).  
Parents medical card ownership (indicates least well off 38% of the population) was used as a surrogate for disadvantage status.

## Results

Outcome and potential explanatory variables		%
Caries	Caries free	58.6
	Caries	41.4
Fluoridation	Non Fluo	63.8
	Fluo since birth	36.2
First brushing	>=12 months	61.8
	<12 months	38.2
Visit dentist	>12 months ago	28.6
	< 12 months ago	71.4
Mothers education	Second level or less	26.7
	Fathers education	Second level or less
Gender	Male	49.3
	Female	50.7
Disadvantage	No	69.6
	Yes	30.4
Started toothpaste	Before 24 months	81.4
	After 24 months	18.6
Frequent snacking	2/day or less	78.5
	3+/day	21.5
First toothpaste	Children's	17.8
	Adults	82.2
Freq of brushing	1/day or less	35.0
	2/day or more	65.0



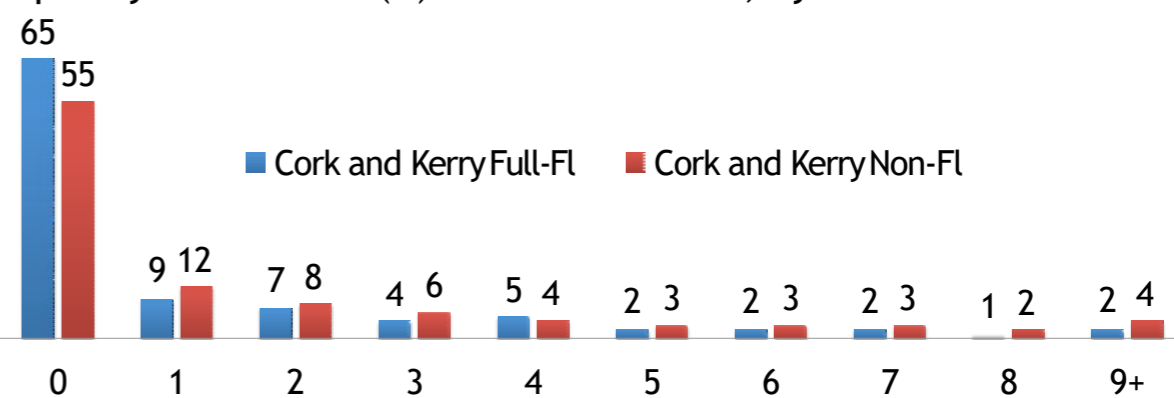
1,879 5-year-olds children in Cork and Kerry were clinically examined  
Parents completed a questionnaire

Number and d<sub>3vc</sub>mft: All children by fluoridation

	n	dmft	sd
Full Fl	520	1.2	2.3
Non Fl	913	1.8	2.9
Other	446		
Total	1,879		

## Results

Frequency distribution (%) of d<sub>3vc</sub>mft scores, by fluoridation status



### Multivariate analysis: Hurdle model

Based on the distribution of the data a Hurdle Model (logistic regression and zero-truncated negative binomial) was selected for multivariate analysis.

The Hurdle model applies analyses in two iterations to the data. The first equation determines whether you clear the hurdle, which in this case is development of any caries, the second determines the value (number of d<sub>3vc</sub>mft) of the outcome conditional on having at least one carious tooth.

The results for the hurdle model after manual backward elimination of variables (step-by-step removal of variables with the highest p-values) until only significant variables remain, are presented in two parts.

Part 1: Primary d <sub>3vc</sub> mft > 0 vs. d <sub>3vc</sub> mft = 0	Odds of having caries %	P >  Z
Water Fluoridation	-46.4	0.001
Visit to dentist <12 months	+76.3	0.005
Mother low education	+136.6	0.001
Father low education	+74.1	0.010

Part 1 looks at the odds of having any caries

Domestic water fluoridation decreases the odds of having caries (d<sub>3vc</sub>mft > 0) by 46.4%, holding all other variables constant.

Visiting the dentist in the past 12 months increases the odds of having caries by 76.3%.

Mothers and fathers having a highest level of education of leaving cert (end of second level) or less increases the odds of having at least one decayed, missing or filled primary teeth (primary d<sub>3vc</sub>mft) by 136.6% and 74.1%.

Part 2: Zero truncated negative binomial	Change in expected d <sub>3vc</sub> mft %	P >  Z
Brushing before 12 months	-21.5	0.018
Visit to dentist 12 months	+34.3	0.040
Mother low education	+45.4	0.001
Father low education	+29.2	0.026

Part 2 looks at those who have at least one decayed, missing or filled primary tooth (primary d<sub>3vc</sub>mft > 0) to determine what variables influence the level of caries experience.

Holding all other variables constant. Starting brushing before the age of 12 months decreases the expected number of decayed, missing or filled primary teeth by 21.5%.

Visiting the dentist in the past 12 months increases the expected number of decayed teeth by 34.3%.

Mothers and fathers having a highest level of education of leaving cert or less increases the expected number of decayed teeth by 45.1% and 29.2%.

## Conclusions

The Hurdle model is a robust multivariate statistical method which caters for the over-dispersion and excess zeros inherent in caries counts. It is a useful method for evaluating the relative contribution of multiple explanatory variables in caries prevalence and severity.

These data suggest that while holding other variables constant water fluoridation at the lower level of 0.7ppm continues to be effective in reducing the prevalence of caries in the primary dentition.

## Acknowledgements

This research was funded by Irish Health Research Board (HRB) as part of the Collaborative Applied Research Grant scheme: CARG 2012/34.