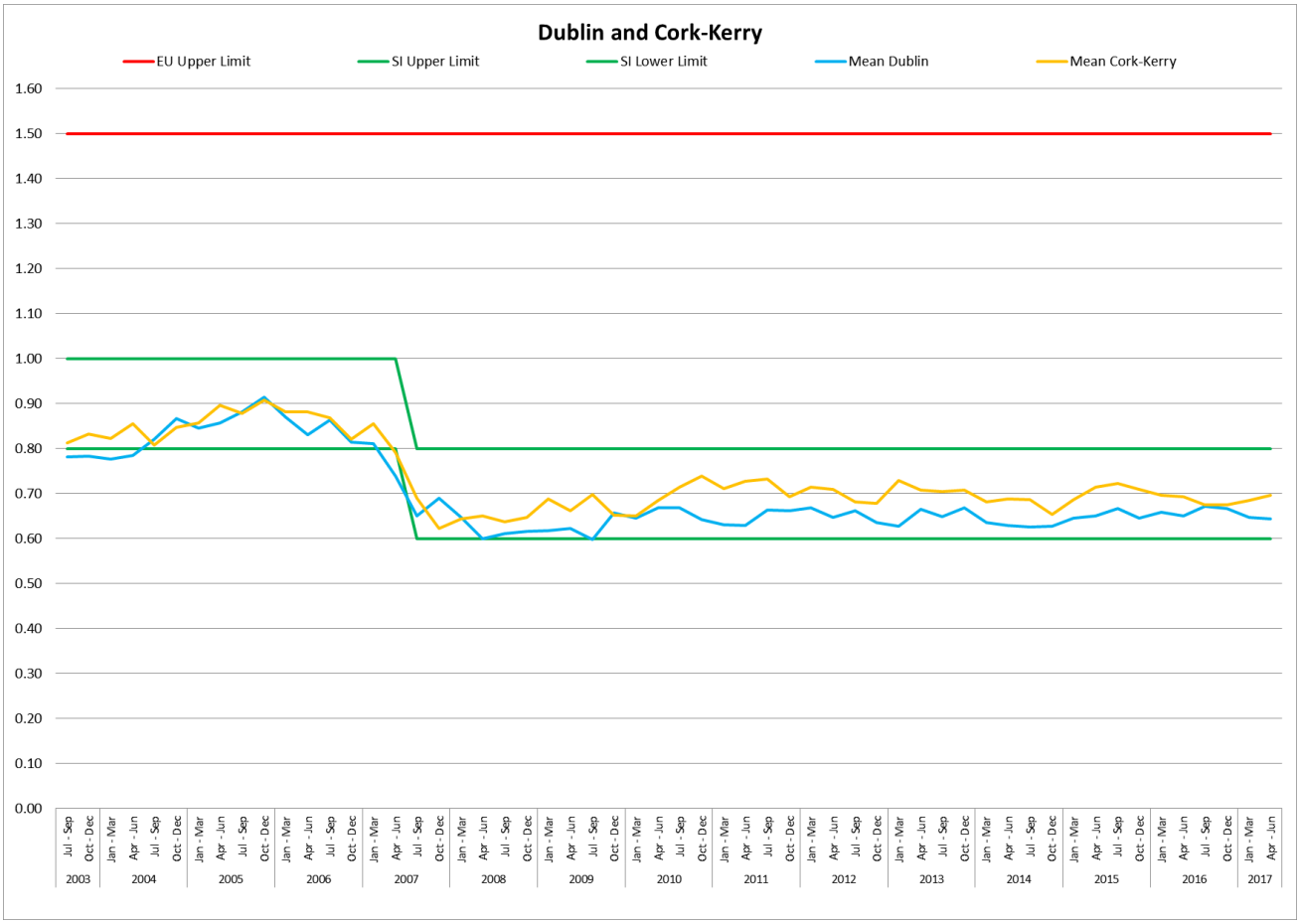
CORA Cork Open Research Archive
Cartlann Taighde Oscailte Chorcaí

