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Different faecal sampling methods alter the acceptability of faecal occult blood testing: A cross sectional community survey

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ABSTRACT

Background: A bowel cancer screening programme is being introduced in the UK. The programme will screen men and women aged 60–69 using faecal occult blood testing (FOBT). Uptake rates in the pilot evaluation were <60%. This study aimed to determine whether the acceptability of FOBT is associated with the sampling method or previous exposure to FOBT.

Methods: Postal questionnaire assessing the perceived acceptability of three potential methods of FOBT sampling: (1) sterile transport swab; (2) smear card [as used in the national screening roll-out]; (3) faecal specimen pot [routinely used in the NHS for stool samples]. Study population comprised those aged 50–69.

Results: Response rate was 63%. FOBT was reported as acceptable by 94.5%. Acceptability fell significantly when sampling methods were detailed. The swab was rated more acceptable than the card or the pot (90.2% versus 62.9% versus 63.0%, $p < 0.0005$). FOBT acceptability did not vary with previous experience of FOBT.

Conclusions: The acceptability of FOBT varied by the sampling method described. The smear card, such as that used in the national screening programme, was the least preferred method. To increase the uptake of screening, alternative methods of faecal sampling should be considered.

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1. Introduction

Each year, in the United Kingdom, almost 35,000 people are diagnosed with, and 16,000 people die from colorectal cancer making it the second most common cause of cancer death.^{1,2} Randomised controlled trials in Nottingham, Denmark and France have shown that screening using unhydrated Hemoccult faecal occult blood testing (FOBT) is effective in reducing mortality by 15%, 18% and 16%, respectively.^{3–5} A meta-analysis supports the results of these individual trials.⁶

The significant impact that colorectal cancer has on health (morbidity, mortality and reduced quality of life), our knowledge of the natural history of this disease and the availability of effective methods for screening, diagnosing and treating this cancer combine to make it a suitable condition for screening.⁷ A bowel cancer screening programme is being introduced in the UK with national coverage planned by 2010.⁸ The programme aims to screen men and women aged 60–69 using faecal occult blood testing (FOBT) and pilot work has confirmed the feasibility.⁹ However, overall uptake was only about 60% and lower in deprived areas, amongst ethnic

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minorities, men and in younger age groups.⁹ Of additional concern is the fact that in the second round of screening, the uptake rate was lower than that observed in the first, suggesting that increased awareness of screening did not lead to a gradual increase in acceptability.¹⁰ Possible explanations for the observed fall in uptake include the poor acceptability of the sampling method for FOBt and the effect of prior experience of FOBt, related either to personal experience or that of friends or relatives.

One of the reasons that patients do not participate in FOBt screening is the nature of sampling, including collection and storage of faecal material. Estimates of the proportion of non-participants citing this factor range from 13% to 65%.^{11–13} Two small studies ($n = 40$ and $n = 27$), carried out by the Medical Devices Agency (MDA), considered three sampling methods for use in the national screening programme; 'card with stick', 'tube with probe' and 'wipe'.¹⁴ The tube method was the most popular method, followed by the card but it was the latter method that was used in the national pilot and is being used in the roll-out of screening.^{9,14}

The colorectal cancer screening programme has the potential to reduce the mortality and reduce the morbidity associated with colorectal cancer. To maximise the benefits and cost-effectiveness of this screening programme, it will be important to deliver a programme that is acceptable to the majority of the target population and which has adequate uptake rates. This cross-sectional questionnaire survey aimed to provide further information relevant to the roll-out of the programme by investigating whether the acceptability of FOBt is associated with (1) different methods of sampling, and (2) level of experience of (exposure to) FOBt.

2. Methods and participants

Eligible participants comprised those aged 50–69 registered with two general practices in the South Birmingham PCT. Exclusions were those with an existing diagnosis of colorectal cancer or any other patients the general practitioner (GP) deemed should not be sent a questionnaire (e.g. palliative care, partner recently deceased). 1318 (50%) of the eligible population ($n = 2639$) were randomly selected and sent a three page questionnaire. Enclosed with each questionnaire was a FREEPOST envelope, an introductory letter from the GP and a personalised letter explaining the purpose of the study from the University. One reminder was sent to all non-respondents. Those who returned a blank questionnaire were classified as non-respondents.

