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Reviewing the impact of 11 national Be Clear on Cancer public awareness campaigns, England, 2012 to 2016: A synthesis of published evaluation results

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Abstract

The Be Clear on Cancer (BCoC) campaigns have run in England since 2010. They aim to raise awareness of possible cancer symptoms, encouraging people to consult a general practice with these symptoms. Our study provides an overview of the impact of 11 national campaigns, for bowel, lung, bladder and kidney, breast and oesophagogastric cancers. We synthesised existing results for each campaign covering seven clinical metrics across the patient pathway from primary care attendances to one-year net survival. For each metric, "before" and "after" periods were compared to assess change potentially related to the campaign. Results show that primary care attendances for campaign-related symptoms increased for 9 of 10 campaigns and relevant urgent referrals for suspected cancer increased above general trends for 9 of 11 campaigns. Diagnostic tests increased for 6 of 11 campaigns. For 7 of 11 campaigns, there were increases in cancer diagnoses resulting from an urgent referral for suspected cancer. There were sustained periods where more cancers were diagnosed than expected for 8 of 10 campaigns, with higher than expected proportions diagnosed at an early stage for sustained periods for 4 of 10 campaigns. There was no impact on survival. In summary, there is evidence that the BCoC campaigns impact help-seeking by patients and referral patterns by general practitioners, with some impact on diagnosis (incidence and stage). There was no clear evidence of impact on survival.

KEYWORDS

Be Clear on Cancer, cancer, mass media campaign

1 | INTRODUCTION

In the United Kingdom, sociodemographic variation in public awareness of cancer symptoms has been reported,[1] with evidence of ecological associations between lower symptom awareness, later presentation of symptoms[2,3] and poorer cancer survival.[4] Studies have also described, for

Abbreviations: BCoC, Be Clear on Cancer; CWT, Cancer Waiting Times; DID, Diagnostic Imaging Dataset; GP, General Practice; GI, gastrointestinal; NCRAS, National Cancer Registration and Analysis Service; NHS, National Health Service; NICE, National Institute of Health and Care Excellence; PHE, Public Health England; THIN, The Health Improvement Network; UK, United Kingdom.

patients with cancer symptoms, risk factors associated with longer than average intervals from symptom onset to help-seeking.[5-7] Since 2010, Be Clear on Cancer (BCoC) awareness campaigns in England have aimed to address these issues by raising public awareness of certain signs and symptoms of possible cancer and encouraging people with those symptoms to see a doctor without delay.

The BCoC campaigns are mass media public awareness campaigns using a variety of platforms, for example, television and radio advertisement, posters or other locally based activities in public places. They publicly highlight some possible signs and symptoms of cancer and are selected because they are easy to recognise and also for their relatively high frequency and positive predictive value.[8] With encouragement to seek help quickly, it is hoped that the campaigns will increase the proportion of cancers diagnosed at an earlier stage, which in turn could lead to improved cancer survival.[9] Campaigns have been run for various cancer sites with the presence of one or two dominant symptoms, which were used as campaigns' target symptoms. There was no explicit targeting by sociodemographic group in the campaign materials; however, the social marketing strategy with regard to the choice of media, and the place and timing of the advertisements, was implicitly aimed at people aged 50 and over (or 70 and over for the breast cancer campaigns) from lower socioeconomic groups. Most campaigns were trialled in small areas, before being rolled-out regionally or across England. For some campaigns, repeated national campaigns have been run with the aim of reinforcing the impact from the first national campaign.

Elsewhere worldwide, similar mass media campaigns include the skin cancer awareness campaigns,[10] bowel screening campaign,[11] "Find Cancer Early" community education campaign and community-based symptom awareness and general practice-based educational interventions[12] in Australia; the "Detect Cancer Early" Programme in Scotland[13]; the lung cancer awareness campaign,[14,15] and the bowel[16] and cervical[17] screening programmes in Wales; the "Be Cancer Aware" campaign in Northern Ireland[18]; and oral cancer awareness campaign in Germany.[19] However, BCoC in England is an exemplar given the large number and range of coordinated campaigns and their comprehensive evaluation.

For each campaign, a comprehensive evaluation process was developed to assess the possible clinical impact using metrics across the patient pathway, from symptom reporting to cancer survival. Results for each metric and campaign are published separately as metric summaries,[20] with results for all the metrics compiled in campaign-specific evaluation reports.[21,22] Several studies have reported the impact of the BCoC campaigns, but these have generally focussed on one campaign only, been based on small populations, or only evaluated the impact on one or two aspects of the patient pathway.[23-30] There is currently one peer-reviewed paper reporting the full-population impact across a wide range of metrics, for the regional and first national lung cancer campaigns.[31]

The objective of this paper is 2-fold: firstly, to provide an overview of the impact of the national BCoC campaigns that ran up to and including early 2016; secondly, to show general patterns of variation in campaign impact across different metrics and campaigns. A better understanding of the differential impact of the campaigns for different cancer sites or repeated campaigns for the same site will identify potential implications for the design and sequencing of future campaigns.

What's new?

