Online Supplement, Appendixes for:

Dental fluorosis trends in United States oral health surveys: 1986–2012

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Appendix Table 1-1. NHANES 2011-2012. Sample size (n), CFI, total prevalence, and Dean's Index score distribution by socio-demographic variables.

Variable[a] Categories	n[b] N, x10^6	CFI (mean numeric fluorosis score)[c]	Total prevalence, % (Fsis ≥ very mild)[c]	Distribution of fluorosis scores, % of category (95%CI)[c]					
				unaffected 0	questionable 0.5	very mild 1	mild 2	moderate 3	severe 4
Age group									
All ages 6-19	2,304 54.15	1.24 (0.99, 1.48)	57.1 (47.8, 65.9)	34.1 (26.3, 42.9)	8.8 (7.1, 10.9)	19.5 (15.6, 24.3)	14.9 (11.9, 18.6)	20.5 (13.9, 29.3)	2.1 (1.3, 3.3)
Ages 6-11	1,120 21.59	1.01 (0.76, 1.25)	49.3 (39.4, 59.4)	42.2 (32.8, 52.2)	8.5 (6.2, 11.4)	19.4 (14.9, 24.9)	14.3 (10.2, 19.8)	13.8 (9.2, 20.3)	1.8 (0.9, 3.4)
Ages 12-15[d]	599 16.59	1.47 (1.16, 1.77)	64.7 (54.6, 73.6)	27.9 (19.5, 38.3)	7.4 (4.9, 11.0)	19.5 (14.9, 25.0)	14.8 (11.5, 18.9)	27.9 (18.3, 40.1)	2.6 (1.1, 6.1)
Ages 16-19	585 15.97	1.31 (1.06, 1.56)	59.6 (49.4, 69.1)	29.7 (22.4, 38.2)	10.7 (7.4, 15.3)	19.8 (14.6, 26.4)	15.9 (11.8, 21.1)	22.0 (13.9, 32.9)	1.9 (1.2, 3.2)
Ages 12-19	1,184 32.56	1.39 (1.12, 1.66)	62.2 (53.0, 70.7)	28.8 (21.4, 37.5)	9.0 (7.0, 11.6)	19.6 (15.6, 24.4)	15.3 (12.1, 19.3)	25.0 (16.3, 36.3)	2.3 (1.4, 3.7)
Gender (Age 12-15)									
Male	312 8.53	1.35 (1.04, 1.66)	62.9 (50.0, 74.2)	30.2 (18.7, 44.8)	7.0 (2.7, 17.0)	20.9 (15.7, 27.3)	17.7 (11.5, 26.3)	21.5 (14.7, 30.4)	2.7 (1.1, 6.6)
Female	287 8.06	1.59 (1.23, 1.95)	66.6 (57.8, 74.4)	25.5 (17.8, 35.2)	7.9 (4.6, 13.2)	17.9 (11.1, 27.5)	11.7 (8.6, 15.8)	34.6 (19.8, 53.1)	2.4 (0.5, 10.4)
Race (Age 12-15)									
White	135 9.22	1.59 (1.21, 1.96)	69.3 (56.3, 79.8)	22.7 (13.9, 34.8)	8.0 (4.4, 14.2)	21.3 (14.3, 30.5)	14.0 (9.2, 20.9)	30.7 (18.4, 46.4)	3.3 (0.9, 11.1)
Black	171 2.32	1.42 (1.21, 1.63)	65.3 (57.1, 72.7)	28.5 (21.2, 37.2)	6.2 (3.4, 11.1)	20.7 (14.0, 29.5)	15.5 (11.8, 20.0)	29.1 (22.9, 36.3)	0.0
Mex.-Amer.	108 2.36	1.28 (0.69, 1.87)	54.7 (37.1, 71.3)	40.0 (23.5, 59.1)	5.3 (1.9, 13.6)	14.0 (8.7, 21.7)	13.9 (10.6, 17.9)	24.0 (9.8, 48.0)	2.9 (1.0, 8.1)
Other Hisp.	72 1.35	1.03 (0.78, 1.28)	50.2 (34.6, 65.8)	38.8 (25.4, 54.1)	11.1 (6.0, 19.5)	18.4 (7.7, 37.7)	16.2 (10.2, 24.9)	15.6 (9.2, 25.3)	0.0
Asian	86 0.80	1.68 (1.26, 2.11)	70.5 (50.8, 84.6)	27.7 (13.2, 49.0)	1.9 (0.4, 7.8)	13.0 (7.3, 22.2)	21.6 (11.6, 36.6)	32.5 (17.6, 52.0)	3.4 (0.6, 18.0)
Other race	27 0.54	1.21 (0.70, 1.72)	54.9 (42.0, 67.1)	22.4 (19.5, 38.3)	13.8 (4.9, 11.0)	20.7 (14.9, 25.0)	12.1 (11.5, 18.9)	24.1 (18.3, 40.1)	6.9 (1.1, 6.1)

Appendix Table 1-1. NHANES 2011-2012. Sample size (n), CFI, total prevalence, and Dean's Index score distribution by socio-demographic variables.

Variable[a] Categories	n[b] N, x10^6	CFI (mean numeric fluorosis score)[c]	Total prevalence, % (Fsis ≥ very mild)[c]	Distribution of fluorosis scores, % of category (95%CI)[c]					
				unaffected 0	questionable 0.5	very mild 1	mild 2	moderate 3	severe 4
Poverty[e] (Age 12-15)									
<1 poorest	169 3.33	1.28 (0.97, 1.60)	59.5 (46.3, 71.4)	32.5 (23.1, 43.6)	8.0 (3.9, 15.6)	19.5 (11.6, 30.8)	16.5 (10.1, 25.7)	22.4 (13.4, 34.9)	1.2 (0.2, 6.3)
1 – 3 middle	226 6.43	1.40 (0.97, 1.83)	62.4 (49.8, 73.5)	30.3 (19.0, 44.5)	7.3 (3.8, 13.6)	21.1 (15.7, 27.8)	13.0 (7.6, 21.2)	24.5 (12.0, 43.5)	3.9 (1.0, 13.9)
3+ not poor	161 6.18	1.60 (1.31, 1.89)	69.5 (59.2, 78.2)	22.8 (15.3, 32.6)	7.7 (3.2, 17.6)	19.0 (11.2, 30.5)	15.8 (9.8, 24.4)	33.3 (23.9, 44.1)	1.5 (0.4, 5.1)
Birth place (Age 12-15)									
born USA	565 16.08	1.47 (1.17, 1.78)	35.2 (26.0, 45.5)	27.7 (19.2, 38.3)	7.4 (4.9, 11.0)	19.4 (14.9, 24.9)	14.5 (11.2, 18.7)	28.3 (18.6, 40.5)	2.6 (1.1, 6.3)
born not USA	34 0.51	1.21 (0.77, 1.64)	40.0 (23.6, 59.0)	34.1 (17.1, 56.5)	5.8 (0.7, 35.8)	20.3 (8.1, 42.4)	23.3 (12.0, 40.5)	14.9 (7.0, 29.0)	1.5 (0.2, 12.7)
Parent education (Age 12-15)									
no high school	68 1.64	1.32 (0.76, 1.88)	59.2 (40.1, 75.8)	35.8 (20.2, 55.0)	5.1 (1.5, 16.3)	14.3 (6.0, 30.3)	19.5 (9.0, 37.2)	25.4 (10.0, 51.0)	0.0
some HS	81 1.85	1.59 (1.06, 2.11)	67.0 (50.0, 80.4)	25.9 (16.8, 37.7)	7.2 (1.7, 25.4)	16.9 (8.6, 30.6)	19.8 (10.0, 35.6)	22.7 (12.8, 36.9)	7.6 (1.2, 36.4)
HS grad	123 3.25	1.52 (1.14, 1.90)	67.3 (52.9, 79.1)	22.2 (12.9, 35.4)	10.5 (5.1, 20.4)	19.8 (12.2, 30.4)	16.7 (10.4, 25.8)	29.5 (16.5, 47.0)	1.4 (0.3, 6.1)
some college	168 5.01	1.28 (0.83, 1.73)	59.8 (46.3, 71.9)	35.0 (22.4, 50.0)	5.3 (2.1, 12.5)	23.4 (14.0, 36.3)	8.3 (4.7, 14.1)	27.6 (13.9, 47.4)	0.5 (0.1, 4.3)
college grad+	139 4.56	1.66 (1.33, 2.00)	70.3 (57.2, 80.8)	21.1 (11.9, 34.6)	8.6 (3.7, 18.9)	17.7 (8.2, 34.1)	17.9 (13.1, 23.9)	30.5 (19.1, 44.8)	4.3 (1.4, 12.3)

CFI = Community Fluorosis Index; Fsis = fluorosis; CI = confidence interval; n = unweighted sample size; N = weighted population size, in millions

[a] Age range 12-15 years for all variables except age groupings.

[b] Sample size n not weighted.

[c] All results except n values are weighted to account for survey design as described in the main text.

[d] These values will not be exactly comparable to Beltran-Aguilar et al (2010) for their calculations of NHANES 1999-2004 because Beltran-Aguilar apparently stratified by age using the age of the participant when the NHANES questionnaire was administered rather than the age when the oral exam was conducted.

[e] The categories of the poverty variable were based on the ratio of the family income to the federal poverty level. The category "<1 poorest" had a ratio less than 1. The category "1 – 3 middle" had a ratio from 1 – 3. The category "3+ not poor" had a ratio of 3 or higher.

Appendix Table 1-2. NHANES 1999-2004. Sample size (n), CFI, total prevalence, and Dean's Index score distribution by socio-demographic variables.