Ethical approval was granted by the student sub-committee of the South Birmingham Research Ethics Committee (Reference number: S/2005/135). R&D approval was granted by the R&D department, South Birmingham Primary Care Trust (Reference number: 856/S).

2.1. The questionnaire

The questionnaire had four sections. The first section asked about socio-demographics and the acceptability of colorectal screening in general and screening using FOBt in particular.

Closed questions (yes, no and not sure) and five point Likert scales (very acceptable to very unacceptable) were used.

The second section provided short descriptions of three different potential sampling methods for FOBt. The sampling methods described comprised

- (1) a sterile transport swab, similar to the 'tube with probe' method in the MDA study, requiring a small sample of faecal material to be extracted from the motion using a long stick (like a cotton bud), which is then sealed in a plastic test tube¹⁴; this method is currently not in use;
- (2) the smear card ('stick with card' method in the MDA study, the Hema-screen (Immunostics, USA) guaiac test that is currently being used in the national pilot of colorectal screening) requiring a small sample of faecal material to be smeared on a card using a stick¹⁴; and
- (3) the faecal specimen pot, currently used in general practice and secondary care, requiring extracting a sample of faecal material from the motion into a pot using a scoop.

Respondents were asked to rate the acceptability of each method using a five point Likert scale ('very acceptable' to 'very unacceptable') and asked to state which of the three methods they thought was the best.

The third section asked about practical aspects of screening with FOBt, including the location of sampling (home, GP surgery, out-patient clinic), the extent to which the respondent wanted assistance from a healthcare professional with sampling and the preferred method of transporting the sample to the laboratory (by post or via the GP).

The final section assessed the participant's experience of FOBt; both personal exposure to testing and other experience (i.e. spouse, other family relation, friend or other). Those who reported having a FOBt in the past, irrespective of the number

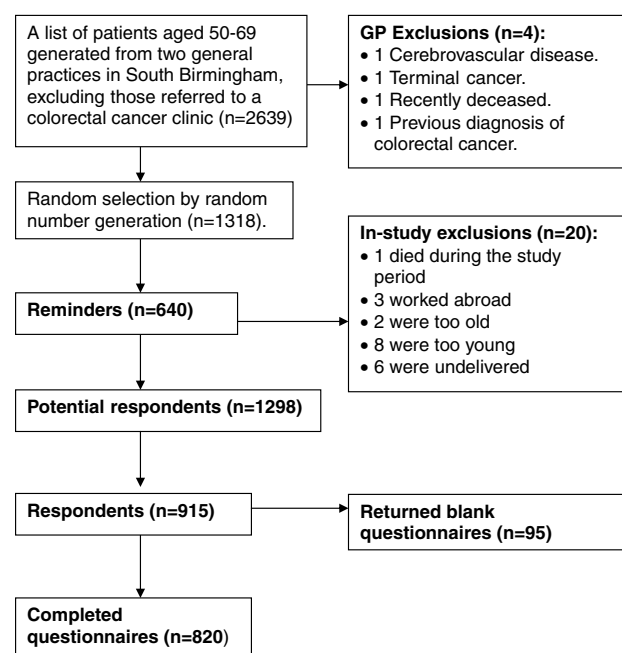


Fig. 1 – Flowchart of the study.

of previous tests, were defined as having personal experience. Those who knew of others who had a FOBt were defined as having non-personal experience.

The questionnaire was piloted to check readability and format and was refined in the light of feedback.

Indices of Multiple Deprivation 2004 (IMD) were used as a proxy measure of socio-economic status. IMD scores are calculated according to a participants' postcode of residence and encompass seven domains of deprivation over local areas of England: income, employment, health deprivation and disability, education skills and training, barriers to housing and services, crime and living environment.¹⁵ Lower IMD scores indicate less deprived areas of residence.