Starting in 2010, the "Be Clear on Cancer" public awareness campaigns in England have promoted awareness of possible cancer symptoms, encouraging people with these symptoms to seek help without delay. This study is the first to evaluate the impact of 11 national campaigns for bowel, lung, bladder and kidney, breast, and oesophago-gastric cancers on multiple points of the patient pathway. Evidence shows that the campaigns influence help-seeking by patients and primary care referral patterns, with some impact on diagnosis (incidence and stage) but no impact on survival. The findings have potential implications for the design and sequencing of future campaigns.

2 | METHODS

Our study considers the 11 national BCoC awareness campaigns that ran between 2012 and early 2016: two bowel cancer campaigns, three lung cancer campaigns, three "blood in pee" campaigns for bladder and kidney cancers, two breast cancer campaigns and one oesophago-gastric cancers campaign. Campaign dates and core message(s) are detailed in Table 1.

Reported here is a synthesis of results from the BCoC campaign evaluations commissioned by the Department of Health and Social Care. The evaluations considered a range of metrics across the patient pathway, which were intended to reflect the scope of potential campaign impact, for patients with possible cancer symptoms or for diagnosed patients. The authors were involved with the majority of the evaluations of these campaigns and therefore had direct knowledge of the results, which are mainly published in grey literature,[20] with only a small number published in peer-reviewed form.[31]

Results were compiled for three process-based metrics, which apply to all patients with possible cancer symptoms:

- *Primary care attendances*, using data from primary care records for a sample of general practices, either as bespoke counts of attendances for specified symptoms or from The Health Improvement Network (THIN),[32] an anonymised dataset of coded primary care records, which was accessed following scientific review committee approval of detailed analytical protocols for each site.
- Number of *urgent referrals for suspected cancer*, often referred to as 2-week wait referrals, for the broad suspected cancer type relevant to the campaign message (target referral type) and for a comparison referral type not related to the campaign message. These referrals,

TABLE 1 BCoC campaign dates and core messages

Target campaign and dates	Core message
First BO: 30.01.12-31.03.12 Second BO: 28.08.12-30.09.12	"See your doctor straight away if, for the last three weeks, you've had blood in your poo or looser poo."
First L: 08.05.12-30.06.12 Second L: 02.07.13-11.08.13 Third L: 10.03.14-30.04.14	"Been coughing for three weeks? Tell your doctor."
First BL&K: 15.10.13-20.11.13 Second BL&K: 13.10.14-23.11.14 Third BL&K: 15.02.16-31.03.16	"If you notice blood in your pee, even if its just the once, tell your doctor."
First BR: 03.02.14-16.03.14 Second BR: 13.07.15-06.09.15	"One in three women who get breast cancer are over 70, so don't assume you're past it." & "A lump isn't the only sign of breast cancer. If you're worried about any changes to your breasts, tell your doctor straight away."
First OG: 26.01.15-22.02.15	"Having heartburn, most days, for 3 weeks or more could be a sign of cancer—tell your doctor." & "Food sticking when you swallow, tell your doctor."

Note: Cancer sites: BO, bowel; BL, bladder; BR, breast; OG, oesophago-gastric; K, kidney; L, lung.

from primary to secondary care based on referral criteria defined by the National Institute for Health and Care Excellence (NICE),[33] provide rapid access to specialist diagnostic services. The National Health Service (NHS) has a target for these referrals to be seen in secondary care within 2 weeks of the referral, which is monitored by collection of the National Cancer Waiting Times (CWT) Monitoring dataset,[34] which was used as the source of these data.

- Number of *relevant diagnostic tests carried out in secondary care* (flexible-sigmoidoscopy, ultrasound, mammogram, colonoscopy, X-ray and endoscopy, and CT scan as relevant to each campaign), including tests carried out for cancer and other medical conditions. These data were sourced from the Diagnostic Imaging Dataset (DID)[35] and the Diagnostic Waiting Times and Activity data,[36] which are NHS data collections used for service improvement activities such as measuring activity, monitoring waiting lists and planning system capacity.

Results were also compiled for four disease-based metrics, which relate to diagnosed patients:

- Number of *cancer diagnoses resulting from an urgent referral for suspected cancer*, using CWT data[34]
- Total number of *cancers diagnosed*, using cancer registration data[37]
- Proportion of *cancers, with a known stage, diagnosed at an early stage* (with early stage defined as stage I or II, except for bladder cancer where it was defined as stage I only), using cancer registration data[37]
- *Net survival* at one-year from diagnosis, using cancer registration data[37]

For each campaign, the patients included in the metrics were tailored according to the symptoms and cancer sites relevant to the campaign message(s) (Tables 1 and 2). For the breast cancer campaigns, analyses only included women aged 70 and over. For the other campaigns, analyses included the following:

- People of all ages, for urgent referrals for suspected cancer, cancer diagnoses resulting from an urgent referral for suspected cancer and cancers diagnosed, including cancers diagnosed at an early stage
- People aged 50 and over, for primary care attendances, diagnostic tests and one-year net survival

For all metrics, analysis compared a relevant period around the campaign ("analysis period") with a period considered to be unrelated to the campaign ("reference period") to assess whether the campaigns were associated with a change in the numbers or rates. Specific analysis and reference periods are outlined in Table 2, with the reference periods generally defined as follows:

- The same period in a previous calendar year (most commonly one year previously, occasionally 2 years previously), for primary care attendances, urgent referrals for suspected cancer, cancer diagnoses resulting from an urgent referral for suspected cancer and diagnostic tests
- The rest of the year before and after the campaign, for cancers diagnosed, cancers diagnosed at an early stage and one-year net survival

For primary care attendances, urgent referrals for suspected cancer, and cancer diagnoses resulting from an urgent referral for suspected cancer only, the reference period was taken as 2 years prior to the campaign when two iterations of the same campaign ran at similar times in consecutive years, to make comparison with data before both campaigns. For example, data for the second national bladder and kidney cancer campaign, which ran from October to November 2014, was compared with the data for the same period in 2012, before the first national campaign, which ran from October to November 2013.