Title	Impact of reducing water fluoride on dental caries and fluorosis
Authors	James, Patrice;Harding, Máiréad;Beecher, Darragh;Browne, Deirdre;Cronin, Michael;Guiney, Helena;O'Mullane, Denis;Whelton, Helen
Publication date	2020-12-21
Original Citation	James, P., Harding, M., Beecher, D., Browne, D., Cronin, M., Guiney, H., O'Mullane, D. and Whelton, H. (2020) 'Impact of Reducing Water Fluoride on Dental Caries and Fluorosis', Journal of Dental Research, (8 pp). doi: 10.1177/0022034520978777
Type of publication	Article (peer-reviewed)
Link to publisher's version	https://journals.sagepub.com/doi/10.1177/0022034520978777 - 10.1177/0022034520978777
Rights	© International & American Associations for Dental Research 2020
Download date	2026-11-08 03:31:55
Item downloaded from	https://hdl.handle.net/10468/10898

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Impact of reducing water fluoride on dental caries and fluorosis

P James, M Harding, T Beecher, D Browne, M Cronin, H Guiney, D O'Mullane, H Whelton.

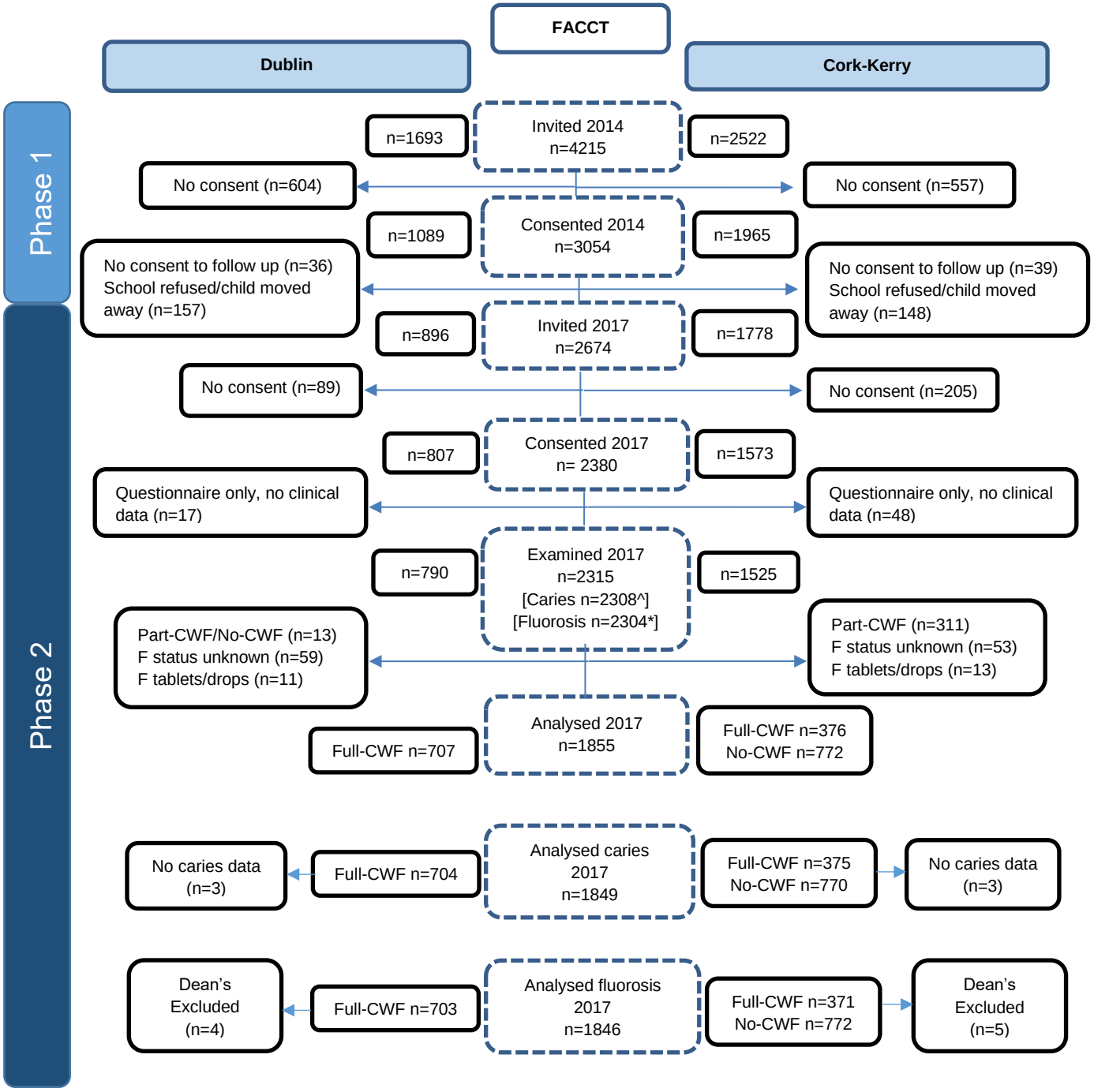