3. Statistical methods

SPSS v13.0 for Windows™ was utilised for statistical analysis. Descriptive statistics and χ^2 analyses were performed to compare participants and non-participants. Simple descriptive statistics and frequency tables were used to present the main findings. One-way repeated measures analysis of variance (ANOVA) and paired t-tests were used to investigate whether the acceptability of FOBt varied with different methods of sampling for the same person, the different methods of sampling forming the repeated measures. *p*-values of less than 0.02 (0.05 divided by 3) were used to denote statistical significance when multiple testing was utilised across the three

Table 1 – Descriptive statistics of participants

	Years			
Age				
Mean				58.84
Range				50–69
Standard deviation				5.47
Median				59
SEM ^a				0.91
95% CI				58.46–59.21
	Percentage			Number
Gender				
Male	47.6			(390)
Female	52.4			(430)
Ethnicity				
White	92.8			(761)
Other	3.5			(29)
No answer	3.7			(30)
IMD Quartile				
1 (most affluent)	9.5			(78)
2	15.5			(127)
3	30.2			(248)
4 (most deprived)	44.6			(366)
Missing data	0.1			(1)
Did the participants think screening in general was a good idea?				
Yes	96.5			(791)
No	0.2			(2)
Not sure	3.3			(27)
FOBt experience				
Had any FOBt experience	21.3			(175)
No FOBt experience	78.5			(644)
No Answer	0.1			(1)
Which sampling method did the participants think was best?				
Sterile transport swab	55.9			(458)
Smear card	7.1			(58)
Faecal specimen pot	22.2			(182)
No answer	14.9			(122)
	Mean	95% CI	SD	SEM ^a
Acceptability of FOB (using five-point Likert scale) 1 = 'very acceptable' 5 = 'very unacceptable'				
FOBt in general	1.56	1.51–1.60	0.67	0.24
FOBt sterile transport swab sampling description	1.72	1.67–1.77	0.73	0.26
FOBt Smear card sampling description	2.36	2.30–2.43	0.94	0.34
FOBt Faecal specimen pot sampling description	2.36	2.29–2.43	1.00	0.36

a Standard error of the mean.

sampling methods. Independent *t*-tests coupled with Levene's test were used to investigate differences between groups in the acceptability of different sampling methods, including whether FOBt acceptability differed with gender or FOBt experience. Initial analyses indicated non-parametric data, therefore non-parametric methods were used to validate the parametric results.

4. Results

4.1. Response rates

There were 20 exclusions subsequent to mailing questionnaires: one died during the study period, three worked abroad, two were older than 69 years, eight were younger than 50 years and six were no longer at that address. The study had a response rate of 63.2% (820/1298, Fig. 1).

Responders were more likely to be female (response rate: male = 60.5% (390/645), female = 65.8% (430/653), $\chi^2 = 3.82$, *DF* = 1, *p* = 0.05) and from more affluent areas (mean IMD: respondents = 29.43; non-respondents = 32.68, *t* = 3.779 *DF* = 952.59 *p* < 0.001). No significant difference in response rates by age was observed (50–59 year: 61.4%, 60–69 years: 65.0%, $\chi^2 = 1.69$ *p* = 0.097).

The mean age of responders was 58.8 years, 52.4% (430/820) were female, 92.8% (761/820) were white and 44.6% (366/820) were from the most deprived IMD quartile (Table 1).

5. FOBt acceptability

The vast majority (96.5%) reported that colorectal screening was a good idea. The reported acceptability of FOBt varied according to the sampling method described (Table 2). Most participants (94.5%) rated FOBt as a general concept as 'very acceptable' or 'acceptable' (Table 2). However, when sampling methods were described, the acceptability rates fell and significant differences between the mean scores for each method were observed (Wilks' Lambda = 0.652, *F*(2,754) = 200.959, *p* < 0.0005) (Table 2). Paired comparisons of the mean acceptability scores demonstrated the sterile transport swab to be

the most acceptable method, with no difference in the overall acceptability of the smear card and the faecal specimen pot (Table 2). When asked to specify which one of the three methods was best, the sterile transport swab was rated the highest (55.9%), followed by the faecal specimen pot (22.2%) and the smear card (7.1%) (Table 1).

Both men and women found the sterile transport swab to be the most acceptable of the three described methods of sampling (Table 3). The faecal specimen pot was reported to be more acceptable (lower acceptability score) to women than men (*t* = 1.94, *DF* = 782, *p* = 0.053), whereas the smear card was more acceptable to men than it was to women (*t* = 2.06, *DF* = 769, *p* = 0.039) (Table 3). Age, ethnic group and IMD (Table 3) were not associated with variability in acceptability scores with age and IMD categorised or treated as continuous measurements.