To test for statistically significant differences between the analysis and reference periods, for primary care attendances, urgent referrals for suspected cancer and cancer diagnoses resulting from an urgent referral for suspected cancer, a likelihood ratio test was used.

TABLE 2 Be Clear on Cancer national campaigns 2012 to 2016, metric details: periods compared and cohort definition

	Metric										
	Primary care attendances For people aged 50 and over[a]		Urgent referrals for suspected cancer For people of all ages[a]		Diagnostic tests For people aged 50 and over[a]		Cancers diagnoses resulting from an urgent referral for suspected cancer For people of all ages[a]			Cancers diagnosed, including cancers diagnosed at an early stage For people of all ages[a]	One-year net survival For people aged 50 and over[a]
Target campaign	Attendances for the following symptom(s)	Reference vs analysis period	Suspected referral (and comparison) type	Reference vs analysis periods	Type of test	Reference vs analysis periods	Site (ICD10 codes)	Reference vs analysis periods	Site (ICD10 codes) for cancers diagnosed, including cancers diagnosed at an early stage, and one-year net survival	Reference vs analysis periods	Reference (excluding analysis period) vs analysis periods
First BO	1	30.01.11-31.03.11 vs 30.01.12-31.03.12	LGI (Other)	Feb-Apr 11 vs Feb-Apr 12	C or FS separately	Feb-Apr 11 vs Feb-Apr 12	LGI (C17-21, C26)	Feb-Apr 11 vs Feb-Apr 12	BO (C18-20)	2012 vs during/after campaign	N/A
Second BO	N/A		LGI (Other)	Sep-Oct 11 vs Sep-Oct 12		Sep-Oct 11 vs Sep-Oct 12		Sep-Oct 11 vs Sep-Oct 12	N/A		N/A
First L	2	08.05.11-30.06.11 vs 08.05.12–30.06.12	L (Other)	May-Jul 11 vs May-Jul 12	CT or XR separately	Apr 12 vs May-Jul 12	R (C33-34, C37-39, C45)	May-Jul 11 vs May-Jul 12	L (C33-34)	2012 vs during/after campaign	2012 vs 01.05.12-31.07.12
Second L		01.07.11-25.08.11 vs 01.07.13-25.08.13	L (Other)	Jul-Sep 11 vs Jul-Sep 13		Jul-Oct 12 vs Jul-Oct 13		Jul-Sep 11 vs Jul-Sep 13		01.03.13-28.02.14 vs 15.07.13-13.10.13	2013 vs 01.07.13-30.09.13
Third L		10.03.13-11.05.13 vs 10.03.14-11.05.14	L (H&N)	Mar-May 13 vs Mar-May 14		Mar-Jun 13 vs Mar-Jun 14		Mar-May 13 vs Mar-May 14		01.11.13-31.10.14 vs 24.03.14-06.07.14	2014 vs 01.03.14-31.05.14
First BL&K	3	15.10.12-25.11.12 vs 15.10.13-25.11.13	U (Other)	Oct-Dec 12 vs Oct-Dec 13	U	Oct 12-Jan 13 vs Oct 13-Jan 14	BL (C67) or KRP (C64-65)	Oct-Dec 12 vs Oct-Dec 13	BL (C67) or K (C64)	01.06.13-31.05.14 vs 28.10.13-26.01.14	2013 vs 1.11.13-31.01.14
Second BL&K		13.10.12-07.12.12 vs 13.10.14-07.12.14	U (H&N)	Oct-Dec 12 vs Oct-Dec 14		Oct 13-Jan 14 vs Oct 14-Jan 15		Oct-Dec 12 vs Oct-Dec 14		01.06.14-31.05.15 vs 27.10.14-25.01.15	2014 vs 01.11.14-31.01.15
Third BL&K		15.02.15-17.04.15 vs 15.02.17-17.04.16	U (Other)	Feb-Apr 15 vs Feb-Apr 16		Feb-May 15 vs Feb-May 16		Feb-Apr 15 vs Feb-Apr 16		01.10.15-30.09.16 vs 29.02.16-05.06.16	2016 vs 29.02.16-12.05.16
First BR	4	03.02.12-16.03.12 vs 03.02.14-16.03.14	Combined BR (H&N)	Feb-Apr 12 vs Feb-Apr 14	U&M	Feb-May 13 vs Feb-May 14	BRI (C50, D05)	Feb-Apr 12 vs Feb-Apr 14	BR (C50)	01.10.13-30.09.14 vs 17.02.14-18.05.14	2014 vs 20.02.14-31.05.14
Second BR		13.07.14-20.09.14 vs 13.07.15-20.09.15	Combined BR (Other)	Jul-Sep 14 vs Jul-Sep 15		Jul-Oct 14 vs Jul-Oct 15		Jul-Sep 14 vs Jul-Sep 15		01.03.15-28.02.16 vs 27.07.15-15.11.15	2015 vs 01.08.15-30.10.15
First OG	5	26.01.13-08.03.13 vs 26.01.15-08.03.15	UGI (Other)	Feb-Mar 13 vs Feb-Mar 15	XR&E	Jan-Apr 14 vs Jan-Apr 15	O (C15) or G (C16)	Feb-Mar 13 vs Feb-Mar 15	O (C15) and/or G (C16). combined for survival	01.10.14-30.09.15 vs 09.02.15-03.05.15	2015 vs 09.02.15-30.04.15