Appendix Figure 1: Quarterly mean water fluoride concentration (ppm F) for Dublin and Cork-Kerry from July 2003 to June 2017.

Appendix Table 1: Details of training and calibration 2002 and 2017

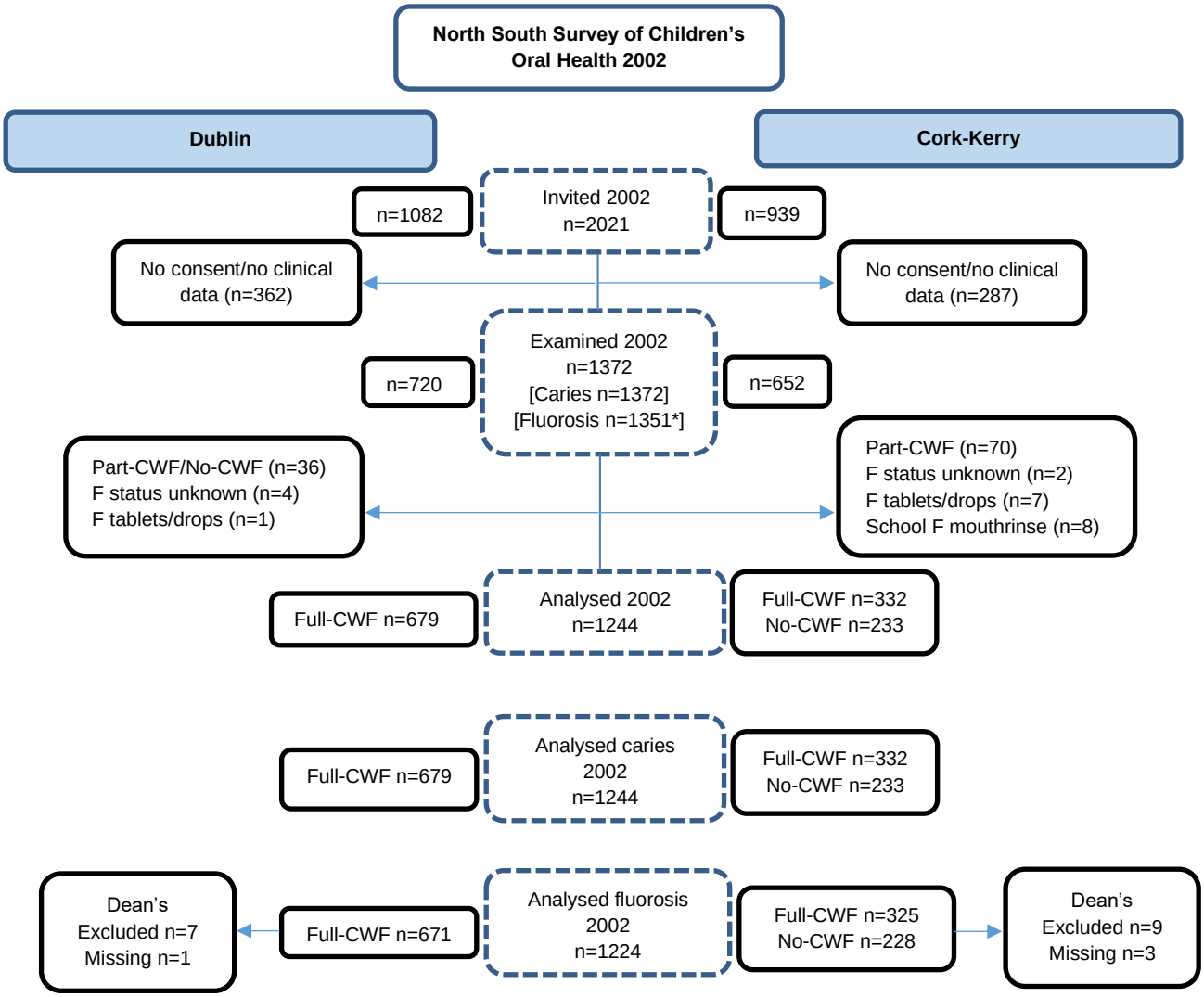
Training and calibration before commencement of fieldwork	2002	2017
Dental nurses trained to use direct data entry software on dedicated laptop computers	√	√
Video resource "Setting up for School Dental Examinations"	x	√
Small group interactive teaching sessions for dentists	√	√
Group discussion and individual scoring of photographic images of caries, dental fluorosis and other developmental defects of enamel by dentists.	√	√
Use of training and calibration components of the online fluorosis training tool ' e-training for Dean's Index' (Whelton et al. 2014)	x	√
School based clinical training	√	√
Final calibration based on clinical scores in school-based calibration exercise	√	√
Minimum acceptable level of agreement with benchmark examiners during calibration exercise	0.4 'moderate agreement*'	0.6 'substantial agreement*^'