Variable[a] Categories	n[b] N, x10[6]	CFI (mean numeric fluorosis score)[c]	Total prevalence, % (Fsis ≥ very mild)[c]	Distribution of fluorosis scores, % of category (95%CI)[c]					
				unaffected	questionable	very mild	mild	moderate	severe
				0	0.5	1	2	3	4
Age group[d]									
All ages 6-19	9,338 51.08	0.62 (0.55, 0.68)	36.6 (32.4, 41.0)	44.3 (38.8, 49.9)	19.1 (16.0, 22.5)	25.4 (22.5, 28.5)	7.6 (6.7, 8.7)	3.1 (2.4, 4.1)	0.5 (0.3, 0.8)
Ages 6-11	2,726 20.10	0.58 (0.50, 0.65)	33.4 (29.0, 38.2)	46.4 (40.0, 53.0)	20.1 (16.1, 24.9)	23.2 (19.8, 26.9)	6.8 (5.5, 8.4)	3.0 (2.1, 4.2)	0.5 (0.3, 1.1)
Ages 12-15	3,364 15.75	0.67 (0.60, 0.74)	41.2 (36.7, 45.9)	39.3 (34.1, 44.8)	19.5 (16.4, 23.0)	28.9 (25.8, 32.3)	8.6 (7.1, 10.3)	3.3 (2.5, 4.4)	0.4 (0.2, 0.8)
Ages 16-19	3,248 15.23	0.60 (0.53, 0.68)	36.1 (31.4, 41.2)	46.6 (40.8, 52.6)	17.3 (14.4, 20.5)	24.7 (21.2, 28.5)	7.8 (6.7, 8.9)	3.2 (2.3, 4.6)	0.5 (0.2, 0.9)
Ages 12-19	6,612 30.98	0.64 (0.57, 0.71)	38.7 (34.3, 43.3)	42.9 (37.7, 48.3)	18.4 (15.6, 21.5)	26.9 (23.9, 30.1)	8.2 (7.1, 9.4)	3.3 (2.5, 4.3)	0.4 (0.2, 0.7)
Gender (Age 12-15)									
Male	1,708 8.11	0.70 (0.62, 0.77)	41.9 (37.2, 46.7)	37.5 (32.8, 42.5)	20.6 (17.0, 24.8)	29.1 (25.9, 32.5)	8.8 (6.9, 11.0)	3.4 (2.2, 5.2)	0.6 (0.2, 1.3)
Female	1,656 7.64	0.65 (0.57, 0.73)	40.5 (35.1, 46.2)	41.2 (34.7, 48.1)	18.3 (15.0, 22.1)	28.8 (24.6, 33.4)	8.4 (6.6, 10.6)	3.2 (2.3, 4.4)	0.2 (0.1, 0.4)
Race (Age 12-15)									
White	861 9.72	0.60 (0.51, 0.69)	36.1 (30.7, 41.9)	42.0 (35.1, 49.3)	21.9 (17.3, 27.4)	26.4 (22.6, 30.5)	6.8 (5.1, 9.0)	2.7 (1.7, 4.3)	0.3 (0.1, 1.1)
Black	1,081 2.35	0.96 (0.85, 1.08)	57.9 (50.9, 64.7)	26.5 (19.6, 34.9)	15.5 (12.4, 19.3)	35.3 (30.5, 40.4)	15.4 (12.4, 19.0)	6.4 (4.8, 8.5)	0.8 (0.4, 1.8)
Mex.-Amer.	1,171 1.73	0.73 (0.55, 0.91)	43.9 (35.3, 52.8)	38.0 (28.6, 48.5)	18.1 (14.4, 22.5)	29.1 (24.1, 34.7)	9.9 (7.3, 13.5)	4.0 (2.2, 7.4)	0.8 (0.2, 2.8)
Other Hisp.	133 1.04	0.50 (0.42, 0.58)	35.1 (27.8, 43.0)	51.3 (43.8, 58.7)	13.7 (8.4, 21.5)	28.0 (20.6, 37.0)	5.8 (2.9, 11.4)	1.2 (0.3, 4.9)	0.0
Other race	118 0.91	0.79 (0.54, 1.03)	54.9 (39.3, 69.6)	32.2 (20.0, 47.6)	12.9 (6.8, 23.0)	40.9 (30.0, 52.8)	10.9 (4.6, 23.7)	3.2 (1.3, 7.5)	0.0

Appendix Table 1-2. NHANES 1999-2004. Sample size (n), CFI, total prevalence, and Dean's Index score distribution by socio-demographic variables.

Variable[a] Categories	n[b] N, x10^6	CFI (mean numeric fluorosis score)[c]	Total prevalence, % (Fsis ≥ very mild)[c]	Distribution of fluorosis scores, % of category *(95%CI)[c]*					
				unaffected 0	questionable 0.5	very mild 1	mild 2	moderate 3	severe 4
Poverty[e] (Age 12-15)									
<1 poorest	976 3.18	0.66 *(0.56, 0.77)*	41.5 *(34.5, 48.8)*	43.7 *(36.3, 51.4)*	14.8 *(11.2, 19.4)*	28.1 *(22.6, 34.3)*	9.9 *(7.3, 13.4)*	3.0 *(2.0, 4.6)*	0.4 *(0.2, 1.0)*
1 – 3 middle	1,317 5.91	0.71 *(0.62, 0.80)*	43.6 *(38.0, 49.3)*	37.9 *(31.6, 44.7)*	18.5 *(14.8, 22.9)*	30.2 *(26.5, 34.0)*	9.0 *(6.9, 11.7)*	3.9 *(2.7, 5.6)*	0.5 *(0.2, 1.4)*
3+ not poor	825 5.77	0.64 *(0.57, 0.71)*	38.3 *(33.7, 43.1)*	38.7 *(33.5, 44.3)*	23.0 *(18.5, 28.2)*	27.7 *(23.9, 31.9)*	7.4 *(5.3, 10.3)*	3.0 *(1.8, 4.8)*	0.2 *(0.0, 1.4)*
Birth place (Age 12-15)									
born USA	3,186 15.19	0.68 *(0.61, 0.75)*	41.6 *(37.1, 46.3)*	38.8 *(33.5, 44.4)*	19.6 *(16.4, 23.3)*	29.2 *(26.0, 32.6)*	8.7 *(7.2, 10.5)*	3.3 *(2.5, 4.5)*	0.4 *(0.2, 0.8)*
born not USA	178 0.55	0.51 *(0.36, 0.66)*	30.6 *(21.2, 42.0)*	52.3 *(39.3, 64.9)*	17.1 *(10.1, 27.5)*	22.1 *(14.5, 32.3)*	5.5 *(3.0, 9.9)*	3.1 *(1.4, 6.4)*	0.0
Parent education (Age 12-15)									
no high school	515 1.22	0.69 *(0.57, 0.82)*	42.8 *(33.8, 52.3)*	39.7 *(31.7, 48.2)*	17.5 *(12.0, 24.9)*	29.1 *(21.6, 37.8)*	10.0 *(6.4, 15.3)*	3.6 *(2.1, 6.3)*	0.2 *(0.0, 0.8)*
some HS	727 2.19	0.65 *(0.52, 0.79)*	39.6 *(31.9, 47.9)*	43.9 *(34.6, 53.6)*	16.5 *(12.0, 22.4)*	26.9 *(21.2, 33.4)*	8.6 *(6.4, 11.5)*	3.5 *(2.0, 6.2)*	0.6 *(0.2, 2.0)*
HS grad	812 4.22	0.66 *(0.56, 0.76)*	39.3 *(33.3, 45.6)*	41.1 *(33.7, 48.8)*	19.6 *(14.5, 26.0)*	27.1 *(22.8, 31.9)*	8.0 *(5.8, 11.0)*	3.9 *(2.5, 6.2)*	0.3 *(0.1, 0.7)*
some college	752 4.36	0.70 *(0.61, 0.80)*	43.6 *(37.3, 50.0)*	35.9 *(28.6, 43.9)*	20.5 *(14.8, 27.7)*	31.1 *(26.2, 36.4)*	9.1 *(6.5, 12.6)*	3.1 *(1.8, 5.2)*	0.3 *(0.1, 1.8)*
college grad+	447 3.30	0.65 *(0.54, 0.75)*	38.9 *(32.2, 46.0)*	39.3 *(31.0, 48.3)*	21.8 *(17.2, 27.2)*	27.7 *(22.1, 34.1)*	8.1 *(5.2, 12.3)*	2.6 *(1.3, 5.1)*	0.5 *(0.1, 2.8)*

Appendix Table 1-2. NHANES 1999-2004. Sample size (n), CFI, total prevalence, and Dean's Index score distribution by socio-demographic variables.