Note: Cancer sites: BO, bowel; BL, bladder; BR, breast; BRI, breast including in situ breast; combined BR, referrals for breast cancer including breast symptoms; G, gastric; H&N, head and neck; O, oesophageal; OG, oesophago-gastric; K, kidney; KRP, kidney including renal pelvis; L, lung; LGI, lower gastrointestinal; R, respiratory; UGI, upper gastrointestinal. Tests: C, colonoscopy; CT, computerised tomography scan; FS, flexible sigmoidoscopy; U, ultrasound; U&M, ultrasound and mammograms; XR, X-rays; XR&E, X-rays and endoscopy. Attendances for the following symptoms: 1 = rectal bleed; blood in faeces; change in bowel habit; loose stools; 2 = cough; 3 = visible hematuria; 4 = breast lump; changes in the size/shape of breast, skin of breast or nipple; nipple discharge; pain in breast or armpit; 5 = heartburn (dyspepsia); food sticking (dysphagia).

[a]Except for breast cancer campaigns, for women aged 70 and over.

TABLE 3 Be Clear on Cancer national campaigns 2012 to 2016, results for GP attendances, urgent GP referrals for suspected cancer and diagnostic tests

	Primary care attendances		Urgent referrals for suspected cancer				Diagnostic tests		
			Target referral type		Comparison referral type				
Target campaign	Number of attendances per practice per week during reference vs analysis periods	% change in average number (*P*-value)	Number of referrals during reference vs analysis periods	% change in number (*P*-value)	Number of referrals during reference vs analysis periods	% change in number (*P*-value)	Test type	Number of tests during reference vs analysis periods	% change in number (*P*-value)
First BO	Numbers not available	29.0 (*P* < .001)	43 690 vs 61 004	39.6 (*P* < .001)	208 846 vs 219 502	5.1 (*P* < .001)	C	Numbers not available	22.7 (*P* < .001)
							FS	Numbers not available	18.8 (*P* < .001)
Second BO	NA		30 188 vs 38 839	28.7 (*P* < .001)	145 326 vs 163 705	12.6 (*P* < .001)	C	Numbers not available	13.2 (*P* < .001)
							FS	Numbers not available	9.0 (*P* < .001)
First L	Numbers not available	63.0 (*P* < .001)	10 504 vs 13 849	31.8 (*P* < .001)	219 109 vs 244 464	11.6 (*P* < .001)	CT	Numbers not available	15.7 (*P* < .001)
							XR	Numbers not available	18.6 (*P* < .001)
Second L	6.40 vs 6.87	7.4 (*P* < .001)	9948 vs 12 887	29.5 (*P* < .001)	220 249 vs 276 639	25.6 (*P* < .001)	CT	9505 vs 11 075	16.5 (*P* = .051)
							XR	460 350 vs 433 475	−5.8 (*P* = .459)
Third L	11.01 vs 11.84	7.5 (*P* < .001)	13 350 vs 14 398	7.9 (*P* < .001)	30 336 vs 34 776	14.6 (*P* < .001)	CT	10 060 vs 13 165	30.9 (*P* < .001)
							XR	454 415 vs 529 540	16.5 (*P* = .034)
First BL&K	0.86 vs 0.99	15.7 (*P* < .001)	36 563 vs 46 003	25.8 (*P* < .001)	149 945 vs 170 112	13.4 (*P* < .001)	U	42 390 vs 43 620	2.9 (*P* = .563)
Second BL&K	0.46 vs 0.54	17.3 (*P* < .001)	36 551 vs 49 105	34.3 (*P* < .001)	28 651 vs 35 466	23.8 (*P* < .001)		43 620 vs 43 580	−0.1 (*P* = .979)
Third BL&K	0.52 vs 0.51	−1.0 (*P* = .825)	47 673 vs 52 570	10.3 (*P* < .001)	167 902 vs 186 323	11.0 (*P* < .001)		41 140 vs 44 020	7.0 (*P* = .058)
First BR	0.13 vs 0.18	35.7 (*P* < .001)	9803 vs 16 412	67.4 (*P* < .001)	3694 vs 4827	30.7 (*P* < .001)	U&M	40 890 vs 50 980	24.7 (*P* = .008)
Second BR	0.23 vs 0.28	21.4 (*P* < .001)	12 553 vs 15 553	23.9 (*P* < .001)	23 646 vs 26 231	10.9 (*P* < .001)		48 550 vs 53 140	9.5 (*P* = .029)
First OG	1.67 vs 2.24	33.9 (*P* < .001)	21 521 vs 39 604	84.0 (*P* < .001)	97 242 vs 128 353	32.0 (*P* < .001)	XR&E	20 775 vs 21 935	5.6 (*P* = .222)

Note: NA: No evaluation results available for this campaign and metric.