5.1. FOBt experience

The overall level of FOBt experience was not high (21.3%) (Table 1). There was a wide distribution of FOBt experience (one participant had ten FOBts' due to Crohn's disease). Experience of FOBt varied by gender: females: 26.1% (112/429) had experience of FOBt, males: 16.2% (63/390) ($\chi^2 = 11.46$, *DF* = 1, *p* = 0.001). Both, those with and without experience of FOBt, rated the sterile transport swab as the best method (61.7% and 66.6%, respectively), followed by the faecal specimen pot (33.6% and 24.1%) and then the smear card (4.7% and 9.3%) ($\chi^2 = 7.44$, *DF* = 2, *p* = 0.024). Participants with previous FOBt experience were not different from those without experience in FOBt acceptability scores (1.54 and 1.56, respectively, *t* = -0.277, *DF* = 260.19, *p* = 0.782), age (58.87 and 58.82 years, respectively, *t* = -0.117, *DF* = 817, *p* = 0.907), or IMD (29.2 and 29.4, respectively, *t* = -0.171, *DF* = 816, *p* = 0.864) (see Table 4).

5.2. Practical issues of FOBt

The majority of respondents, 51% (418/820), reported preferring to return their samples by post, but 46.7% (383/820) of

Table 2 – Percentage (n) of participants rating the acceptability of the FOBt sampling methods and paired t-test results

Method	Five-point Likert acceptability scale				Mean score	No answer
	Very acceptable	Acceptable	Neither	Unacceptable		
General FOB ^a	52.2 (428)	42.3 (347)	3.3 (27)	0.9 (7)	1.0 (8)	0.4 (3)
Sterile transport swab	39.3 (322)	50.9 (417)	5.5 (45)	1.8 (15)	0.9 (7)	1.7 (14)
Smear card	13.0 (107)	49.9 (409)	16.1 (132)	13.8 (113)	1.2 (10)	6.0 (49)
Faecal specimen pot	16.7 (137)	46.3 (380)	16.7 (137)	13.5 (111)	2.3 (19)	4.4 (36)
Paired comparison	Difference in mean scores			t-Value	DF	p-Value
General FOB and swab (n = 803)	-0.162			-5.736	802	<0.0005
General FOB and Hema card (n = 768)	-0.806			-21.523	767	<0.0005
General FOB and specimen pot (n = 781)	-0.799			-21.346	780	<0.0005
Swab and Hema card (n = 767)	-0.636			-18.181	766	<0.0005
Swab and specimen pot (n = 775)	-0.630			-15.132	774	<0.0005
Smear card and specimen pot (n = 759)	0.009			0.216	758	0.829

a Description of FOBt as a general concept. 1 = very acceptable, 5 = very unacceptable.

