

Supplement (available online)

for:

COMMENTARY

Limitations of fluoridation effectiveness studies: Lessons from Alberta, Canada

Neurath C, Beck JS, Limeback H, Sprules WG, Connett M, Osmunson B, Davis DR. Limitations of fluoridation effectiveness studies: Lessons from Alberta, Canada (Commentary). *Community Dent Oral Epidemiol.* 2017;00:1–7. <https://doi.org/10.1111/cdoe.12329>

Standardized measures: relative differences in decay

In our main commentary we presented graphs using the same units of decay measurement as reported in the McLaren et al papers. The measures are **defs**, **deft**, and percent of children with any decay, or %**deft**>0. We used these same original measures to make clear we were using data taken directly from the publications of McLaren et al.^{1,2,3} They have the additional advantage of being decay rate measures familiar to dental researchers.

However, to more accurately compare analyses that use different measures, it is helpful to standardize them by presenting each as relative differences from reference values. We chose the Calgary 2004/2005 decay rate as the reference value, because for all analyses and all measures it had the lowest value so that relative differences were always positive. We thus produced graphs with the dimensionless measure “percent difference from the Calgary 2004/2005 decay rate value”, or “decay rate relative difference”. These graphs allow easier comparison between analyses using different decay rate measures and either of the two study designs we discuss (pre- post- cross-sectional and time-trend).

Examination of Figures S1a, S1b, and S3 allows direct comparison of the sensitivity of the three main decay measures to differences in decay over time and between the two cities Calgary and Edmonton. All graphs use the same Y-axis scale ranging from 0% to 180% difference from the reference. In order of decreasing sensitivity the measures are **defs**, **deft**, and %**deft**>0.

Figure S1b shows the time-trend analysis for **deft** in Calgary and reveals that decay is increased by about 65% over the nine years from 2004/2005 to 2013/2014. This is more than 7% per year, and this rate of increase is the same in the pre- and the mostly post- cessation periods. This rapid rate of change

highlights the weakness of the McLaren et al study design that looks at differences in rates nine years apart and six years prior to the time of fluoridation cessation.

Figure S2 shows results for **def_s**, but in a subgroup analysis of only those with **def_s>0**. This subgroup analysis was expected by McLaren et al to be more sensitive than the full group analysis. Children at higher risk of decay were hypothesized to derive a greater benefit from fluoridation than those at low risk. However, comparing Figure S2 to Figure S1a shows this subgroup had smaller relative differences in decay than the full group. Since we have shown that most, if not all, of the differences in decay rates are due to confounding, the lower sensitivity in the **def_s>0** subgroup may reflect the effects of a confounder that reduces risk of caries more in those already at low risk of caries, and confers less benefit to those at high risk of caries.

Figure S3 shows results for the measure **%def_t>0** (percent of children “not caries-free”). This decay measure was used by McLaren et al in a recent third paper, published in the journal *Public Health (PH)*, on their study of fluoridation cessation in Calgary³. The paper is similar to the *CDOE* paper, differing mainly by incorporating the third data point from the 2009/2010 Calgary survey. Using the three data points, the authors replicated our finding that there was no difference in rate of increase in **def_t** in primary teeth in Calgary when comparing pre-cessation to post-cessation time periods.

The authors also presented a new analysis using the three Calgary data points and the decay measure **%def_t>0**. They reported this analysis shows “some indication (though very small)” of a higher rate of increase post-cessation than pre-cessation. No confidence intervals were reported. It is likely that the measure **%def_t>0** is less sensitive than either **def_s** or **def_t**. Using the information presented in their figure, we plotted the relative difference in **%def_t>0** for the three time points, with reference being the 2004/2005 survey, to allow a better comparison with our graphs of **def_t** and **def_s**. Our analysis confirms **%def_t>0** is a less sensitive measure than **def_t** or **def_s** (Figures S1a, S1b, S3). The effect sizes are smaller as shown by shallower slopes. Furthermore, the difference in slopes between the pre- and post-cessation periods is so small that this analysis best supports a conclusion that there was no difference in the rate of increase of decay, consistent with the conclusion when using the more sensitive **def_t** measure.