Note: Cancer sites: BO, bowel; L, lung; BL, bladder; K, kidney; BR, breast; OG, oesophago-gastric. Tests: C, colonoscopy; FS, flexible sigmoidoscopy; CT, computerised tomography scan; XR, X-rays; U, ultrasounds; U&M, ultrasound and mammograms; XR&E, X-rays and endoscopy.

For diagnostic tests, an independent-samples *t*-test was used. For both statistical tests, statistical significance was set at 5% or lower.

For cancers diagnosed, including the proportion diagnosed at an early stage, statistical significance was defined as a period of 5 or more consecutive weeks where the numbers or proportions of cases per week were the same or higher than the median. In addition, sustained periods of 5 or more weeks were only considered where they began during the analysis period. This is under the premise that there is a 50% chance that a weekly count is higher or lower than the median; therefore, 5 consecutive weeks higher than the median (one-tailed) equates to $P = .031$.

For one-year net survival, statistical significance was determined by comparing the 95% confidence intervals around the survival estimates; if they did not overlap, this was taken as statistically significant.

Most analyses for these campaigns were undertaken by analysts within Public Health England's (PHE) National Cancer Registration and Analysis Service (NCRAS). Exceptions were the analyses on primary care attendances and diagnostic tests for the first and second national bowel and the first national lung cancer campaigns, which were carried out by analysts from Cancer Research UK, which was responsible for the evaluation of the BCoC campaigns at the time. Primary care attendance data for the first national bowel, lung,[31] bladder and kidney, and breast cancer campaigns were obtained as bespoke data extracts.

Further details of metric definitions, data sources and statistical analysis are outlined in a methodology document published on the NCRAS website.[20]

3 | RESULTS

Results for all campaigns and metrics are summarised in Tables 3 and 4.

3.1 | Primary care attendances

There were statistically significant increases for nine campaigns in the average number of primary care attendances per week per practice during the analysis period, compared with the reference period (Table 3). For the second bowel campaign, there were no results available and for the third national bladder and kidney cancer campaign, there was no significant change. The largest increase in primary care attendances was observed for the first national lung cancer campaign where, between the reference period in 2011 and the analysis period in 2012, there was a 63% increase in primary care attendances. The smallest statistically significant increase was observed for the second and third national lung cancer campaigns (7%-8%).

3.2 | Urgent referrals for suspected cancer

For all campaigns, there were statistically significant increases in the number of urgent referrals for suspected cancer from the reference to the analysis period (Table 3). However, as there are long-term increasing trends in the number of urgent referrals for suspected cancer,[38] the increases for campaign-related referrals were compared to increases for other referrals, which should not have been affected by the respective campaigns. Except for the third national lung cancer campaign and the third national bladder and kidney cancer campaign, the increases in the number of referrals for the campaign-related suspected cancer were larger than the increases for other, comparator, referrals (Figure 1). The largest impact was for the first national oesophago-gastric cancer campaign (84% increase in urgent referrals for suspected upper gastrointestinal [GI] cancers, compared to 32% for other referrals). In contrast, the increase in urgent referrals for suspected lung cancer for the third national campaign (8%) was smaller than the increase for other referrals (15%).

For campaigns that ran multiple times, the increases in campaign-related referrals for the subsequent second and third national campaigns were smaller, relative to other referrals, than for the first national campaigns.

3.3 | Diagnostic tests

Compared to the same months in the previous year (or April 2012 for the first national lung cancer campaign), there were statistically significant changes in the number of diagnostic tests recorded for six campaigns: first and second national bowel, first and third national lung, and first and second national breast cancer campaigns (Table 3). Of the statistically significant results, the largest increases in diagnostic tests were observed for CT scans following the third national lung campaign (31%), ultrasounds and mammograms following the first national breast cancer campaign (25%), and colonoscopies following the first national bowel cancer campaign (23%).

3.4 | Cancer diagnoses resulting from an urgent referral for suspected cancer

Compared to the same months in a previous year, increases in the number of diagnoses resulting from an urgent referral for suspected cancers were statistically significant for 7 of the 11 campaigns (Table 4), with increases of up to 30% for kidney cancers for the second national bladder and kidney cancer campaign. However, some of these statistically significant results generally followed long-term steadily increasing trends, so these significant increases might have been observed even without the campaigns.