* (Landis and Koch 1977)
^ Moderate agreement (McHugh 2012)



Appendix Figure 2: Flow of participants through the FACCT study

^ 7 children do not have a caries measurement in 2017: Dublin Full-CWF n=3, Cork-Kerry Full-CWF n= 1, Cork-Kerry No-CWF n=3 (one of whom reported taking F tablets/drops). *11 children were examined in 2017 but not assigned a Dean's Index score: "Dean's Excluded". Dublin Full-CWF n=4, Cork-Kerry Full-CWF n=5, Cork-Kerry Part-CWF n=2



Appendix Figure 3: Flow of participants through the North South Survey 2002
*17 children were examined in 2002 but not assigned a Dean's Index score: "Dean's Excluded" (Dublin Full-CWF n=7, Dublin Part-CWF n=1, Cork-Kerry Full-CWF n=5, Cork-Kerry No-CWF n=4). Dean's index score was missing for 4 children.

Appendix Table 2: Sensitivity analysis of impact of re-classifying Part-CWF 2002

		Part-CWF 2002 assumed to be Full-CWF				Part-CWF 2002 assumed to be No-CWF	
		Dublin Full-CWF		Cork-Kerry Full-CWF		Cork-Kerry No-CWF	
Outcome	**Year**	**OR% (95%CI)**	**P value**	**OR% (95%CI)**	**P value**	**OR% (95%CI)**	**P value**
Caries prevalence[a]	2017	14%→14%	0.350→0.349	25%→24%	0.208→0.206	-23%→-29%	0.179→0.064
	2002	Ref		Ref		Ref	
Caries severity[a,b]	2017	5%→4%	0.487→0.548	7%→3%	0.424→0.704	-13%→-15%	0.039→0.010
	2002	Ref		Ref		Ref	
Fluorosis prevalence[c]	2017	16%→15%	0.312→0.356	-7%→ -4%	0.771→0.859	97%→8%	0.129→0.806
	2002	Ref		Ref		Ref	

OR% = odds ratio %: the percentage increase/decrease in odds
95%CI = 95% confidence interval
[a] Negative binomial Hurdle Model analysis. Adjusted for medical card ownership, age, age first used toothpaste, age at first visit to the dentist, frequency of toothbrushing (age 8), amount of toothpaste (age 8), rinse method after toothbrushing (age 8), frequency of intake of sweet foods or drinks between meals (age 8).
[b] Percentage change in mean d_{3vc}mft(cde)
[c] Logistic regression analysis. Adjusted for age, gender, medical card ownership and age first used toothpaste.