Variable[a] Categories	n[b] N, x10^6	CFI (mean numeric fluorosis score)[c]	Total prevalence, % (Fsis ≥ very mild)[c]	Distribution of fluorosis scores, % of category (95%CI)[c]					
				unaffected	questionable	very mild	mild	moderate	severe
				0	0.5	1	2	3	4
Additional age groups[d]									
All ages 6-49	16,049	0.41	23.0	60.5	16.5	16.0	4.7	1.9	0.3
	162.35	(0.36, 0.46)	(20.2, 26.1)	(56.4, 64.4)	(14.6, 18.7)	(14.1, 18.2)	(3.9, 5.7)	(1.5, 2.5)	(0.2, 0.4)
Ages 6-11	2,726	0.58	33.4	46.4	20.1	23.2	6.8	3.0	0.5
	20.10	(0.50, 0.65)	(29.0, 38.2)	(40.0, 53.0)	(16.1, 24.9)	(19.8, 26.9)	(5.5, 8.4)	(2.1, 4.2)	(0.3, 1.1)
Ages 12-15	3,364	0.67	41.2	39.3	19.5	28.9	8.6	3.3	0.4
	15.75	(0.60, 0.74)	(36.7, 45.9)	(34.1, 44.8)	(16.4, 23.0)	(25.8, 32.3)	(7.1, 10.3)	(2.5, 4.4)	(0.2, 0.8)
Ages 16-19	3,248	0.60	36.1	46.6	17.3	24.7	7.8	3.2	0.5
	15.23	(0.53, 0.68)	(31.4, 41.2)	(40.8, 52.6)	(14.4, 20.5)	(21.2, 28.5)	(6.7, 8.9)	(2.3, 4.6)	(0.2, 0.9)
Ages 20-29	2,455	0.49	28.2	53.9	18.0	19.7	5.8	2.3	0.4
	34.80	(0.43, 0.55)	(24.4, 32.4)	(49.2, 58.5)	(14.9, 21.5)	(17.1, 22.6)	(4.3, 7.6)	(1.5, 3.5)	(0.2, 1.0)
Ages 30-39	2,181	0.28	14.5	70.8	14.7	10.2	2.9	1.3	0.1
	37.70	(0.22, 0.33)	(11.5, 18.0)	(66.0, 75.3)	(12.3, 17.5)	(8.1, 12.8)	(1.9, 4.4)	(0.8, 2.1)	(0.0, 0.3)
Ages 40-49	2,075	0.19	8.7	77.7	13.7	6.1	1.9	0.6	0.1
	38.77	(0.14, 0.24)	(6.3, 11.7)	(72.8, 81.9)	(10.8, 17.2)	(4.6, 8.1)	(1.1, 3.3)	(0.3, 1.3)	(0.0, 0.2)

CFI = Community Fluorosis Index; Fsis = fluorosis; CI = confidence interval; n = unweighted sample size; N = weighted population size, in millions

[a] Age range 12-15 years for all variables except age groupings.

[b] Sample size n not weighted.

[c] All results except n values are weighted to account for survey design as described in the main text.

[d] These values differ slightly from those reported by Beltran-Aguilar et al (2010) because Beltran-Aguilar apparently stratified by age using the age of the participant when the NHANES questionnaire was administered rather than the age when the oral exam was conducted.

[e] The categories of the poverty variable were based on the ratio of the family income to the federal poverty level. The category "<1 poorest" had a ratio less than 1. The category "1 – 3 middle" had a ratio from 1 – 3. The category "3+ not poor" had a ratio of 3 or higher.

Appendix Table 1-3. NIDR 1986-1987. Sample size (n), CFI, total prevalence, and Dean's Index score distribution by socio-demographic variables.

Variable[a] Categories	n[b] N, x10^6	CFI (mean numeric fluorosis score)[c]	Total prevalence, % (Fsis ≥ very mild)[c]	Distribution of fluorosis scores, % of category (95%CI)[c]					
				unaffected 0	questionable 0.5	very mild 1	mild 2	moderate 3	severe 4
Age group									
All ages 6-19	33,700	0.44	21.9	47.8	30.3	16.7	4.0	1.0	0.3
	34.47	(0.36, 0.51)	(16.4, 28.5)	(40.8, 54.9)	(25.6, 35.6)	(12.5, 21.9)	(2.8, 5.6)	(0.7, 1.3)	(0.2, 0.4)
Ages 6-11	14,818	0.48	23.7	44.0	32.3	17.8	4.4	1.1	0.3
	14.01	(0.39, 0.56)	(17.9, 30.5)	(36.6, 51.7)	(27.4, 37.6)	(13.5, 23.2)	(3.0, 6.3)	(0.8, 1.7)	(0.2, 0.5)
Ages 12-15[d]	11,818	0.44	21.8	47.8	30.4	16.5	4.1	1.0	0.2
	12.97	(0.36, 0.51)	(16.2, 28.6)	(40.6, 55.1)	(25.4, 36.0)	(12.1, 22.2)	(2.9, 5.7)	(0.6, 1.5)	(0.1, 0.4)
Ages 16-19	7,064	0.36	18.5	55.1	26.4	14.8	3.1	0.6	0.1
	7.49	(0.29, 0.43)	(13.4, 25.0)	(48.3, 61.8)	(21.7, 31.6)	(10.7, 20.0)	(2.0, 4.7)	(0.4, 0.8)	(0.1, 0.2)
Ages 12-19	18,882	0.41	20.6	50.5	28.9	15.9	3.7	0.8	0.2
	20.46	(0.34, 0.48)	(15.3, 27.2)	(43.5, 57.4)	(24.1, 34.3)	(11.7, 21.3)	(2.6, 5.2)	(0.6, 1.2)	(0.1, 0.3)
Gender (Age 12-15)									
Male	5,776	0.46	22.9	46.5	30.6	17.3	4.2	1.0	0.4
	6.62	(0.38, 0.54)	(16.8, 30.4)	(39.1, 54.1)	(25.1, 36.7)	(12.3, 23.8)	(3.0, 5.9)	(0.7, 1.5)	(0.2, 0.6)
Female	6,042	0.42	20.6	49.1	30.3	15.7	3.9	0.9	0.1
	6.35	(0.34, 0.49)	(15.4, 27.1)	(41.8, 56.5)	(25.4, 35.6)	(11.7, 20.9)	(2.7, 5.6)	(0.5, 1.5)	(0.0, 0.3)
Poverty[e] (Age 12-15)									
poorest	4,122	0.51	26.0	44.8	29.3	18.4	5.3	1.7	0.6
	2.97	(0.40, 0.62)	(19.6, 33.6)	(34.6, 55.4)	(23.4, 35.9)	(13.8, 24.2)	(3.9, 7.2)	(0.9, 3.1)	(0.3, 1.2)
middle	3,170	0.40	19.4	47.9	32.8	15.9	2.9	0.4	0.1
	3.68	(0.26, 0.54)	(9.3, 36.2)	(35.2, 60.8)	(23.2, 44.1)	(7.2, 31.7)	(1.6, 5.2)	(0.2, 1.0)	(0.0, 0.4)
not poor	2,511	0.40	18.9	49.8	31.3	14.5	3.5	0.8	0.1
	4.62	(0.28, 0.52)	(12.0, 28.6)	(37.7, 61.9)	(22.2, 42.2)	(9.5, 21.7)	(1.8, 6.6)	(0.5, 1.5)	(0.0, 0.3)
Birth place (Age 12-15)									
born USA	11,354	0.44	22.0	47.4	30.7	16.7	4.1	1.0	0.2
	12.67	(0.36, 0.52)	(16.3, 29.0)	(40.1, 54.7)	(25.6, 36.2)	(12.2, 22.5)	(2.9, 5.7)	(0.6, 1.5)	(0.1, 0.4)
born not USA	464	0.04	17.4	57.1	25.5	12.4	3.9	0.7	0.5
	0.57	(0.45, 0.66)	(12.6, 23.7)	(46.6, 66.9)	(18.2, 34.6)	(8.3, 18.1)	(2.2, 6.6)	(0.3, 1.4)	(0.2, 1.4)

Appendix Table 1-3. NIDR 1986-1987. Sample size (n), CFI, total prevalence, and Dean's Index score distribution by socio-demographic variables.

Variable[a] Categories	n[b] N, x10^6	CFI (mean numeric fluorosis score)[c]	Total prevalence, % (Fsis ≥ very mild)[c]	Distribution of fluorosis scores, % of category (95%CI)[c]					
				unaffected 0	questionable 0.5	very mild 1	mild 2	moderate 3	severe 4
Race (Age 12-15)									
White	8,493 8.54	0.43 (0.34, 0.51)	21.6 (15.4, 29.4)	49.2 (40.9, 57.5)	29.3 (23.4, 35.9)	16.6 (11.6, 23.1)	3.9 (2.6, 5.9)	0.9 (0.6, 1.4)	0.2 (0.1, 0.4)
Black	1,467 2.27	0.50 (0.38, 0.63)	25.4 (16.5, 36.9)	39.3 (29.1, 50.6)	35.3 (27.0, 44.6)	19.2 (12.5, 28.3)	5.1 (2.9, 8.8)	1.0 (0.5, 2.1)	0.1 (0.0, 0.5)
Hisp., White	1,244 1.36	0.43 (0.29, 0.56)	19.0 (11.0, 30.8)	51.1 (40.4, 61.8)	29.9 (23.4, 37.4)	13.0 (7.2, 22.2)	3.9 (2.4, 6.3)	1.7 (0.6, 4.2)	0.6 (0.2, 1.7)
Hisp., Black	205 0.29	0.48 (0.36, 0.61)	24.1 (15.7, 35.2)	39.8 (27.7, 53.4)	36.1 (25.8, 47.8)	19.2 (12.4, 28.4)	4.0 (2.0, 8.1)	0.5 (0.1, 3.2)	0.4 (0.1, 3.0)
Asian	291 0.38	0.31 (0.17, 0.45)	14.3 (6.4, 28.9)	60.0 (44.4, 73.8)	25.7 (19.2, 33.6)	11.1 (4.2, 26.2)	2.7 (1.1, 6.5)	0.6 (0.1, 2.4)	0.0
Native Amer.	97 0.10	0.41 (0.27, 0.54)	21.6 (10.6, 39.0)	45.0 (30.4, 60.4)	33.5 (21.0, 48.8)	19.3 (9.0, 36.5)	2.3 (0.5, 9.4)	0.0	0.0
Other race	4 0.01	0.15 (-0.11, 0.41)	0.0	70.0 (16.9, 96.4)	30.0 (3.6, 83.1)	0.0	0.0	0.0	0.0
Unknown race	17 0.02	0.14 (-0.07, 0.35)	11.8 (2.1, 46.0)	83.8 (49.9, 96.4)	4.4 (0.9, 18.9)	11.8 (2.1, 46.0)	0.0	0.0	0.0
Additional age group									
Age 7-17	29,489 30.53	0.45 (0.37, 0.53)	22.4 (16.9, 29.0)	46.7 (39.7, 53.9)	30.9 (26.1, 36.2)	17.0 (12.7, 22.3)	4.1 (2.9, 5.8)	1.0 (0.7, 1.4)	0.3 (0.2, 0.4)

Appendix Table 1-3. NIDR 1986-1987. Sample size (n), CFI, total prevalence, and Dean's Index score distribution by socio-demographic variables.

