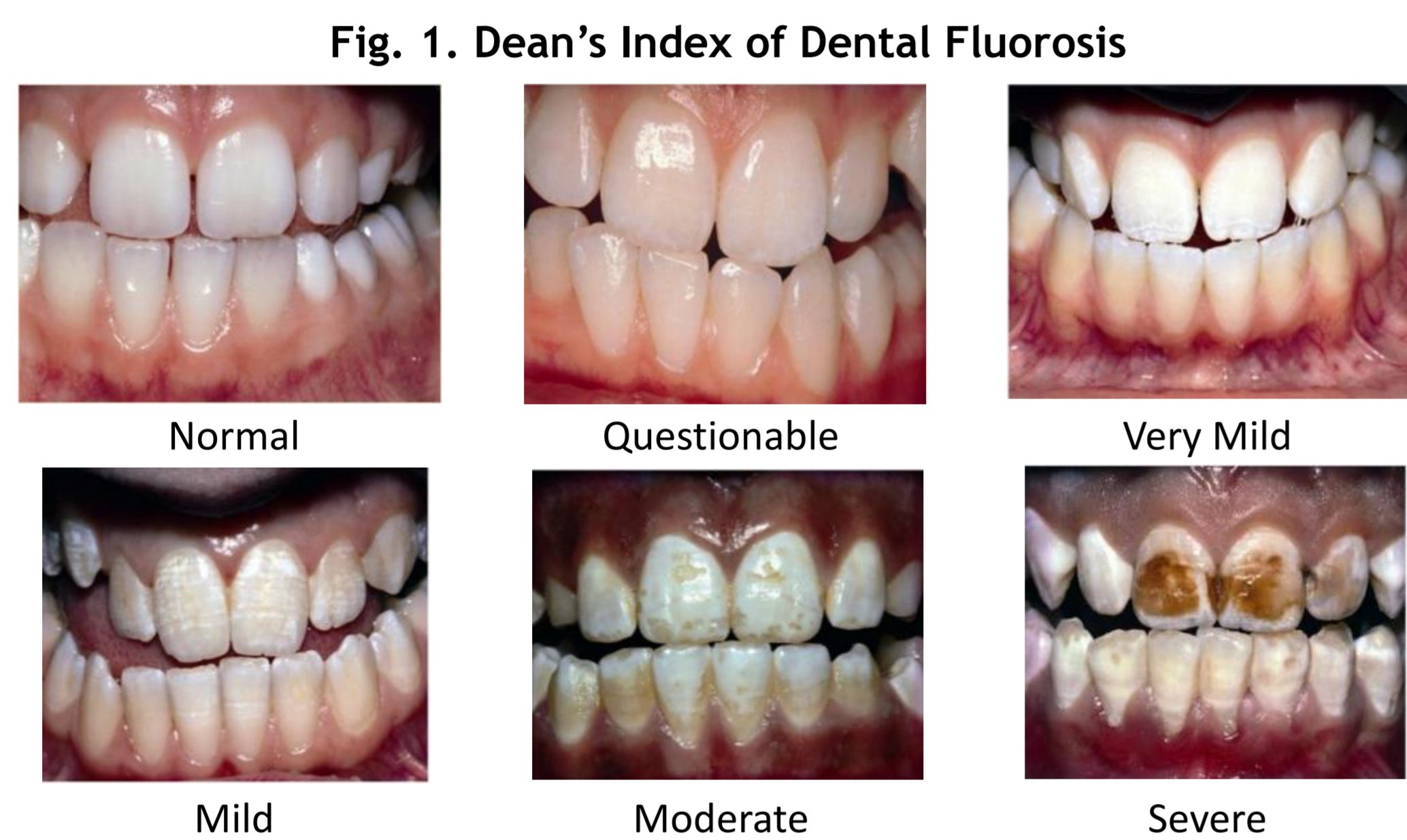


Background

FACCT is a collaborative project between the Oral Health Services Research Centre, University College Cork and the Health Service Executive dental service. Funding from the Health Research Board was awarded under a competitive Collaborative Applied Research Grant in Population Health and Health Service Research.