Appendix Table 3: Characteristics at baseline (2014) for all children who consented in phase 1 (Consented 2014), children who were followed-up and examined in phase 2 (Examined 2017) and children who consented in phase 1 but were not examined in phase 2 (Lost to follow-up 2017)

Characteristic	**Dublin**			**Cork-Kerry**		
	Consented 2014	**Examined 2017**	**Lost to follow-up 2017**	**Consented 2014**	**Examined 2017**	**Lost to follow-up 2017**
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Gender						
Female	542 (50)	413 (52)	129 (43)	993 (51)	795 (52)	198 (45)
Male	546 (50)	376 (48)	170 (57)	969 (49)	731 (48)	238 (54)
Missing	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	1 (<1)
Total	**1088 (100)**	**789 (100)**	**299 (100)**	**1963 (100)**	**1526 (100)**	**437 (100)**
Age* (phase 1)	5.2 (0.4)	5.2 (0.4)	5.2 (0.4)	5.3 (0.4)	5.4 (0.4)	5.3 (0.4)
Economic disadvantage						
MC/GP card	424 (39)	275 (35)	149 (50)	652 (33)	467 (31)	185 (42)
No MC/GP card	646 (59)	504 (64)	142 (47)	1273 (65)	1032 (68)	241 (55)
Missing	18 (2)	10 (1)	8 (3)	38 (2)	27 (2)	11 (3)
Total	**1088 (100)**	**789 (100)**	**299 (100)**	**1963 (100)**	**1526 (100)**	**437 (100)**

*mean (SD). Percentages may not sum to 100 due to rounding.
MC/GP card=Medical card or GP visit card
Total number 3051 rather than 3054 as reported in Appendix Figure 2 because parents/caregivers of three children consented and completed residential history only. No demographic information is available for these three children.
Numbers for phase 2 differ slightly from those reported in Appendix Figure 2 because by necessity, demographic variables and the county variable for phase 1 (age 5) rather than phase 2 (age 8) were used to generate this table.
Numbers examined 2017 include all children (all F status categories) who had a caries or fluorosis examination in phase 2 (total n=2315).

Appendix Table 4: Negative binomial hurdle model analyses of the association between year of examination and the prevalence and severity of dental caries among 8-year-olds in Dublin (Full-CWF)

		Dublin Full-CWF (d_{3vc}mft(cde))					
		Prevalence (n=1291)			Severity (n=699)		
Explanatory Variable		**OR (%)**	**95% CI**	**p-value**	**Mean (%)**	**95% CI**	**p-value**
Year	2017	14%	(-13%, 49%)	0.350	5%	(-9%, 21%)	0.487
	2002	Ref					
Medical card	Yes	71%	(29%, 127%)	<0.001	23%	(7%, 40%)	0.003
	No	Ref					
Age (in years)		15%	(-14%, 55%)	0.347	1%	(-13%, 18%)	0.877
Frequency of toothbrushing (age 8)	Once/day or less	51%	(17%, 94%)	0.001	16%	(2%, 33%)	0.021
	Twice/day or more	Ref					
Amount of toothpaste (age 8)	Pea-sized^ or less	-1%	(-25%, 31%)	0.956	7%	(-8%, 24%)	0.388
	> Pea-sized	Ref					
Rinse method after toothbrushing (age 8)	Glass	12%	(-15%, 47%)	0.421	6%	(-8%, 22%)	0.393
	Other◊	Ref					
Sweet food/drinks between meals (age 8)	≥ 4 times/ day	130%	(51%, 252%)	<0.001	34%	(10%, 63%)	0.004
	2-3 times/day	69%	(33%, 116%)	<0.001	13%	(-1%, 30%)	0.072
	Once/day or less	Ref					
Age at first visit to the dentist	≤ 4 years old	151%	(79%, 252%)	<0.001	76%	(44%, 114%)	<0.001
	5-6 years old	88%	(37%, 159%)	<0.001	46%	(20%, 77%)	<0.001
	≥ 7 years old	76%	(24%, 150%)	0.002	21%	(-2%, 49%)	0.082
	Never	Ref					
Age first used toothpaste*	≤ 24 months	-47%	(-61%, -27%)	< 0.001	-3%	(-16%, 12%)	0.675
	> 24 months^	Ref					

Ref = Reference group/category
OR% = odds ratio %: the percentage increase/decrease in odds
Mean % = the percentage change in mean d_{3vc}mft(cde)
95%CI = 95% confidence interval
^Recommended from 2002 onwards
◊Other = using toothbrush to rinse/cupping hands to rinse/rinsing directly from the tap
*Grouped responses for age at first toothbrushing in 2002 (prior to introduction of toothbrushing guidance, collected at age 8) and age first used toothpaste in 2014 (collected at age 5)
Year of examination adjusted for the effect of the other explanatory variables is the main explanatory variable. The OR (%) and Mean (%) for the other explanatory variables represents the association between each explanatory variable and the prevalence and severity of dental caries controlled for the effect of the other explanatory variables.