Variable[a] Categories	n[b] N, x10^6	CFI (mean numeric fluorosis score)[c]	Total prevalence, % (Fsis ≥ very mild)[c]	Distribution of fluorosis scores, % of category (95%CI)[c]					
				unaffected 0	questionable 0.5	very mild 1	mild 2	moderate 3	severe 4
Region of USA (Age 12-15)									
1 NewEngland	1,362 0.57	0.37 (0.18, 0.55)	19.7 (9.9, 35.5)	55.9 (39.0, 71.6)	24.3 (17.5, 32.7)	15.6 (8.0, 28.2)	3.6 (1.8, 7.2)	0.6 (0.1, 2.3)	0.0 (0.0, 0.0)
2 Northeast	1,786 1.80	0.36 (0.20, 0.51)	14.9 (7.2, 28.2)	53.6 (36.2, 70.1)	31.5 (19.4, 46.8)	10.8 (5.2, 21.1)	3.5 (1.8, 6.9)	0.3 (0.1, 0.9)	0.3 (0.1, 1.6)
3 Midwest	2,247 2.91	0.55 (0.35, 0.74)	31.4 (16.9, 50.8)	40.0 (22.6, 60.2)	28.6 (15.4, 46.8)	24.4 (12.3, 42.7)	5.4 (3.2, 9.1)	1.4 (0.7, 2.8)	0.2 (0.1, 0.4)
4 Southeast	2,025 3.63	0.40 (0.26, 0.54)	17.8 (9.1, 31.9)	46.8 (34.8, 59.2)	35.4 (27.4, 44.3)	14.3 (7.8, 24.7)	3.1 (1.2, 7.8)	0.4 (0.1, 1.2)	0.1 (0.0, 0.6)
5 Southwest	1,278 1.37	0.69 (0.41, 0.96)	34.7 (16.6, 58.7)	30.1 (15.5, 50.3)	35.2 (27.4, 44.0)	23.1 (10.6, 43.4)	7.5 (3.1, 17.0)	3.2 (1.4, 7.2)	0.9 (0.5, 1.8)
6 Northwest	1,534 0.78	0.45 (0.24, 0.66)	23.0 (10.0, 44.3)	45.1 (27.0, 64.5)	31.9 (19.8, 47.1)	18.4 (8.0, 36.8)	3.4 (1.5, 7.2)	1.1 (0.3, 3.4)	0.1 (0.0, 0.9)
7 Pacific	1,586 1.90	0.26 (0.12, 0.39)	11.9 (7.5, 18.4)	67.8 (48.3, 82.6)	20.3 (10.0, 36.9)	8.9 (5.5, 14.3)	2.4 (1.1, 4.8)	0.5 (0.2, 1.3)	0.1 (0.0, 1.0)

CFI = Community Fluorosis Index; Fsis = fluorosis; CI = confidence interval; n = unweighted sample size; N = weighted population size, in millions

[a] Age range 12-15 years for all variables except age groupings.

[b] Sample size n not weighted.

[c] All results except n values are weighted to account for survey design as described in the main text.

[d] These values differ slightly from those reported by Beltran-Aguilar et al (2010). Minor ambiguities in ages in the NIDR 1986-1987 data file may account for these differences.

[e] The categories of the poverty variable were the tertiles of mean county poverty ratio (ratio of income to federal poverty level income). Mean county family income and poverty level were obtained from U.S. Census data for 1980. NIDR 1986-1987 data file includes coded county of residence.

Appendix 2. Mosaic Plots. Fluorosis score distribution by socio-demographic variables.

Appendix Table 2-1. Three surveys; fluorosis by age group.

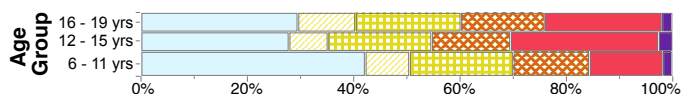**Appendix Table 2-2.** NHANES 2011-2012

Appendix Table 2-3. NHANES 1999-2004

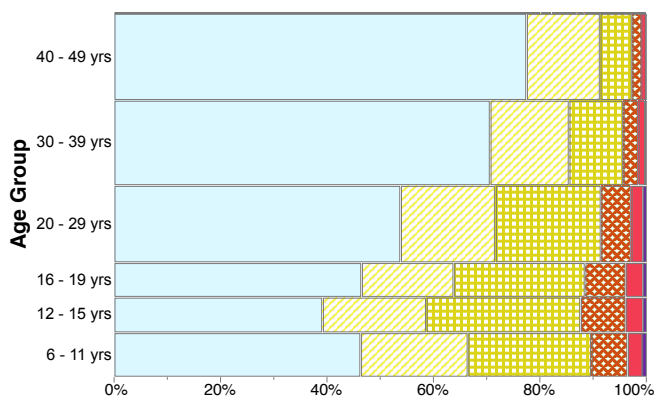**Appendix Table 2-4.** NIDR 1986-1987

Appendix ... veys of USA
Mosaic ...

Dean's Index fluorosis score:

unaffected | questionable | very mild | mild | moderate | severe

**NHANES
2011-2012**
n = 2,304
ages 6 - 19 yrs

**NHANES
1999-2004**
n = 16,098
ages 6 - 49 yrs

**NIDR
1986-1987**
n = 33,700
ages 6 - 19 yrs
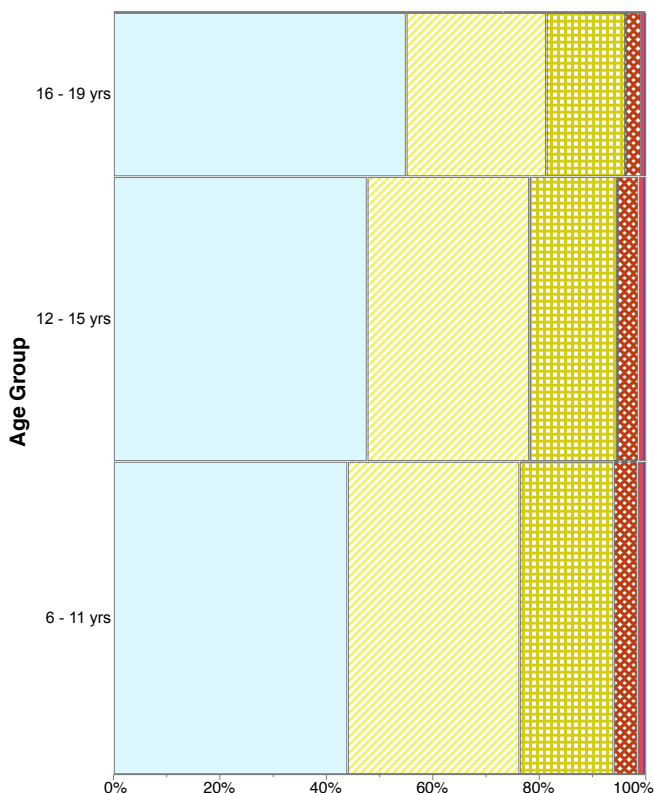
For each survey:
Areas of rectangles are proportional to USA population by weighting

Dean's Index fluorosis score:

unaffected | questionable | very mild | mild | moderate | severe

Sex

Race

Poverty

Birth Country

Parent Education
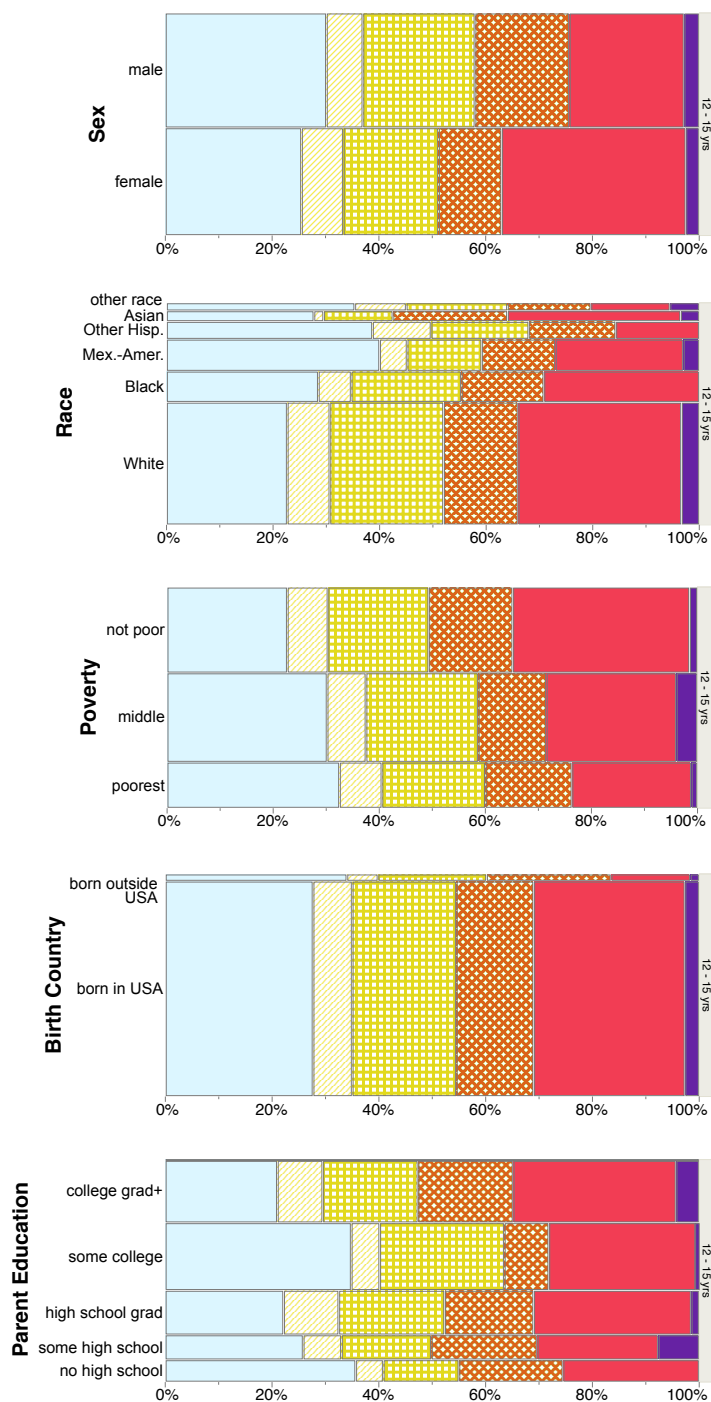
Ages 12-15 years, n = 599
Areas of rectangles are proportional to USA population by weighting