3.5 | Cancers diagnosed

During or soon after the campaign, there were statistically significant sustained periods of 5 or more consecutive weeks where the weekly number of cancers diagnosed were higher than expected for 8 of the

TABLE 4 Be Clear on Cancer national campaigns 2012 to 2016, results for cancer diagnoses resulting from an urgent GP referral for suspected cancer, cancer diagnosed, cancer diagnosed at an early stage and one-year net survival

	Cancers diagnoses resulting from an urgent referral for suspected cancer				Cancers diagnosed		Cancers diagnosed at an early stage		One-year net survival Number of cases, Net survival % (95% CI)		
Target campaign	Site	Number of cancers during reference vs analysis periods	% change in number (*P*-value)	Site for cancers diagnosed, including cancers diagnosed at an early stage	Number of cancers expected vs observed[a]	Number of consecutive weeks[b]	Number of cancers diagnosed at an early stage expected vs observed[a]	Number of consecutive weeks[b]	Site	Analysis period	Reference period
First BO	LGI	2580 vs 2877	11.5 (*P* < .001)	BO	7929 vs 8523	12 (06.02.12)	–	<5		NA	
Second BO		1689 vs 1803	6.7 (*P* = .054)		NA		NA			NA	
First L	R	2547 vs 3005	18.0 (*P* < .001)	L	5542 vs 5587 & separately, 7592 vs 7962	6 (07.05.12) &, separately, 11 (02.07.12)	Numbers not available	11 (02.07.12)	L	N = 9019, 39.8 (38.7, 40.9)	N = 25 557, 39.6 (38.9, 40.2)
Second L		2598 vs 2695	3.7 (*P* = .182)		–	<5	–	<5		N = 8926, 41.1 (40.0, 42.2)	N = 26 043, 40.2 (39.5, 40.8)
Third L		2640 vs 2769	4.9 (*P* = .079)		5992 vs 6298	8 (31.03.14)	–	<5		N = 8885, 41.0 (39.9, 42.1)	N = 26 967, 41.2 (40.5, 41.8)
First BL&K	BL	1545 vs 1672	8.2 (*P* = .025)	BL	1925 vs 2093	11 (04.11.13)	–	<5	BL	N = 1507, 71.1 (69.0, 73.1)	N = 4701, 71.1 (70.0, 72.3)
	KRP	536 vs 652	21.6 (*P* < .001)	K	888 vs 961	5 (18.11.13)	368 vs 452	5 (04.11.13)	K	N = 1715, 76.8 (74.9, 78.6)	N = 5528, 75.2 (74.2, 76.2)
Second BL&K	BL	1546 vs 1547	0.1 (*P* = .986)	BL	1026 vs 1068 &, separately, 1026 vs 1099	6 (24.11.14) & separately, 6 (19.01.15)	–	<5	BL	N = 1468, 73.7 (71.6, 75.8)	N = 4609, 70.6 (69.4, 71.7)
	KRP	546 vs 712	30.4 (*P* < .001)	K	1092 vs 1211	6 (10.11.14)	–	<5	K	N = 1751, 75.5 (73.7, 77.4)	N = 5656, 75.1 (74.1, 76.1)
Third BL&K	BL	1466 vs 1547	5.5 (*P* = .140)	BL	1980 vs 2257	12 (14.03.16)	683 vs 736	9 (28.03.16)	BL	N = 1150, 69.6 (67.2, 71.9)	N = 6441, 69.5 (66.4, 72.5)
	KRP	640 vs 703	9.8 (*P* = .086)	K		<5		<5	K	N = 1151, 76.7 (74.4, 78.9)	N = 6438, 77.0 (75.0, 79.0)
First BR	BRI	2360 vs 2921	23.8 (*P* < .001)	BR	4904 vs 5792	16 (17.02.14)	–	<5	BR	N = 3887, 91.4 (90.3, 92.4)	N = 8697, 91.6 (90.9, 92.3)
Second BR		2681 vs 2920	8.9 (*P* = .001)		2779 vs 3040	9 (27.07.15)	1235 vs 1270	5 (03.08.15)		N = 3271, 92.8 (91.7, 93.9)	N = 8913, 92.1 (91.4, 92.8)
First OG	O	544 vs 655	20.4 (*P* = .001)	O	–	<5	–	<5	OG	N = 1235, 44.7 (42.8, 46.6)	N = 4103, 44.5 (43.5, 45.6)
	G	216 vs 225	4.2 (*P* = .668)	G	–	<5	–	<5			

Note: Cancer sites: BL, bladder; BO, bowel; BR, breast; BRI, breast including in situ breast; G, gastric; L, lung; LGI, lower gastrointestinal; R, respiratory; K, kidney; KRP, kidney including renal pelvis; O, oesophageal, OG, oesophago-gastric. <5, not statistically significant. NA: No evaluation results available for this campaign and metric.

[a]Number of cancers expected vs observed only provided for statistically significant results.

[b]Number of consecutive weeks where the number of cancers or proportion of cancers diagnosed at an early stage were higher than the comparison baseline or median (when this period started).