Appendix Table 5: Negative binomial hurdle model analyses of the association between year of examination and the prevalence and severity of dental caries among 8-year-olds in Cork-Kerry (Full-CWF)

		Cork-Kerry Full-CWF (d_{3vc}mft(cde))					
		Prevalence (n=663)			Severity (n=369)		
Explanatory Variable		**OR (%)**	**95% CI**	**p-value**	**Mean (%)**	**95% CI**	**p-value**
Year	2017	25%	(-12%, 78%)	0.208	7%	(-9%, 27%)	0.424
	2002	Ref					
Medical card	Yes	45%	(-1%, 110%)	0.053	34%	(14%, 58%)	0.001
	No	Ref					
Age (in years)		58%	(7%, 132%)	0.021	-8%	(-24%, 11%)	0.376
Frequency of toothbrushing (age 8)	Once a day or less	47%	(3%, 110%)	0.033	13%	(-4%, 33%)	0.138
	Twice a day or more	Ref					
Amount of toothpaste (age 8)	Pea-sized^ or less	-9%	(-37%, 31%)	0.605	-1%	(-17%, 18%)	0.912
	> Pea-sized	Ref					
Rinse method after toothbrushing (age 8)	Glass	38%	(-5%, 99%)	0.090	14%	(-3%, 35%)	0.119
	Other◊	Ref					
Sweet food/drinks between meals (age 8)	≥ 4 times per day	73%	(-9%, 229%)	0.092	26%	(-4%, 66%)	0.094
	2-3 times per day	52%	(10%, 112%)	0.012	12%	(-5%, 31%)	0.168
	Once a day or less	Ref					
Age at first visit to the dentist	≤ 4 years old	82%	(7%, 210%)	0.027	87%	(40%, 150%)	< 0.001
	5-6 years old	77%	(6%, 193%)	0.028	79%	(35%, 136%)	< 0.001
	≥ 7 years old	9%	(-36%, 86%)	0.757	31%	(-4%, 78%)	0.087
	Never	Ref					
Age first used toothpaste*	≤ 24 months	-20%	(-49%, 25%)	0.332	-17%	(-31%, 1%)	0.061
	> 24 months^	Ref					

Ref = Reference group/category
OR% = odds ratio %: the percentage increase/decrease in odds
Mean % = the percentage change in mean d_{3vc}mft(cde)
95%CI= 95% confidence interval
^Recommended from 2002 onwards
◊Other=using toothbrush to rinse/cupping hands to rinse/rinsing directly from the tap
*Grouped responses for age at first toothbrushing in 2002 (prior to introduction of toothbrushing guidance, collected at age 8) and age first used toothpaste in 2014 (collected at age 5)
Year of examination adjusted for the effect of the other explanatory variables is the main explanatory variable. The OR (%) and Mean (%) for the other explanatory variables represents the association between each explanatory variable and prevalence and severity of dental caries controlled for the effect of the other explanatory variables.

Appendix Table 6: Negative binomial hurdle model analyses of the association between year of examination and the prevalence and severity of dental caries among 8-year-olds in Cork-Kerry (No-CWF)

