Received: 11 January 2021 | Revised: 26 April 2021 | Accepted: 8 July 2021

DOI: 10.1111/ecc.13500

ORIGINAL ARTICLE

European Journal of Cancer Care WILEY

Abdominal cancer symptoms: Evaluation of the impact of a regional public awareness campaign

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Abstract

Objective: A regional 'Be Clear on Cancer' (BCoC) campaign developed by Public Health England aimed to promote public awareness of key abdominal cancer symptoms in people aged 50 years and over.

Methods: Data were analysed for metrics at different stages in the patient care pathway including public awareness, GP attendance and referrals, to cancer diagnosis.

Results: There was significantly higher recognition of the BCoC abdominal campaign in the campaign region compared to the control area (Post Campaign/Control, $n = 401/406$; 35% vs. 24%, $p < 0.05$). The campaign significantly improved knowledge of 'bloating' as a symptom ($p = 0.03$) compared to pre-campaign levels. GP attendances for abdominal symptoms increased significantly by 5.8% ($p = 0.03$), although the actual increase per practice was small (average 16.8 visits per week in 2016 to 17.7 in 2017). Urgent GP referrals for suspected abdominal cancer increased by 7.6%, compared to a non-significant change (0.05%) in the control area. For specific abdominal cancers, the number diagnosed were similar to or higher than the median in the campaign area but not in the control area in people aged 50 and over: colorectal (additional $n = 61$ cancers), pancreatic (additional $n = 102$) and stomach cancers (additional $n = 17$).

Conclusions: This campaign had a modest impact on public awareness of abdominal cancer symptoms, GP attendances and cancers diagnosed.

KEYWORDS
abdominal symptoms, cancer awareness, health promotion, public health

1 | INTRODUCTION

Approximately half of all cancers diagnosed and registered in the UK (excluding non-melanoma skin cancer) are situated in the abdominal cavity (Information Service Division of NHS Scotland, 2017; Office for National Statistics, 2017). In primary care, patients presenting with abdominal and digestive symptoms account for 10%–15% of consultations with general practitioners (GPs) (Elliott et al., 2011; Holtedahl et al., 2017; Information Services Division of NHS Scotland, 2013), and diagnosis of cancer can prove challenging (Holtedahl et al., 2017; Lyratzopoulos et al., 2014; Rubin et al., 2015). Abdominal symptoms have been found to be significantly associated with a new cancer

diagnosis in the abdominal region (Holtedahl et al., 2017; Scheel & Holtedahl, 2015), and there are several recurrent symptoms that are reported for different types of abdominal cancer. For example, symptoms such as diarrhoea, abdominal discomfort and bloating have all been reported as indicators of colorectal, ovarian and pancreatic cancer (Hamilton et al., 2016; Koo, Hamilton, et al., 2018; Walter, Emery, et al., 2016; Walter, Mills, et al., 2016).

Although UK cancer survival has been improving steadily since the 1970s (Arnold et al., 2019; Quaresma et al., 2015) and can be comparable to other high-income countries, international disparities do persist (Allemani et al., 2018; Arnold et al., 2019; Bankhead, 2017). More advanced cancer stage at diagnosis is a significant contributor to reduced survival, as are poorer stage-specific survival and higher rates of co-morbidity (Coleman et al., 2011; Maringe et al., 2013).

Low cancer symptom awareness contributes to delay in presentation and may lead to delay in cancer diagnosis (McCutchan et al., 2015; Rendle et al., 2019; Simon et al., 2010). Approaches to promote early presentation in general practice aim to increase awareness of the significance of cancer symptoms, and it has been suggested that they should be specifically designed to work for people of the lowest socioeconomic status (Forbes et al., 2014). Cancer awareness campaigns aim to educate the public about cancer symptoms and encourage help-seeking and could play a role in promoting early diagnosis (Simon et al., 2010) by shortening the interval between symptom onset and presentation to a doctor thereby potentially improving patients' prognosis (Smith et al., 2018).