Appendix Figure 2-3. NHANES 1999-2004
Mosaic Plots of Fluorosis by Socio-Demographic Variables

Dean's Index fluorosis score:

unaffected   questionable   very mild   mild   moderate   severe
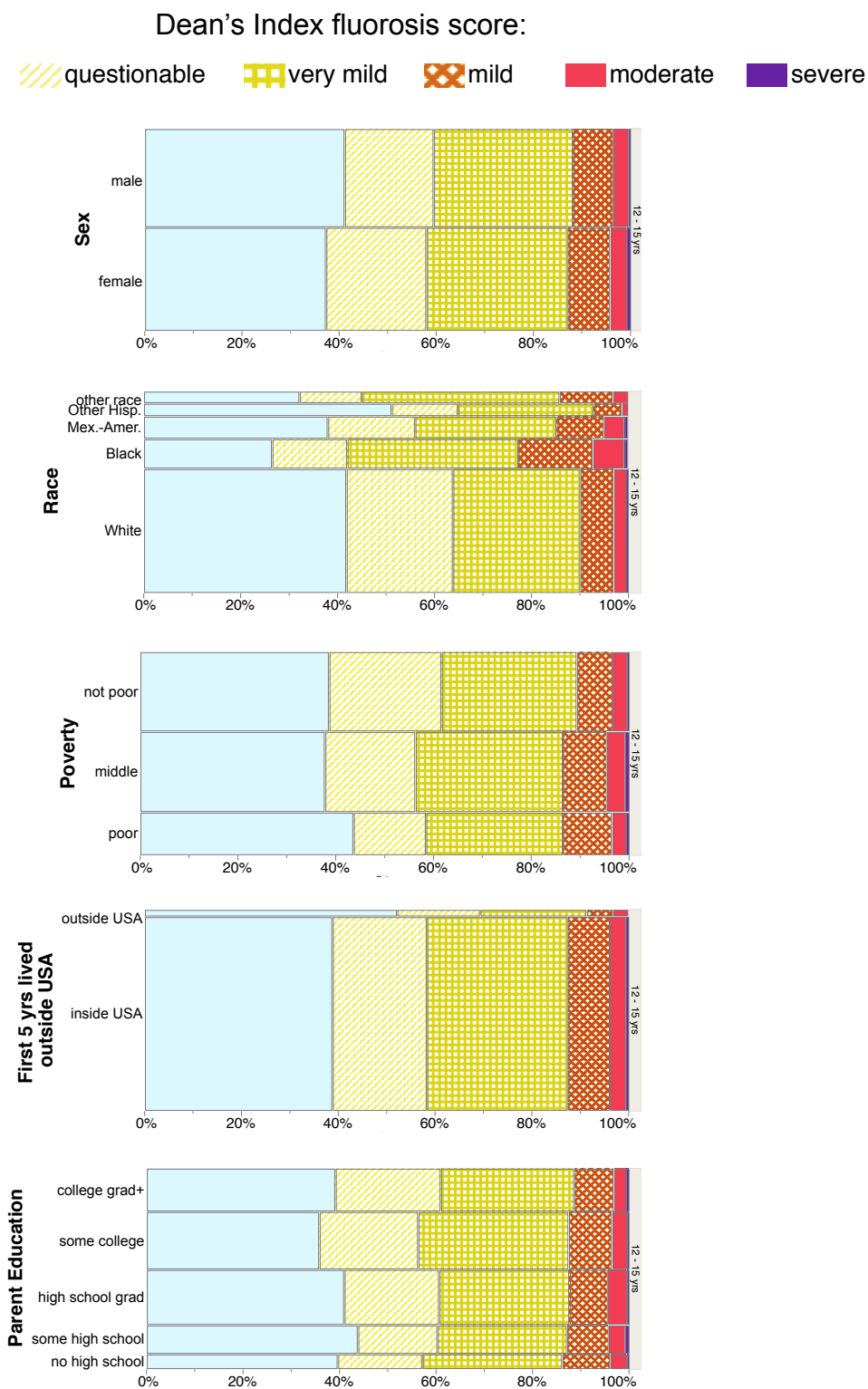
Ages 12-15 years, n = 3,364
Areas of rectangles are proportional to USA population by weighting

Appendix Figure 2-4. NIDR1986-1987
Mosaic Plots of Fluorosis by Socio-Demographic Variables

Dean's Index fluorosis score:

unaffected   questionable   very mild   mild   moderate   severe
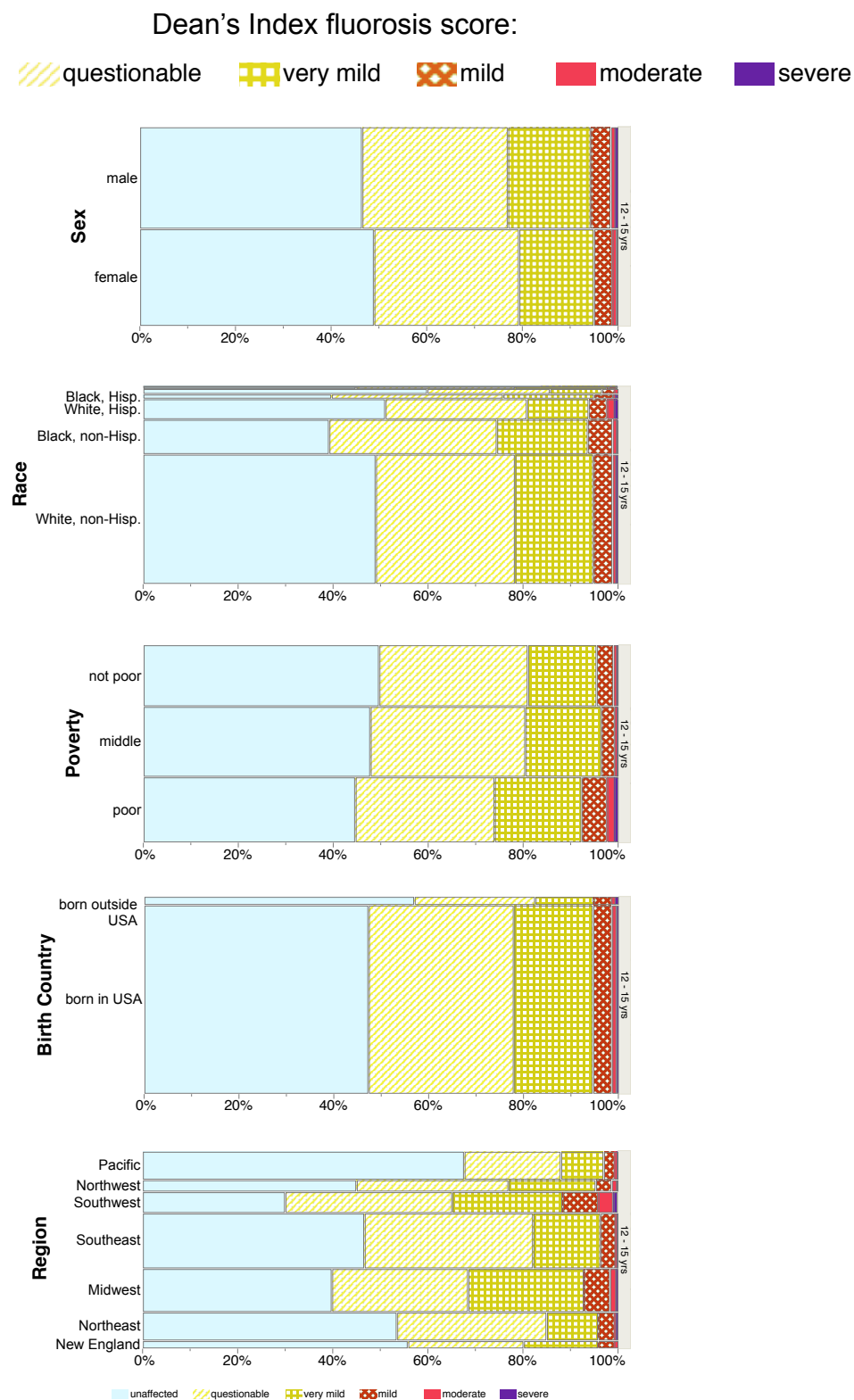
Ages 12-15 years, n = 11,818
Areas of rectangles are proportional to USA population by weighting

Appendix 3. Estimation of the Community Fluorosis Index (CFI) for the USA at the time of Dean's 1939-1940 fluorosis surveys.

Appendix Figure 3-1. Histogram of NHANES 2013-2014 individual tap water fluoride concentrations, population-weighted.