		Cork-Kerry No-CWF (d_{3vc}mft(cde))					
		Prevalence (n=941)			Severity (n=622)		
Explanatory Variable		**OR (%)**	**95% CI**	**p-value**	**Mean (%)**	**95% CI**	**p-value**
Year	2017	-23%	(-48%, 13%)	0.179	-13%	(-24%, -1%)	0.039
	2002	Ref					
Medical card	Yes	15%	(-21%, 67%)	0.467	17%	(3%, 32%)	0.012
	No	Ref					
Age (in years)		-15%	(-42%, 24%)	0.394	-3%	(-15%, 11%)	0.664
Frequency of toothbrushing (age 8)	Once a day or less	50%	(9%, 108%)	0.013	9%	(-2%, 21%)	0.111
	Twice a day or more	Ref					
Amount of toothpaste (age 8)	Pea-sized^ or less	27%	(-12%, 82%)	0.199	-6%	(-18%, 7%)	0.342
	> Pea-sized	Ref					
Rinse method after toothbrushing (age 8)	Glass	39%	(1%, 91%)	0.044	2%	(-9%, 13%)	0.771
	Other[◊]	Ref					
Sweet food/drinks between meals (age 8)	≥ 4 times per day	125%	(17%, 334%)	0.016	30%	(8%, 57%)	0.006
	2-3 times per day	83%	(35%, 148%)	<0.001	17%	(5%, 30%)	0.004
	Once a day or less	Ref					
Age at first visit to the dentist	≤ 4 years old	136%	(52%, 266%)	<0.001	87%	(50%, 132%)	<0.001
	5-6 years old	280%	(143%, 494%)	<0.001	76%	(42%, 118%)	<0.001
	≥ 7 years old	108%	(30%, 232%)	0.002	51%	(20%, 91%)	0.001
	Never	Ref					
Age first used toothpaste*	≤ 24 months	-10%	(-37%, 30%)	0.587	-6%	(-17%, 6%)	0.324
	> 24 months^	Ref					

Ref = Reference group/category
OR% = odds ratio %: the percentage increase/decrease in odds
Mean % = the percentage change in mean d_{3vc}mft(cde)
95%CI= 95% confidence interval
^Recommended from 2002 onwards
[◊]Other=using toothbrush to rinse/cupping hands to rinse/rinsing directly from the tap
* Grouped responses for age at first toothbrushing in 2002 (prior to introduction of toothbrushing guidance, collected at age 8) and age first used toothpaste in 2014 (collected at age 5)
Year of examination adjusted for the effect of the other explanatory variables is the main explanatory variable. The OR (%) and Mean (%) for the other explanatory variables represents the association between each explanatory variable and prevalence and severity of dental caries controlled for the effect of the other explanatory variables.

Appendix Table 7: Multivariate logistic regression analyses of the association between year of examination and prevalence of dental fluorosis among 8-year-olds in Dublin (Full-CWF) and Cork-Kerry (Full-CWF and No-CWF)

		Fluorosis (very mild or higher)					
		Dublin Full-CWF		Cork-Kerry Full-CWF		Cork-Kerry No-CWF	
		n=1338		n=678		n=979	
Explanatory variable		**OR% (95%CI)**	**P-value**	**OR% (95%CI)**	**P-value**	**OR% (95%CI)**	**P-value**
Year	2017	16% (-13, 56)	0.312	-7% (-41, 48)	0.771	97% (-18, 373)	0.129
	2002	Ref		Ref		Ref	
Age (in years)		-16% (-42, 21)	0.337	45% (-14, 143)	0.164	-40% (-74, 36)	0.221
Gender	Female	55% (16, 108)	0.003	6% (-34, 70)	0.801	44% (-22, 166)	0.244
	Male	Ref		Ref		Ref	
Medical card	Yes	6% (-24, 48)	0.736	-5% (-44, 60)	0.845	62% (-17, 215)	0.157
	No	Ref		Ref		Ref	
Age first used toothpaste*	≤ 24 months	29% (-13, 91)	0.211	94% (-10, 315)	0.090	-6% (-55, 100)	0.882
	>24 months^	Ref		Ref		Ref	

OR% = odds ratio %: the percentage increase/decrease in odds
95%CI= 95% confidence interval
* Grouped responses for age at first toothbrushing in 2002 (prior to introduction of toothbrushing guidance, collected at age 8) and age first used toothpaste in 2014 (collected at age 5)
^Recommended from 2002 onwards
Year of examination adjusted for the effect of the other explanatory variables is the main explanatory variable. The OR (%) for the other explanatory variables represents the association between each explanatory variable and prevalence of fluorosis controlled for the effect of the other explanatory variables.

References

Landis JR, Koch GG. 1977. The measurement of observer agreement for categorical data. Biometrics. 33(1):159-174.

McHugh ML. 2012. Interrater reliability: the kappa statistic. Biochem Med (Zagreb). 22(3):276-282.

Whelton H, Browne D, Felicia P, Whelton J. 2014. e-training for Dean's Index Version 2 [accessed 31 October 2020] http://www.fluorosisindex.com/.