There is some evidence that community-level interventions, to increase public awareness, may lead to earlier diagnosis at stage of presentation for specific cancers (breast cancer, malignant melanoma, retinoblastoma and lung cancer) in the short term (Austoker et al., 2009; Ironmonger et al., 2015). Based on the success of previous campaigns run under the 'Be Clear on Cancer' brand, (Ironmonger et al., 2015; Moffat et al., 2015), a regional campaign was developed by Public Health England (PHE) and aimed to promote public awareness of key abdominal symptoms in people aged 50 and over and involved regional TV as well as distribution of messages via bus stop posters and billboards. The core campaign message was, 'Don't ignore the warning signs. If you've been suffering from tummy troubles such as diarrhoea, bloating, discomfort or anything else that just doesn't feel right for three weeks or more, it could be a sign of cancer. Finding it early makes it more treatable. Tell your doctor'. This paper aims to evaluate the impact of the regional campaign on public awareness of abdominal symptoms, number of patients presenting to a GP with symptoms, subsequent referrals and cancers diagnosed.

2 | METHODS

2.1 | Sample and setting

The regional abdominal symptoms campaign ran from 9 February to 31 March 2017 in the East and West Midlands in England.

The regional campaign area was selected for a number of reasons: it was populous enough to support accurate campaign evaluation, the area had a mix of urban and rural areas and demographically the region is reasonably representative of the national population. Background research with the target audience was undertaken during the development phase, leading on to the approach to include symptoms in the context of a body area (abdomen), and that are associated with a number of different tumour types. This was developed on the basis that advertising this group of symptoms would achieve both a high level of reach among the target audience, while broadening the potential number of cancers associated with the campaign. The advertising approach and messaging were developed and tested with the target audience (men and women over 50 years of age) and refined to ensure that campaign advertising was focused and clearly communicated. There was significant input from clinical and marketing experts, and the final advertising was reviewed by clinical experts for accuracy and appropriateness. The local Strategic Clinical Networks supported the campaign. Strategic Clinical Networks work in partnership with commissioners, providers and voluntary organisations as a vehicle for improvement for patients, carers and the public.

2.2 | Data

To evaluate the impact of the regional campaign, data were obtained and analysed for a range of metrics outlined below. These represent the various stages of the patient care pathway including symptom recognition, consultation with a health professional, referral and diagnosis.

Data were obtained from a range of existing national datasets, each described below. The main analyses for each metric compared the period during and/or immediately after the campaign (analysis period) with a period prior to the campaign (often the same months as the analysis period in the previous year, or the median for the previous year) (comparison period). The exact periods used varied across metrics, dependent on data availability and clinician recommendations, and these are detailed in Table 1.

Data were also sourced for a control geographic area (South East England—unless otherwise specified) for each of the metrics. South East England was chosen as a control as it has a similar demographic profile (e.g. age, sex and deprivation) to East and West Midlands, although the campaign area had a larger population overall (10,632,372 in campaign area and 9,080,825 in control area in 2017). For GP attendances, rather than a control area, a control symptom (Back pain) was evaluated. Back pain was chosen as a control symptom as GP attendances for this symptom were unlikely to be affected by the campaign messaging. It was hypothesised that changes in controls represent any background trends, and any changes around the campaign period that were greater than controls may suggest a campaign impact.

TABLE 1 Analysis and comparison periods used for each clinical metric in main analyses and further analyses

Metric	Comparison period	Analysis period	Data source
GP attendances	Pre-campaign period: 23 November 2015 to 14 February 2016	Pre-campaign period: 21 November 2016 to 12 February 2017	The Health Improvement Network (THIN) database (Network)
	Campaign period: 15 February 2016 to 17 April 2016	Campaign period: 13 February 2017 to 16 April 2017	
	Post-campaign period: 18 April 2016 to 10 July 2016	Post-campaign period: 17 April 2017 to 9 July 2017	
Urgent GP referrals for suspected abdominal cancer	February to April 2016	February to April 2017	National Cancer Waiting Times Monitoring Data Set, NHS England
Diagnostics in secondary care	February to May 2016	February to May 2017	Diagnostic Imaging Dataset, NHS England
Cancers diagnosed	Overall median for October 2016 to September 2017	20 February 2017 to 4 June 2017	National Cancer Registration dataset

Note: The exact dates are provided for metrics which had weekly data available. The Health Improvement Network (THIN) database (Network) https://www.the-health-improvement-network.com/en/#what-is-thin. National Cancer Waiting Times Monitoring Data Set, NHS England https://digital.nhs.uk/data-and-information/data-collections-and-data-sets/data-collections/cancerwaitingtimescwt. Diagnostic Imaging Dataset, NHS England https://www.england.nhs.uk/statistics/statistical-work-areas/diagnostic-imaging-dataset/. National Cancer Registration dataset (Henson et al., 2020).