Table 3 – Mean acceptability scores for FOBt acceptability

		FOBt description			
		General ^b	Sterile transport swab	Smear card	Faecal specimen pot
<i>Gender</i>					
Male	Mean ^a	1.58	1.70	2.29	2.43
	95% CI	1.52–1.65	1.63–1.77	2.20–2.38	2.32–2.53
	SD (n)	0.66 (389)	0.72 (385)	0.92 (370)	1.02 (377)
	SEM ^c	0.03	0.04	0.05	0.05
Female	Mean ^a	1.53	1.74	2.43	2.29
	95% CI	1.46–1.60	1.67–1.81	2.34–2.53	2.19–2.39
	SD (n)	0.73 (428)	0.74 (421)	0.96 (401)	1.00 (407)
	SEM ^c	0.04	0.04	0.05	0.05
<i>Age</i>					
50–59	Mean ^a	1.58	1.73	2.35	2.37
	95% CI	1.52–1.65	1.66–1.80	2.27–2.44	2.28–2.46
	SD (n)	0.71 (457)	0.74 (457)	0.92 (441)	0.97 (446)
	SEM ^c	0.03	0.04	0.04	0.05
60–69	Mean ^a	1.52	1.70	2.38	2.34
	95% CI	1.45–1.59	1.63–1.78	2.28–2.49	2.22–2.45
	SD (n)	0.68 (360)	0.71 (349)	0.96 (330)	1.05 (338)
	SEM ^c	0.04	0.04	0.05	0.06
<i>Ethnicity</i>					
White	Mean ^a	1.55	1.72	2.38	2.37
	95% CI	1.50–1.60	1.67–1.77	2.31–2.45	2.30–2.44
	SD (n)	0.69 (758)	0.73 (751)	0.94 (717)	1.00 (726)
	SEM ^c	0.03	0.03	0.03	0.04
Other	Mean ^a	1.69	1.81	2.35	2.41
	95% CI	1.40–1.69	1.50–2.13	1.95–2.74	2.01–2.81
	SD (n)	0.76 (29)	0.79 (27)	0.98 (26)	1.05 (29)
	SEM ^c	0.14	0.15	0.19	0.20
<i>IMD Quartile</i>					
1 (most affluent)	Mean ^a	1.55	1.67	2.34	2.30
	95% CI	1.39–1.71	1.53–1.80	2.12–2.55	2.07–2.53
	SD (n)	0.71 (78)	0.60 (78)	0.91 (71)	1.00 (73)
	SEM ^c	0.08	0.07	0.11	0.12
2	Mean ^a	1.58	1.75	2.55	2.52
	95% CI	1.46–1.70	1.62–1.88	2.37–2.72	2.34–2.71
	SD (n)	0.68 (127)	0.74 (125)	0.98 (121)	1.04 (124)
	SEM ^c	0.06	0.07	0.09	0.09
3	Mean ^a	1.54	1.71	2.33	2.32
	95% CI	1.47–1.61	1.63–1.79	2.21–2.44	2.19–2.45
	SD (n)	0.57 (247)	0.66 (246)	0.90 (238)	1.01 (240)
	SEM ^c	0.04	0.07	0.06	0.07
4 (most deprived)	Mean ^a	1.56	1.72	2.33	2.33
	95% CI	1.48–1.64	1.64–1.81	2.23–2.43	2.23–2.44
	SD (n)	0.77 (364)	0.62 (356)	0.96 (340)	0.99 (346)
	SEM ^c	0.04	0.04	0.05	0.05

a Mean acceptability score (1 = very acceptable, 5 = very unacceptable).

b Description of FOBt as a general concept.

c Standard error of the mean.

participants preferred to take the faecal sample to the GP (Table 5). Most participants wanted to do the sampling at home (91.7%, 752/820), and did not want a healthcare professional present to help take the sample (90.9%, 745/820) (Table 5).

6. Discussion

6.1. The principal findings

This large cross-sectional community based survey aimed to determine whether the acceptability of FOBt is associated

Table 4 – Summary of FOBt experience

Type of experience	Response	Detail	% (n)
Personal experience (Had the participant had FOBt in the past?)	Number of FOBts		
	Yes	1	6.5 (53)
		>1 and <11	2.2 (19)
	No		90.7 (744)
	No Answer		0.5 (4)
	Total		100 (820)
Non-personal experience (Did the participant know of others who had had FOBt in the past?)	How did they know the individual who had had FOBt?		
	Yes	Spouse	3.0 (25)
		Other family relation	7.1 (58)
		Friend	3.8 (31)
		Other	1.7 (14)
	No		84.3 (691)
	No Answer		0.1 (1)
	Total		100 (820)

Note: Some participants had both personal and non-personal experience.

Table 5 – Practical issues of FOBt screening

Question	Answer	% (n)
Where would the participants prefer the sampling to be done?	Home	91.7 (752)
	Out-patient clinic	2.7 (22)
	GP-practice	4.6 (38)
	Other	0.1 (1)
	No answer	0.9 (7)
Would the participants want a healthcare professional present to help take the sample?	Yes	2.8 (23)
	No	90.9 (745)
	Not sure	4.3 (35)
	No answer	2.1 (17)
How did the participants want the samples to reach the laboratory?	Direct post	51.0 (418)
	Via the GP	46.7 (383)
	Other	0.7 (6)
	No answer	1.1 (9)

with sampling methods and prior experience of FOBt. It has demonstrated that colorectal screening in general and FOBt screening in particular are reported as being acceptable to the majority of those aged 50–69 years. However, once the practical aspects of faecal sampling were described, acceptability scores fell and varied significantly between methods, with method preferences between the genders.