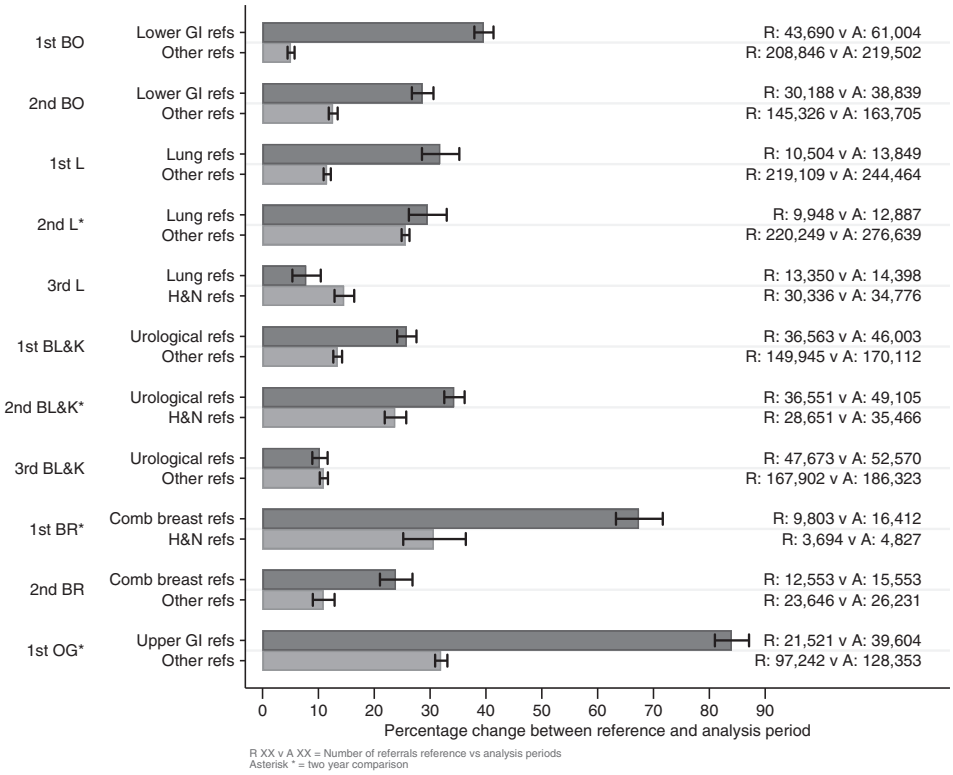

FIGURE 1 Percentage change between reference and analysis period, in the number of urgent referrals for suspected cancer, England

10 campaigns where this was assessed (Table 4), with up to 16 weeks with higher than expected numbers for the first national breast cancer campaign. For the first national oesophago-gastric cancer campaign and the second national lung cancer campaign, there were no sustained periods where the numbers of cancers diagnosed were higher than expected. This metric was not assessed for the second bowel national campaign.

3.6 | Cancers diagnosed at an early stage

During or soon after the campaign, there were statistically significant sustained periods of 5 or more consecutive weeks where the weekly proportion of cancers diagnosed at an early stage were higher than expected for 4 of the 10 campaigns where this was assessed: the first national lung, first national bladder and kidney (for kidney cancer only), third national bladder and kidney (for bladder cancer only) and second national breast cancer campaigns (Table 4). This metric was not assessed for the second bowel national campaign.

3.7 | One-year net survival

One-year net survival results were not available for the two national bowel cancer campaigns. For all other campaigns, 95% confidence intervals for one-year net survival overlapped for patients diagnosed during the analysis period compared to those diagnosed in the other months of the calendar year (Table 4).

4 | DISCUSSION

Although a range of individual evaluations have been published,[20,31] our study is the first to provide an overview of short-term impact of 11 national BCoC awareness campaigns, across different cancer sites and across a range of metrics representing different points of the patient pathway, and to compare these possible impacts across campaigns. The evaluation results indicate that the majority of the BCoC awareness campaigns had some short-term impact on metrics early in the patient pathway, particularly for primary care attendances and urgent referrals for suspected cancer, with less evidence of impact on stage at diagnosis and no measurable impact on survival. That is, the campaign had most impact on patient help-seeking and GP referral behaviour, with moderate impact on diagnosis (incidence and stage). There was varying impact between campaigns related to different cancer sites or for repeated campaigns for the same site. The study did not evaluate longer-term effects of campaigns.

These results are consistent with other studies reporting the impact of the BCoC campaigns, which conclude that the campaigns appear to have led to substantial changes for process-based metrics, for example, urgent referrals for suspected cancer, rather than disease-based metrics, for example, cancer diagnoses.[23-26,28,29] This is likely to reflect a number of factors that make it harder to detect an impact on later aspects in the pathway, including smaller numbers that would reduce the power to detect a change. For events later in the pathway, it is harder to determine a period of likely impact due to individual variation in the interval between events, for example, from seeing the campaign to reporting symptoms in primary care or from

referral to diagnosis, and the additive effect of these different intervals. Furthermore, although one-year survival is sometimes used as a proxy measure for early diagnosis,[39-41] it likely reflects several factors, including stage at diagnosis and comorbidities. This means one-year survival is unlikely to be sensitive enough to detect an impact of the campaigns and, as such, it was not considered in isolation but alongside all metrics.

Heterogeneity in the campaign impact by cancer site possibly relates to the variable nature of the symptoms highlighted by the campaigns, including prevalence among the general population, disease specificity or baseline levels of public awareness. Some symptoms (eg, cough) are more prevalent in the general population than others (eg, rectal bleeding). Although all BCoC symptoms are selected for their relative specificity, some have a higher positive predictive value for cancer (eg, haematuria) than others (eg, cough).[8,33,42,43] Additionally, individuals may be less inclined to report particular symptoms to their doctor than others, due to embarrassment or fear of wasting the doctor's time.[1,44] Further to this, awareness of the possible cancer symptoms[1] may affect both precampaign and postcampaign response to new information. The differences in the campaign impact may also be related to the differences in campaign intensity, for example, the number and type of media used (TV, radio, and/or posters), budgets (air time, space) allocated and duration of campaigns (varying from 27 to 61 days).