2.2.1 | Public awareness

To determine whether there were differences in public awareness of abdominal symptoms, before and after the campaign, pre- and post-campaign online and face-to-face interviews were undertaken by Kantar Public on behalf of PHE. These data were collected from residents in the regional campaign area and from a comparative control group (rest of England). The evaluation sample comprised of adults aged 50–89 year and were weighted to age, gender, social grade and region profile within the pilot and control regions. Participants were firstly asked about awareness of abdominal symptoms for possible cancer and then specifically about awareness of the campaign including radio adverts, poster and leaflets in health care setting (e.g. doctor's surgery and pharmacies).

2.2.2 | GP attendances

Data on GP attendances for abdominal symptoms and a control symptom (back pain) for those aged 50 and over were sourced from The Health Improvement Network (THIN) database for the period 14 September 2015 to 9 July 2017 (The Health Improvement Network (THIN) database, 2017). The data were grouped into weeks (based on International Organisation for Standardisation [ISO] week) and adjusted to account for bank holidays and for a 5-day working week (International Organization for Standardization, 2017). Information on the number of GP practices from the campaign area submitting data to THIN each week (ranging from 37 to 16) was also extracted to enable calculation of the average number of attendances per practice per week. Compared to all practices nationally, these practices had a similar age-sex population structure, but a less deprived population on average. Relevant symptoms were identified using a clinically-advised set of NHS Digital (2016) a standard clinical terminology system used by GP systems during the time period of the study (full list of Read Codes available in the supporting information).

2.2.3 | Urgent GP referrals for suspected cancer

The monthly number of urgent GP referrals for suspected abdominal cancers for those aged 50 and over for the period January 2015 to August 2017 were obtained from the National Cancer Waiting Times Monitoring Data Set, provided by NHS England. Data were analysed as suspected gynaecological, urological, upper gastro-intestinal (GI) and lower GI cancers, and all four suspected cancers combined. Results are presented by the month that a patient was first seen in secondary care following referral.

2.2.4 | Diagnostics in secondary care

The monthly number of imaging tests conducted from GP direct access only for suspected abdominal cancers between January 2016 and June 2017 was obtained from the Diagnostic Imaging Dataset (2017).

2.2.5 | Cancers diagnosed

The weekly numbers of newly diagnosed abdominal cancers (through all diagnostic routes) among those aged 50 and over were obtained from the National Cancer Registration dataset in England (Henson et al., 2020) for the period October 2016 to September 2017. Number of cancers were based on ISO week and adjusted for bank holidays (International Organization for Standardization, 2017).

Data relating to abdominal cancers were identified using International Classification of Diseases Version 10. Data analyses included codes for both individual cancer sites and combined abdominal cancers groups: colorectal (ICD10 C18-C20), kidney (C64-C66, C68), oesophageal (C15), ovarian (C56-C57, C48 non-sarcoma), pancreatic (C25), and stomach (C16) cancers, and where appropriate in combination as lower gastro- intestinal (GI) (ICD10 C17-C21, C26) and upper GI (C15-C16, C22-C25).

2.3 | Statistical analysis

For all metrics, excluding cancers diagnosed, weekly and monthly counts or percentages were aggregated over the analysis and comparison periods, and a statistical test was used to test for any differences between the two periods. A two-sample *t*-test was used to test for statistical significance of aggregated proportion between two periods for the metric *Public awareness*. A likelihood ratio test was used to test for statistical significance of aggregated counts for the metrics *GP attendances and urgent GP referrals for suspected cancer*. A two-sided *t*-test adjusted for unequal variances, if required, was used to test for statistical significance of aggregated counts for the metric *diagnostics in secondary care*. For *cancers diagnosed*, the campaign was considered to have had a possible impact if (1) the numbers of cases per week were the same or higher than the median for five or more consecutive weeks (under the premise that there is a 50% chance that a weekly count is higher or lower than the median, therefore five consecutive weeks equal to or above the median [one-tailed] equates a $p = 0.031$) and (2) this sustained period started during the analysis period based on ISO week. A *p*-value <0.05 was considered to be statistically significant throughout the analysis. All statistical analyses were carried out in Stata version 15.0 (StataCorp, 2017).