Appendix Figure 3-2. Histogram of natural drinking water fluoride concentration in the USA, with information from three sources superimposed.

Appendix Figure 3-3. Histogram of natural drinking water fluoride concentration in the USA used to calculate overall CFI for Dean 1939-1940 fluorosis survey.

Appendix Table 3-1. Comparison of USA drinking water fluoride concentration distributions from three sources of information.

Appendix Figure 3-4. Appendix Figure 3-4. Community Fluorosis Index (CFI) for national surveys of the USA, ages 12-15 years, by survey years midpoint.
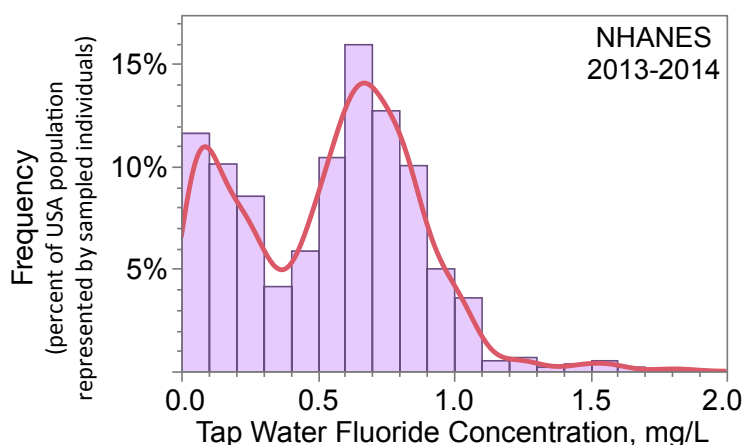
Appendix 3

Estimation of the Community Fluorosis Index (CFI) for the USA at the time of Dean's 1939-1940 fluorosis surveys

To estimate the national-level CFI in 1939-1940, at the time when Dean did some of his seminal fluorosis surveys in the USA, we needed to estimate the population-weighted water fluoride distribution in the USA. Dean's survey can not be directly compared to the three later national surveys because he did not attempt to collect information from a representative sample of the USA. Instead, Dean's work is used to help establish the dose-response relationship between drinking water fluoride and CFI during a time when drinking water was the dominant source of fluoride for most children. Fejerskov et al used Dean's data, together with information from other early studies of water fluoride and fluorosis, to develop a dose-response formula (Fejerskov et al. 1990). When this formula is applied to the population-weighted distribution of water fluoride concentration in the USA, an overall CFI can be calculated.

The relevant time of exposure to water fluoride for the Dean 1939-1940 survey of fluorosis in 12-15 year olds was the years from about 1924-1934 when the children would have been ages 0-6 years old. No suitable information on natural drinking water fluoride levels for the USA is available for this time so we made the assumption that the natural water fluoride distribution has not changed since that time, so that we could use more recent data. Even today, no single source of data provides the population-weighted distribution of natural water fluoride in the USA (before fluoride is added in artificially fluoridated systems), so we examined several sources of partial data. The data sources differ in whether they include public water sources, private water sources, or both; whether they were for ground water or all water; and in their applicable range of water fluoride concentrations. Private water sources (nearly all from wells providing ground water) are used by about 15% of the population of the USA. The four data sources we examined were:

NHANES 2013-2014. The NHANES 2013-2014 survey has population-weighted data for tap water fluoride concentration in the USA, but we could only use the portion of the distribution below 0.4 mg/L, because above this level much of the water has been artificially fluoridated (National Health and Nutrition Examination Survey [NHANES] 2016). Appendix Figure 3-1 is a histogram showing the full distribution, and is copied from Figure 4B in the main text.

Appendix Figure 3-1. Histogram of NHANES 2013-2014 individual tap water fluoride concentrations, population-weighted. This histogram includes all results up to 2.0 mg/L but only that below 0.4 mg/L was considered for estimating the distribution for the time before artificial fluoridation existed. This figure is reproduced from Figure 4B in the main article.


PHS 1969 Natural Fluoridation Census. A census of water systems in the USA with elevated natural water fluoride, conducted by the Public Health Service (PHS), provides a population-weighted estimate, but only for public water, and only above 0.7 mg/L. At the time, only concentrations of at least 0.7 mg/L were considered beneficial so the PHS did not include water systems with lower concentrations (PHS 1969).

USGS NWIS database. The United States Geological Survey (USGS) has a large database of mostly private well water fluoride levels from tens of thousands of wells across the USA, which we assumed was representative of the population that uses such private drinking water (USGS National Water Information System [NWIS] 2018). We used data from 1998-2001. The data covers the complete range of water fluoride levels.

EPA 2002. A report by the United States Environmental Protection Agency (EPA) derived estimates of the population-weighted public water (ground and surface water) fluoride concentration distribution before artificial fluoridation, but only by broad categories of water fluoride concentration (EPA 2002). However, this information can be used to check the more detailed data from other sources. The original source of this data was an EPA water system survey conducted in 1995.

We compared the water fluoride distributions from these sources of data to see whether they were sufficiently consistent with each other so that they could be combined or a simplifying assumption applied. Despite some differences in type of water included in each data set (private versus public, ground water versus surface water, limits on included range of fluoride concentration), we found they showed very similar

distributions which were closely fit by a lognormal distribution as shown in Figure 3-2 where NHANES 2013-2014 and PHS 1969 data are superimposed on USGS NWIS data. Independent confirmation of this distribution comes from the EPA (2002) estimate of the percent of the USA population with public water having a water fluoride concentration below 0.7 mg/L, which was 73%, similar to the USGS NWIS database which found 81% below 0.7 mg/L (EPA 2002 Table 2.3-10; USGS NWIS 2018). Since the USGS NWIS database had the most detailed and complete information between 0.0 mg/L and the highest water fluoride levels, we used its distribution to calculate the overall CFI for the USA population in 1939-1940 (see Appendix Figure 3-3).
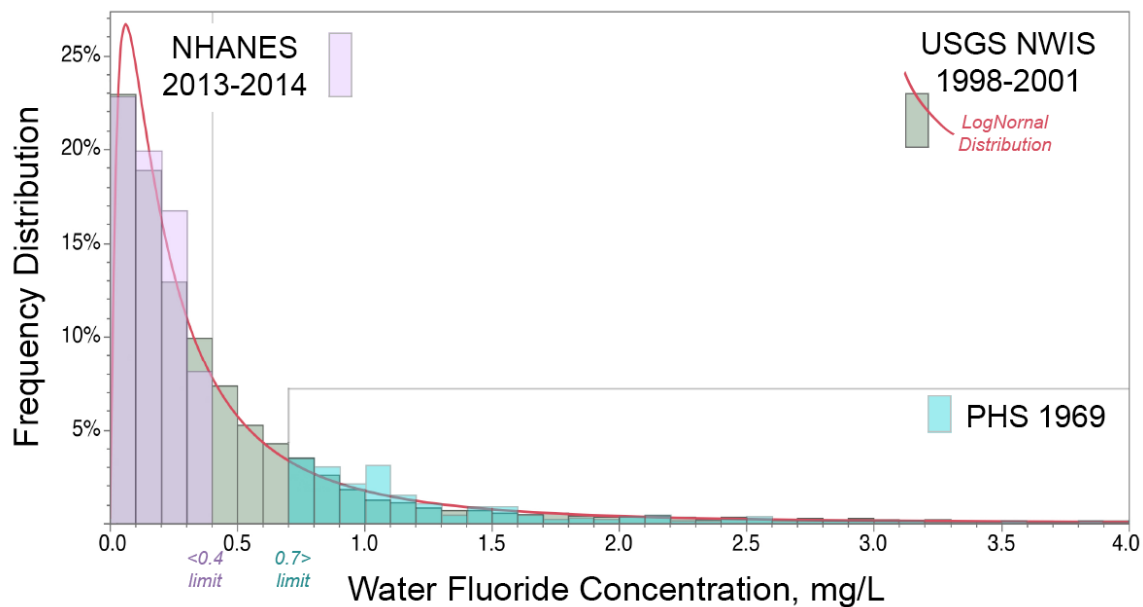
Appendix Figure 3-2. Histogram of natural drinking water fluoride concentration in the USA, with information from three sources superimposed. Pink color for NHANES 2013-2014 tap water; blue color for PHS 1969 survey of public water systems with natural water fluoride ≥ 0.7 mg/L; and green color for USGS NWIS 1998-2001 data from 9,595 wells. Red line is the fitted lognormal distribution for the USGS NWIS 1998-2001 data (parameter estimates: µ=-1.37, σ=1.19). The NHANES 2013-2014 and PHS 1969 partial histograms were scaled to match the complete histogram for USGS NWIS 1998-2001.
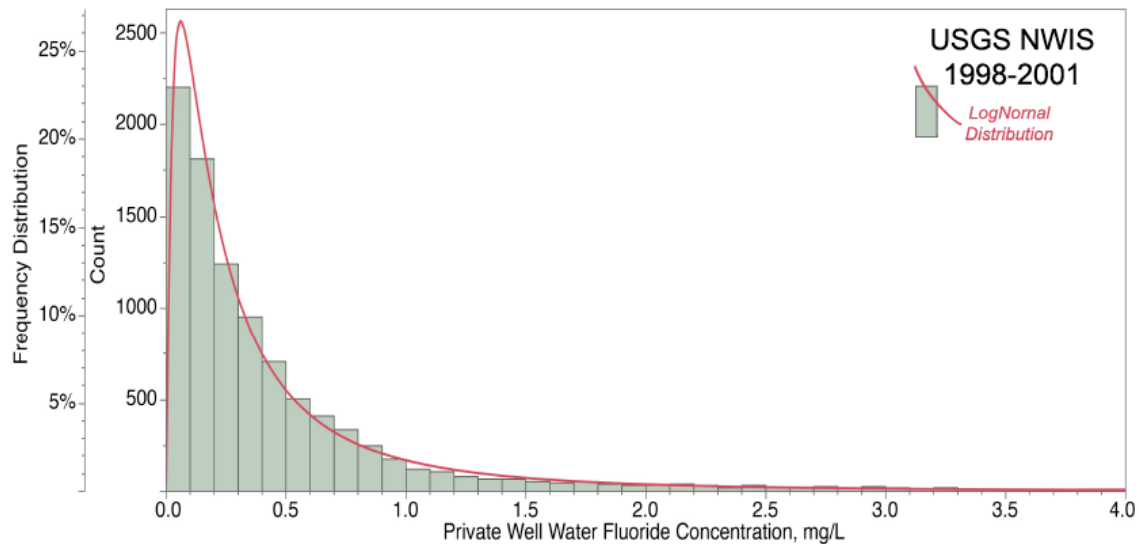
Appendix Figure 3-3. Histogram of natural drinking water fluoride concentration in the USA used to calculate overall CFI for Dean 1939-1940 fluorosis survey. Data from USGS NWIS 1998-2001 for 9,595 wells. Red line is the fitted lognormal distribution for the data (parameter estimates: μ=-1.37, σ=1.19).