A sterile transport swab was reported to be the preferred method of sampling and the smear card that will be used in the national screening roll-out was the least preferred method. The acceptability of FOBt was not associated with previous experience of FOBt. Different faecal sampling methods appear to significantly alter the acceptability of FOBt; this supports the results of the two smaller evaluation studies carried out by the MDA.¹⁴

6.2. Strengths and limitations of this study

This survey had a response rate of 63% and was undertaken in South Birmingham, which is a relatively affluent area within

Greater Birmingham. Comparison with census data for the West Midlands suggests that the study population slightly over-represented women (census: 50.8%, study: 52.4%) and those from affluent areas (IMD average score census: 37.53, study: 29.43) and under-represented ethnic minorities (census: 11.0%, study: 3.5%).^{16,17} The national pilot reported that uptake was lower in deprived areas, amongst ethnic minorities, amongst men and in lower age groups.⁹ We have not shown an association between the acceptability of FOBt with either gender, age, IMD, ethnicity or previous experience of FOBt. This may be because this study was undertaken in a small area with a relatively homogeneous population, that we measured perceptions of acceptability rather than actual uptake, or that response bias could have confounded our ability to demonstrate a true association. Nevertheless, responders are likely to be those most likely to consider participation in the national screening programme and the findings have relevance to this population.

This survey reports on the perceived acceptability of FOBt. The questionnaire consisted of closed questions and was dependent on the participants' interpretation of brief descriptions of different sampling methods. Whilst there is likely to be a direct association between acceptability and uptake of screening, it is possible that individuals may make different decisions when confronted with making a decision about actually participating in screening. The roll-out of the national screening programme could provide an opportunity to more accurately determine the association between different sampling methods, or how we present information about the sampling method, and uptake rates.

6.3. Explanation of results

The observed association between the acceptability of FOBt and different sampling methods could be related to the unpleasantness of sampling. One respondent commented: 'The stick (swab) in a sealed tube is a more aesthetic method'. Another participant suggested that a 'plastic straw, which can be, from a distance, pushed into the motion, twisted and then withdrawn, wiped and capped' could be used. Although spec-

ulative, such comments suggest that the less contact with faecal material is required, the more acceptable the procedure would be. Relationships between accuracy, acceptability and cost effectiveness of different sampling techniques need further evaluation.

Both men and women found the sterile transport swab the most acceptable sampling method. Women reported the smear card to be the least acceptable form of sampling, whereas men reported the faecal specimen pot to be the least acceptable method. The differences observed between the genders could either be a matter of gender preference, or in some way related to the fact that women have more experience of population based screening (cervical and breast) than men, and in this study reported more experience of FOBt.

6.4. Comparison with other literature

The results from this study confirm those from small scale work carried out by the MDA finding that a 'swab on a stick method' was most acceptable.¹⁴ The NHS Cancer Screening Programme (NHSCSP) commissioned the Guilford Medical Device Evaluation Centre (GMEC) to find a suitable FOBt kit for the national bowel cancer screening programme, but specified that the test must be the card method.¹⁸ Maximising the effectiveness of a national screening programme will require relatively high uptake rates, which in turn requires the test to be acceptable to the general population. This study suggests that the smear card method of sampling currently utilised for the National programme may not be the most acceptable sampling option.

Furthermore, although many participants (51%) reported preferring to post the sample to the laboratory, a significant minority (46.7%) would rather deliver the sample via their GP. The national pilot study solely relied on participants using the post.⁹ The general population are used to taking samples (urine, blood, saliva) for investigative purposes to their GPs, and offering both options might have the potential to increase the uptake of bowel cancer screening at a relatively small additional cost.

7. Conclusions, unanswered questions and further research

In comparison with the other screening programmes (breast cancer 75.4% and cervical cancer 81.7%),^{19,20} the observed uptake in the national colorectal screening pilot (60%)^{9,10} was relatively low. Acceptability of the sampling method, along with other issues such as the level of education about the risks and benefits of screening, is likely to be associated with uptake rates. Further work is required to determine the most cost-effective and acceptable method of faecal sampling.

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Conflict of interest statement

The authors have no competing interests to declare.

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