National epidemiological surveys of children's oral health conducted in Ireland in 1984¹ and 2001/02² showed an ongoing reduction in dental caries levels among 5-, 8-, 12- and 15-year-olds in areas with and without domestic water fluoridation. Children with a lifetime exposure to fluoridated water had significantly lower dental caries levels than those with non-fluoridated water supplies.

This reduction in dental caries was accompanied by an increase in enamel fluorosis levels. Measurement of fluorosis (typically presenting as white patches or fine white lines on the teeth; see figure 1) is a recognised method of monitoring intake of fluoride from different sources. In 1984, 6% of 8-year-olds and 5% of 15-year-olds in fluoridated regions had any sign of fluorosis¹. By 2001/02, using the same criteria, the prevalence of fluorosis had risen dramatically, with 24% of 8-year-olds and 36% of 15-year-olds showing signs of fluorosis. In all age groups (8, 12 and 15) the percentage of children with scores at the higher end (mild and moderate) was low (1 or 2%); the majority of affected children were scored questionable or very mild. The prevalence of fluorosis was significantly higher among children in fluoridated areas compared to non-fluoridated groups for the three age groups studied (all $p < 0.0001$)².



As the level of fluoride in water had not changed between 1984 and 2001/02, it would be reasonable to suggest that increased use of fluoride toothpaste was the likely causative factor for the increase in enamel fluorosis levels. Use of fluoride toothpaste by young children has been reported as a potential risk factor for fluorosis in a number of studies in fluoridated areas. Potential risk factors include the age at which brushing commenced, the frequency of brushing, the fluoride concentration of the toothpaste, and the amount of toothpaste applied to the toothbrush and subsequently swallowed^{3,4,5}.

In 2002 the Forum on Fluoridation - 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 to a range of 0.6 to 0.8 ppm, with a target of 0.7 ppm⁶. This change was effected on July 1st 2007.

In addition, the Forum 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 used⁶. The combination of these two measures aimed to strike a balance between the risk of fluorosis and caries prevention. However, the impact of these changes has not been evaluated in terms of caries prevention or fluorosis.

Aim: The aim of this 5-year research programme is to evaluate the impact and outcome of the change in policy on water fluoridation and the use of fluoride toothpaste on dental caries and enamel fluorosis in Irish children with and without lifetime exposure to water fluoridation.

Methods

Survey Design: A cross-sectional study with a nested cohort study will be conducted by standardised trained examiners in primary schools in Dublin, Cork and Kerry for children born either prior to (age 12, born 2001) or post (age 5, born 2008) policy changes. For a target sample size of 5,245, with equal numbers of male and female participants, over 8,000 children must be contacted.

Fig. 2. Sample Size (Number of consents to be issued)

	Dublin	Cork/Kerry Fluoridated	Cork/Kerry Non-Fluoridated	Total
Age 5	1673	1427	1427	4527
Age 12	1163	1190	1190	3543
Total	2836	2617	2617	8070

Five and 12-year-old children will be examined for dental caries and their height and weight will be recorded. Fluorosis and enamel opacities will also be recorded for the 12-year-olds. In addition to the clinical examination, the 12-year-olds will be asked to complete an electronic Oral-Health-related Quality of Life (COHRQoL) and oral health behaviours questionnaire. All participants will be asked to provide a sample of their domestic water to confirm their current fluoridation status.

The 5-year-olds (born 2008) will be followed-up and examined for caries and fluorosis when they are 8-years-old (2016).

Additional Components: The evaluation will also measure perceptions of the aesthetic acceptability of fluorosis and caries through focus groups with parents and with 12-year-old children.

The FACCT study also includes an economic evaluation of water fluoridation and will explore the potential of electronic health records to generate oral health data that can be used to monitor oral health.

The study design ensures that the sample is representative of the school-going 5 and 12-year-old populations in Cork, Dublin and Kerry.