The USGS database includes water fluoride analyses of samples taken from thousands of mostly private drinking water wells located across the USA. We restricted it to a manageable subset of results for all wells with fluoride analyses sampled from 1998-2001, which totaled 9,595 wells. When multiple samples were analyzed from a single well, we used the average of those samples. The resulting distribution of water fluoride concentration was similar to that reported by the USGS from the same data set, but restricted to those wells known to be used for private domestic water (DeSimone 2009). The USGS also reported a very similar distribution of water fluoride in a sample of public water systems' source waters (before any fluoride was added) (Toccalino et al. 2010). Appendix Table 3-1 compares the distributions from these three USGS information sources.

Appendix Table 3-1. Comparison of USA drinking water fluoride concentration distributions from three sources of information, mg/L by percentile of sample.

|	Information Source		
Percentile	USGS NWIS database[a]	USGS 2010, Toccalino[b]	USGS 2009, DeSimone[c]
10%	0.05	0.05	<0.10
25%	0.15	0.10	<0.10
50% median	0.25	0.20	0.20
75%	0.55	0.50	0.40
90%	1.05	1.00	1.05

[a] ground water (USGS NWIS 2018)
[b] public ground water (Toccalino et al. 2010)
[c] private ground water (DeSimone 2009)

Fejerskov et al found a linear dose-response between total fluoride intake in units of mg/kg$_{bodyweight}$/day and CFI (Fejerskov et al. 1990). Fejerskov also reported an equation for calculating the total fluoride intake as a function of water fluoride concentration and mean annual maximum daily temperature under the assumption that water fluoride was the sole source of fluoride intake. However, the Fejerskov dose-response relationship is not valid for water fluoride concentrations above about eight mg/L because the predicted CFI will be over 4.0, which is the maximum possible for the CFI and would represent 100% of children having a Dean's Index score of severe. We therefore capped the CFI at 4.0 when water fluoride was > 8.0 mg/L in our calculations. Water fluoride levels above about 2.0 mg/L contributed relatively little to the CFI since they represented less than 5% of the total population. We used a mean annual maximum temperature of 64 degrees Fahrenheit because it is the population-weighted temperature for the 50 largest USA cities in 1930. The results for all levels up to 20 mg/L were combined to give the estimated CFI for the entire USA in 1939-1940. With these inputs to the Fejerskov equations, we calculated the population-weighted CFI for each 0.1 mg/L width level bin of USA water fluoride concentration from the USGS database histogram shown in Appendix Figure 3-3, and then summed them to get the overall CFI for the USA.

Our estimated CFI in the USA for the time of Dean 1939-1940 is 0.29 and is used in Appendix Figure 3-4, which is also Figure 3 of the main article. This CFI score suggests that less than 1% of the population would have a Dean's Index score as high as "mild", and only a small percent would have "very mild".
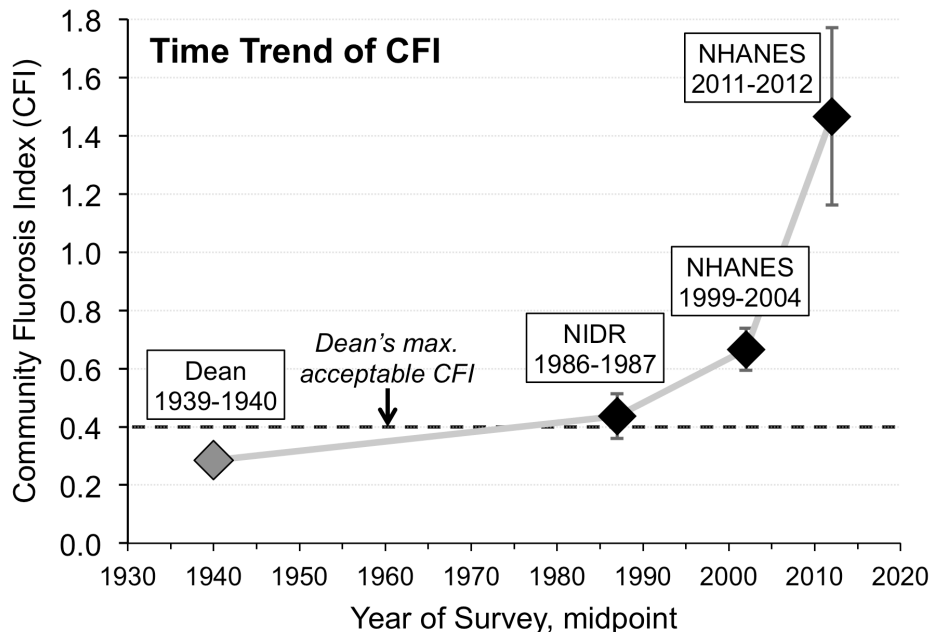
Appendix Figure 3-4. Community Fluorosis Index (CFI) for national surveys of the USA, ages 12-15 years, by survey years midpoint. Error bars show 95% confidence intervals. Dashed line at CFI of 0.4 is Dean's maximum acceptable CFI for artificially fluoridated water (Dean 1951).
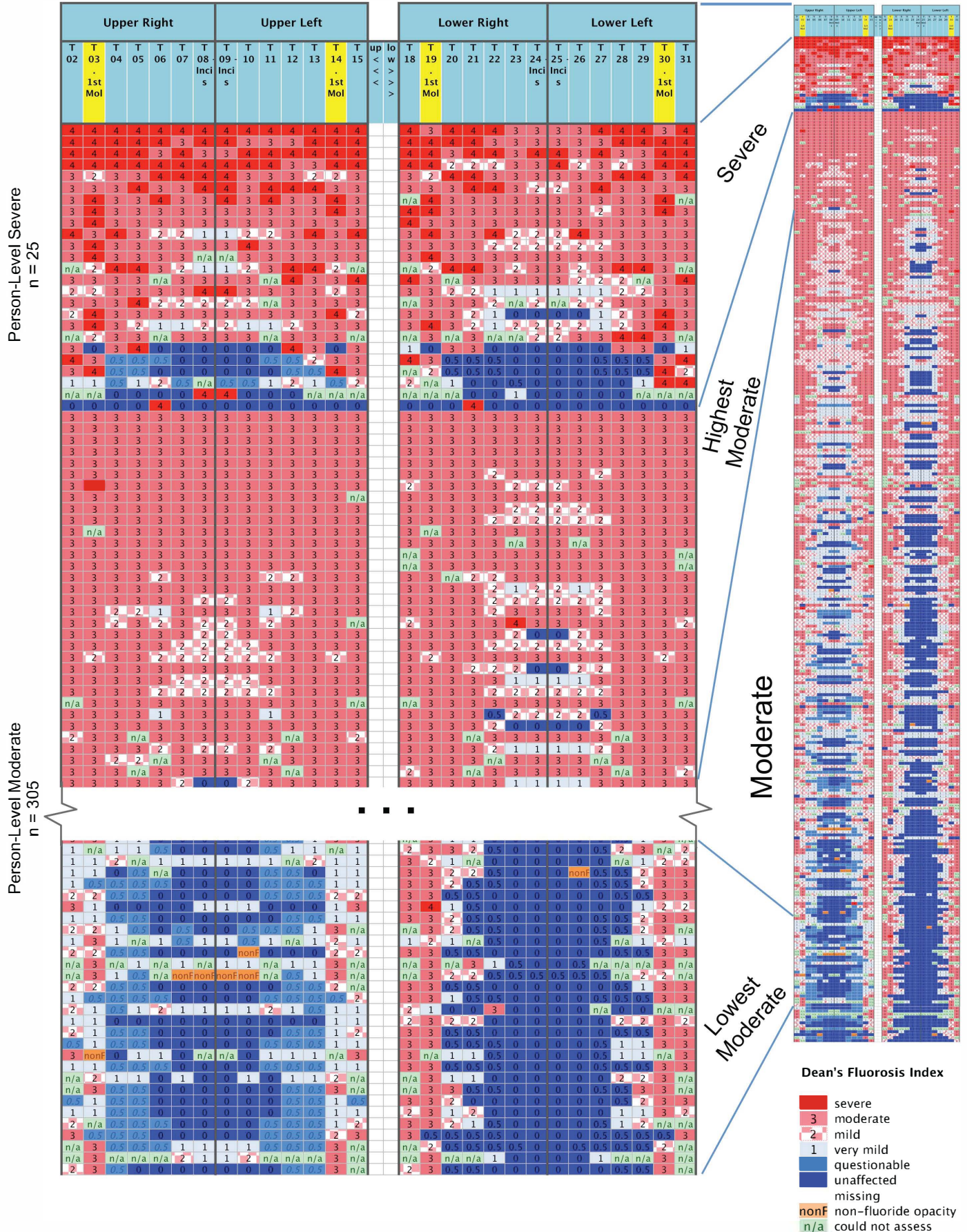
Appendix 3 References

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US Public Health Service (PHS). 1969. Natural fluoride content of community water supplies 1969. Bethesda, MD. [accessed 2018 Jun 1]. https://www.cdc.gov/fluoridation/pdf/statistics/naturalfluoridecontent1969.pdf

Appendix 4. NHANES 2011-2012, Tooth-level fluorosis scores, graphic display.