Possible reductions in impact for repeated campaigns for the same cancer site may reflect various factors. Underlying trends (for example, increasing numbers of urgent referrals for suspected cancer) due to a range of BCoC and non-BCoC early diagnosis initiatives (for example, the Movember campaigns[45] and primary care risk assessment tools[46,47]) may provide less scope for increases over time and make it harder to attribute changes to the BCoC campaigns alone. The possible novelty of the information for initial campaigns may have had a stronger impact on help-seeking behaviour than the reminder of information advertised in further campaigns. Similarly, there may be fewer people experiencing symptoms they have not reported to their doctor at the time of a later campaign due to sustained effects of previous campaigns. Additionally, repeated campaigns for the same site may risk desensitisation, which is a persistent issue reported in evaluations of tobacco control campaigns.[48,49]

Results indicate differential impacts of repeating campaigns for the same cancer types within a short-time period; for example, for primary care attendances, the impacts of the first and second bladder and kidney cancer campaigns were similar, which contrasts with the diminishing impacts of the second compared with the first lung cancer campaign. Further work would be required to better understand the optimal "spacing" of repeat campaigns, including study of the message recall over time.

Variation in impact may reflect small differences between individual analyses. For example, long-term trends may affect the comparability of changes over one year or 2 years. Comparison groups (chosen if not affected by other campaigns with robust numbers) were only used for urgent referrals for suspected cancer, and these comparison referral types were inconsistent between campaigns (head and neck or broader groups of other referrals). Between metrics there were also some differences in age-groups reported (all-ages or 50 of 70 and over).

However, these differences were present in the existing evaluation results, which our study aimed to synthesise, without attempting to alter. Many of these differences reflect restrictions of the available resources; for instance, primary care attendance and diagnostic test results were not available for all ages for every campaign and DID was only available from April 2012 onwards. Comparison groups were not used for many metrics due to difficulties in defining appropriate, relevant groups.

These are observational results and the campaigns have occurred over several years against a backdrop of other awareness and early diagnosis initiatives, meaning that observed changes cannot be directly attributed to the BCoC campaigns alone. These metrics were measured for a single point in time, which will reflect a mixture of activity, some of which would have occurred anyhow, some resulting from other factors prior to or during the campaigns (eg, "new stories," personal holidays) and some arising from the campaign's impact (or combinations of the above factors). As it was not possible to categorise activity into that which would have occurred without a campaign or that which was prompted by the campaign, a direct causal link between the campaigns and changes in activity cannot be proved.

Additionally, considering the number of campaigns and metrics evaluated, the issue of multiple testing means the statistically significant results should be considered with some caution due to the increased risk of reporting false-positive results.[50] Nevertheless, the changes reported in our study were generally largest during or soon after the campaigns, with larger changes observed for metrics early in the patient pathway, which can be more closely linked to the campaigns and campaign messages. Therefore, some impact of the campaigns appears evident.

These results focus on immediate clinical aspects of campaign impact, relating to patients who were already experiencing the symptoms highlighted by the campaigns or who developed them during the campaigns. The results do not demonstrate the potential longer-term effects, such as a general increase in awareness of cancer symptoms among patients who were symptom-free at the time of the campaign but may develop these symptoms in the future.[51,52] Also, these results do not assess potential wider impacts such as diagnoses of other diseases, for example, chronic obstructive pulmonary disease.

However, these results provide valuable information that is used in the planning of future campaigns, for instance, to inform decisions about which campaigns to repeat. In addition, considering the evidence presented here, these results are being used to streamline future campaign evaluations with more focus on evaluating early parts of the pathway, for example, one-year survival is no longer routinely included in the campaign evaluations.

In conclusion, the BCoC campaigns appear to have had an impact, particularly on early parts of the patient pathway, for example, increased help-seeking by patients and referrals by GPs. Campaign impact varied for different symptoms and their related cancer sites, and between repeated campaigns for the same symptoms/cancer sites.

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The Be Clear on Cancer programme is led by PHE, working in partnership with the Department of Health and Social Care, NHS England and Cancer Research UK. Campaigns are run by the PHE marketing team and are overseen by the Be Clear on Cancer Steering Group.

CONFLICT OF INTEREST

The authors declare there are no conflicts of interest.

DATA AVAILABILITY STATEMENT

All data published in this study can be sourced from the following website www.ncin.org.uk/be_clear_on_cancer.

ETHICS STATEMENT

No ethical approval or individual consent was required for our study because the data used were either collected as part of cancer registration within the National Cancer Registration and Analysis Service with Section 251 approval from the UK Patient Information Advisory Group (PIAG) (now the Confidentiality Advisory Group, CAG), under Section 251 of the NHS Act 2006 (PIAG 03[a]/2001) or sourced as anonymised data from secondary external sources (NHS Digital, NHS England, Mayden or IQVIA).

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