Results

Ethical approval for the study was obtained from the Clinical Research Ethics Committee of the Cork Teaching Hospitals.

Data Protection: A detailed submission was made to the Office of the Data Protection Commissioner (ODPC) in relation to management of sensitive personal health records. Outcomes of this process included modification to study consent and information leaflets, daily backups of data to the OHSRC and the introduction of weekly removal of study data from fieldwork laptops. All data will be stored with AES-256 encryption.

Clinical Indices: Ten HSE examining teams were trained in the nominated indices: dmft, DMFT (decayed, missing and filled primary or permanent teeth), Developmental Defects of Enamel (DDE) and Dean's Index for dental fluorosis. The Kappa values, which measure agreement between each examiner and the gold standard were calculated. Figure 3 indicates how the Kappa statistic should be interpreted in terms of the level of agreement found.

Fig. 3. Interpretation of the Kappa statistic

Kappa	Strength of agreement beyond chance
0.00	Poor
0.01-0.20	Slight
0.21-0.40	Fair
0.41-0.60	Moderate
0.61-0.80	Substantial
0.81-1.00	Almost perfect

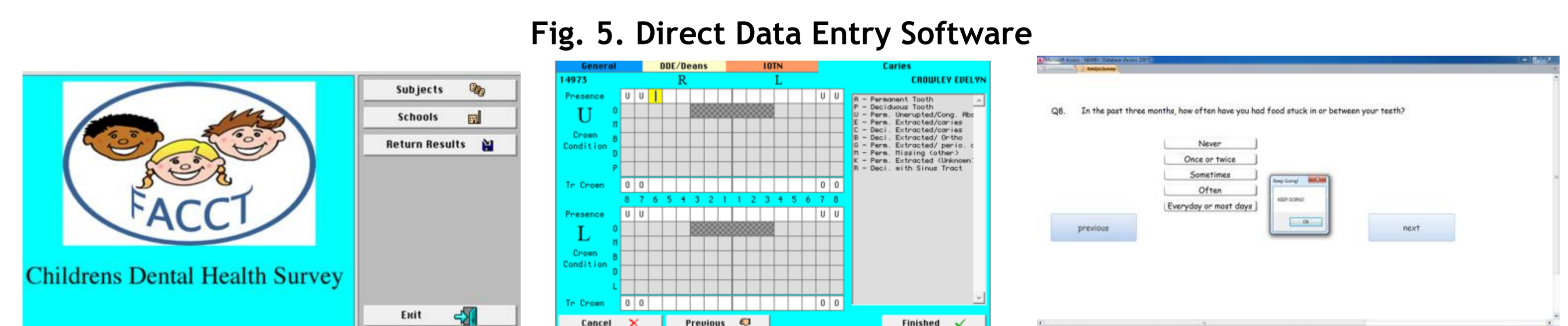
Further training was required for Dean's Index and DDE. The range of kappa values for dental caries and Dean's index (fluorosis) are shown in Figure 4.

Fig. 4. Range of Kappa statistics achieved by FACCT examiners

	Caries (dmft/DMFT)	Fluorosis (Dean's Index)
Kappa (range)	0.72-0.91	0.60-0.89

Direct Data Entry: The random classes, subjects and direct data entry programmes developed for the 2001/02 National Survey were adapted for the current study. In addition, an electronic direct data entry version of the Oral-Health-related Quality of Life (COHRQoL) and oral health behaviours questionnaire was developed and piloted in both English and Irish languages.

The dental nurses were trained in electronic direct data entry of clinical data. Innovative software solutions were developed and tested to ensure that sensitive personal data is managed in compliance with the Data Protection Acts.



Conclusions

Prior to the commencement of data collection in a large epidemiological study, considerable resources are expended in determining sample size, development and piloting of data collection tools, and training examining teams. Scarce resources necessitate optimising the multiple skills of every team member.

The collection of data on height and weight promotes a holistic approach to health and oral health.

Visit facct.ucc.ie for further information.



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