Graphs showing relative differences from reference of Calgary 2004/2005

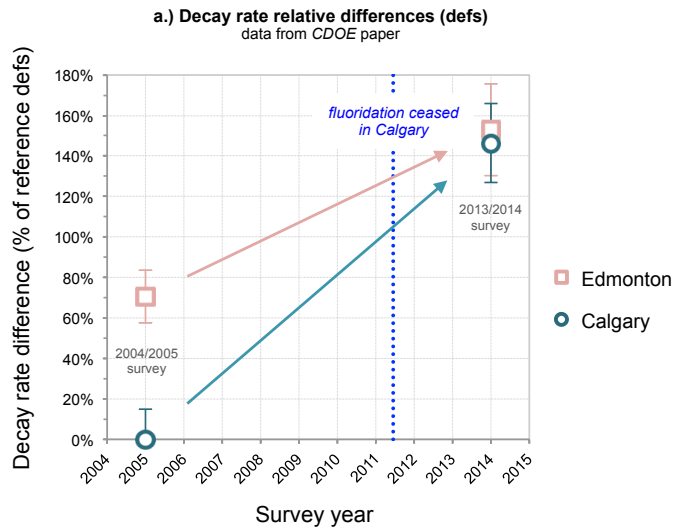


Fig. S1 a.) defs

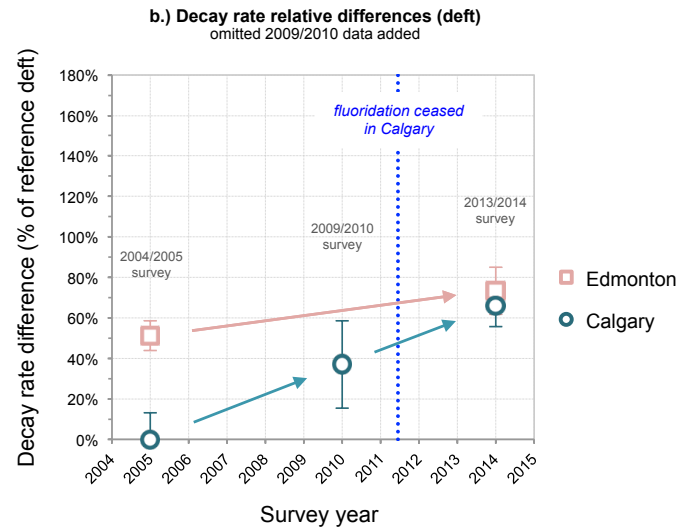


Fig. S1 b.) deft

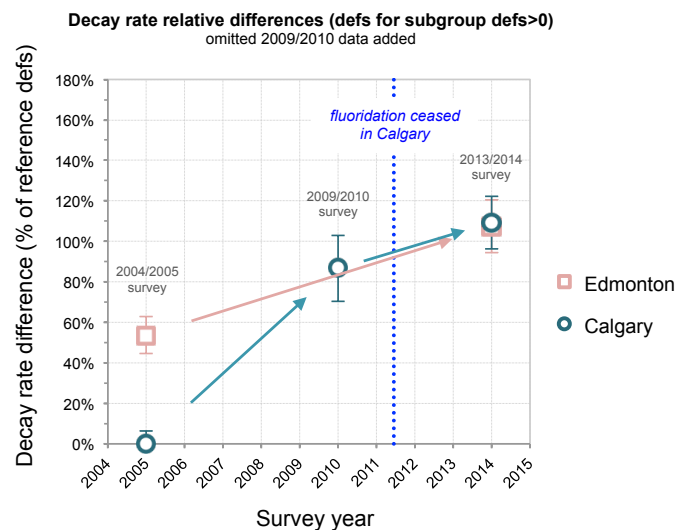


Fig. S2. defs for subgroup defs>0

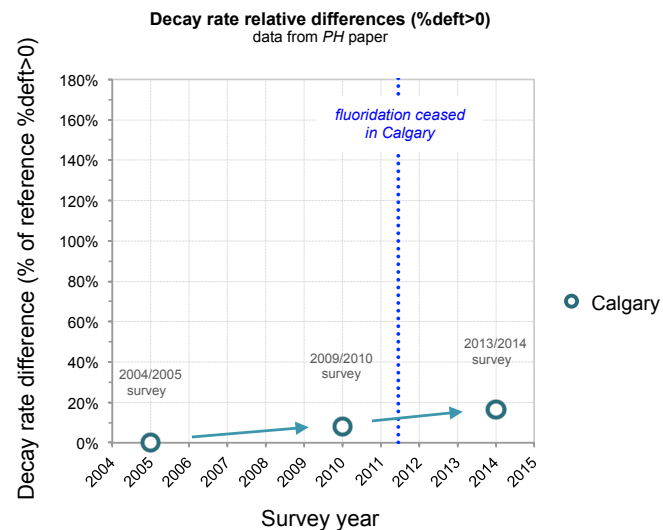


Fig. S3. %deft>0, prevalence of children with any decay

SUPPLEMENT REFERENCES

1. McLaren L, Patterson S, Thawer S, Faris P, McNeil D, Potestio M, et al. Measuring the short-term impact of fluoridation cessation on dental caries in Grade 2 children using tooth surface indices. *Community Dent Oral Epidemiol* 2016;44:274–82.
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3. McLaren L, Patterson S, Thawer S, Faris P, McNeil D, Potestio M, et al. Exploring the short-term impact of community water fluoridation cessation on children’s dental caries: a natural experiment in Alberta, Canada. *Public Health* 2017;146:56–64.