Appendix 4.

NHANES 2011-2012, Tooth-Level Fluorosis Scores,
Highest to Lowest; all Person-Level Severe and Moderate; Ages 12-19

All Children with Moderate and Severe

Dean's Fluorosis Index

- severe
- 3 moderate
- 2 mild
- 1 very mild
- questionable
- unaffected
- missing
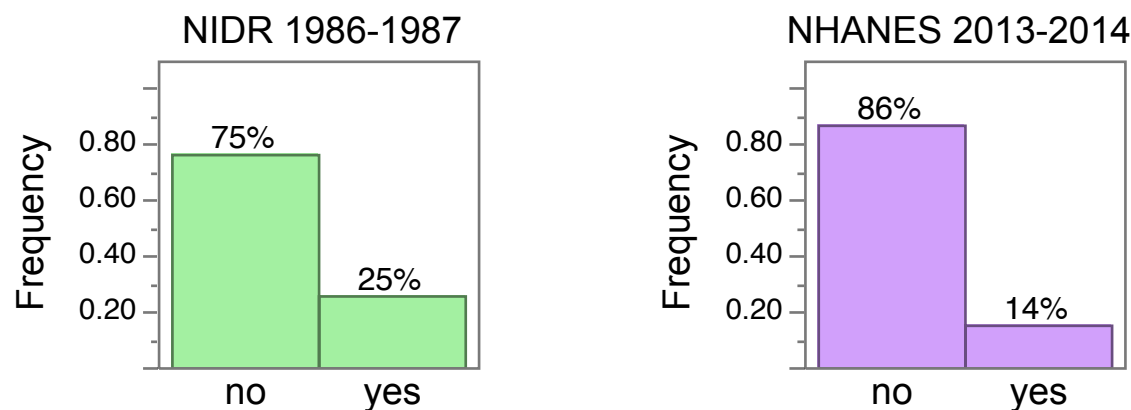- nonF non–fluoride opacity
- n/a could not assess

Appendix 5. Reported use of fluoride supplements in NIDR 1986-1987 and NHANES 2013-2014 surveys.

Appendix Figure 5-1. Reported fluoride supplement use in NIDR 1986-1987 and NHANES 2013-2014 oral health surveys.

Appendix 5

Reported use of fluoride supplements in NIDR 1986-1987 and NHANES 2013-2014 surveys

Appendix Figure 5-1. Reported fluoride supplement use in NIDR 1986-1987 and NHANES 2013-2014 oral health surveys. Ever use of fluoride drops or fluoride tablets. Ages 5-14 years, weighted.

NIDR 1986-1987

Responses to these questions:

Q1QAYC: Has Your Child Ever Received Fluoride Drops?
Q2QAYC: Has Your Child Ever Received Fluoride Tablets?

Responses were "yes" to one or both of these questions for 8,496 children (weighted 24.8%) and "no" to both questions for 21,990 children (weighted 75.1%).

National Institute for Dental and Craniofacial Research (NIDCR). 1992. The National Survey of Oral Health in U.S. School Children: 1986-1987 Public Use Data File Documentation and Survey Methodology [Internet]. Bethesda, Maryland. Available from:
ftp://ftp.cdc.gov/pub/Data/DOH/Childrendoc.pdf

Data and additional information available from this ftp site:
ftp://ftp.cdc.gov/pub/Data

Log in as "guest".
Choose folder: DOH
Choose file: Childrendata_ascii.dat
Other related files and oral health survey documents from the CDC DOH (Dept. of Oral Health) are also available for download at this ftp site.

Or access data file directly (100 mb file size):
ftp://ftp.cdc.gov/pub/Data/DOH/Childrendata_ascii.dat

NHANES 2013-2014

Responses to these questions:

OHQ565: Has {SP} ever received prescription fluoride drops?
OHQ580: Has {SP} ever received prescription fluoride tablets?

Responses were "yes" to one or both of these questions for 222 children (weighted 14.3%) and "no" to both questions for 1,902 children (weighted 85.7%).

National Health and Nutrition Examination Survey (NHANES). 2016. National Health and Nutrition Examination Survey 2013-2014 Data Documentation, Codebook, and Frequencies: Oral Health (OHQ_H)). [cited 2018 Jun 1].
Available from:
https://wwwn.cdc.gov/Nchs/Nhanes/2013-2014/OHQ_H.htm
Data available here:
https://wwwn.cdc.gov/Nchs/Nhanes/2013-2014/OHQ_H.XPT

Additional data and information available from:
https://wwwn.cdc.gov/nchs/nhanes/continuousnhanes/default.aspx?BeginYear=2013

Appendix 6. Toothpaste use by young children, from NHANES 2013-2014 survey data.

Appendix Figure 6-1. Mosaic plot of amount of toothpaste applied to toothbrush reported for children in the NHANES 2013-2014 survey, by age group.
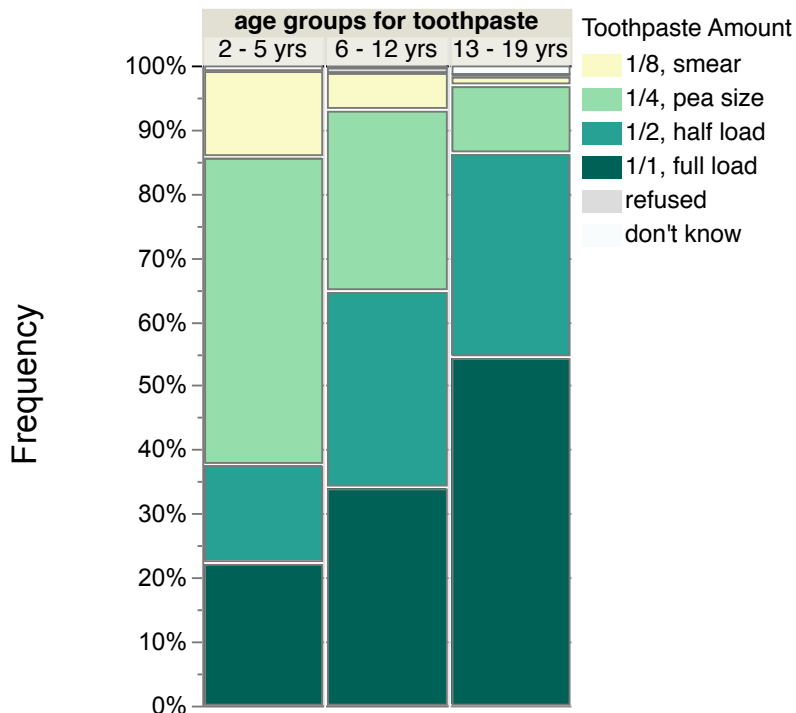
Appendix Table 6-1. Toothpaste use reported for children in NHANES 2013-2014 survey.

Appendix 6

Toothpaste use by young children, from NHANES 2013-2014 survey data

The only nationally representative information on the amount of toothpaste used by young children in the USA, to our knowledge, is from the NHANES 2013-2016 surveys (NHANES 2016; CDC 2018). The interview portion of these surveys asked the child (or a proxy respondent such as a parent) how much toothpaste they put on the toothbrush when brushing. We report the results in Appendix Figure 6-1 and Appendix Table 6-1.

The warning on fluoride toothpaste labels since 1997 has been to use no more than a "pea-sized amount for children under six", yet the results from NHANES 2013-2014 show that even 15 years after this warning first appeared it is not being followed by 36% of children. Advice from the American Dental Association to use only a pea-sized amount in children under age six first appeared in 1991 (Oldenburg 1997).

Appendix Figure 6-1. Mosaic plot of amount of toothpaste applied to toothbrush reported for children in the NHANES 2013-2014 survey, by age group. Weighted to account for survey design as described in main text.

Appendix Table 6-1. Toothpaste use reported for children in NHANES 2013-2014 survey. Amount placed on brush by age group. Percent of total. Weighted to account for survey design as described in main text.

% Using	2 - 5 yrs	6 - 12 yrs	13 - 19 yrs
Sample size, n	238	559	431
1/1, full load	20.7	34.4	50.8
1/2, half load	15.5	29.4	34.4
1/4, pea size	50.4	28.9	11.9
1/8, smear	13.1	6.6	1.9
refused	0.0	0.5	0.4
don't know	0.4	0.2	0.7
Total	100.0	100.0	100.0

Appendix 6 References

Centers for Disease Control and Prevention (CDC). 2018. NHANES - National Health and Nutrition Examination Survey homepage. [accessed 2018 Jun 1]. https://www.cdc.gov/nchs/nhanes

National Health and Nutrition Examination Survey (NHANES). 2016. National Health and Nutrition Examination Survey 2013-2014 Data Documentation, Codebook, and Frequencies: Oral Health (OHQ_H). [accessed 2018 Jun 1]. https://wwwn.cdc.gov/Nchs/Nhanes/2013-2014/OHQ_H.htm

Oldenburg D. 1997 Jun 16. Consummate Consumer: Toothpaste: How Safe? Washington Post.:C5. [accessed 2018 Jun 1]. https://search.proquest.com/docview/1458317001 or http://fluoridealert.org/articles/fda-toothpaste