For metrics where the main analysis used data on people ages 50 years and over, sensitivity analyses examined persons of any age, where possible.

Full details of the methodology used for the analysis can be found on the National Cancer Registration and Analysis Service website (Public Health England, 2019).

3 | RESULTS

3.1 | Public awareness

When asked if they were aware of any adverts, publicity or other information about '*tummy troubles … for three weeks or more*', there was significantly higher campaign recognition in the regional campaign compared to the control area (post-campaign/control, $n = 401/406$; 35% vs. 24%, $p < 0.005$). With regard to specific abdominal symptoms, the campaign significantly improved knowledge that 'bloating' ($p = 0.03$) and 'feeling sick/nauseous' ($p = 0.03$) could be a sign of something serious, whereas this was not seen in the control region (Table 2). There was no significant impact on knowledge of diarrhoea,

TABLE 2 Regional abdominal symptoms public awareness campaign: pre and post campaign results

	Campaign region			Control region				
Concern about symptoms, *n* (%)	**A** Pre-campaign, *n* (%)	**B** Post-campaign, *n* (%)	*p*-value for change pre- to post-campaign[a] (A vs. B)	**C** Pre- control, *n* (%)	**D** Post-control, *n* (%)	*p*-value for change pre- to post-control[a] (C vs. D)	*p*-value for **pre-campaign** difference between campaign and control[a] (A vs. C)	*p*-value for **post-campaign** difference between campaign and control[a] (B vs. D)
Unweighted base	401	401		400	406			
How likely each of the following symptoms could be signs of something serious if they lasted for 3 weeks or more? *n* (%)[b]								
Diarrhoea	317 (79%)	317 (79%)	1.00	308 (77%)	321 (79%)	0.49	0.49	1.00
Bloating	269 (**67%**)	297 (**74%**)	**0.03**	280 (70%)	288 (71%)	0.76	0.36	0.34
Discomfort	281 (70%)	305 (76%)	0.06	300 (75%)	305 (75%)	1.00	0.11	0.74
Feeling sick/nauseous	277 (**69%**)	305 (**76%**)	**0.03**	292 (73%)	292 (72%)	0.75	0.21	0.20
Indigestion	196 (49%)	201 (50%)	0.78	204 (51%)	199 (49%)	0.57	0.57	0.78
Constipation	241 (60%)	265 (66%)	0.08	244 (61%)	260 (64%)	0.38	0.77	0.55
Blood in poo	393 (98%)	393 (98%)	1.00	392 (98%)	394 (97%)	0.36	1.00	0.36

[a]*t*-test for proportions between campaign and control region groups.
[b]Respondents who reported 'Very Likely/Likely'.

discomfort or other symptoms within the campaign area or compared with the control area.

3.2 | GP attendances

For patients aged 50 and over, there were significant increases in post-campaign GP attendances per practice per week for all abdominal symptoms ($p < 0.001$), for diarrhoea ($p = 0.014$) and for discomfort ($p = 0.018$), compared to the same period in 2016. Presentations for bloating increased during the campaign period from 0.4 visits in 2016 to 0.6 visits per GP practice per week during the same period in 2016 ($p = 0.003$) (Table 3).

3.3 | Urgent GP referrals for suspected abdominal cancers

For all suspected abdominal cancers combined, there was a statistically significant 8.1% increase in the number of urgent GP referrals for suspected cancer from 35,845 in February to April 2016, to 38,737 cases in the same period in 2017 ($p < 0.001$). There was a significant, 18.0% increase in referrals for suspected lower GI cancers (12,046 cases to 14,214 cases, $p < 0.001$), 5.4% increase in referrals for suspected upper GI cancers (8759 to 9327 cases; $p < 0.001$) and 5.0% increase in referrals for suspected gynaecological cancer (5681 cases to 5966 cases; $p = 0.008$). These changes are compared with non-significant changes in the control area, where the only significant increase observed for urgent referrals for suspected lower GI cancer (8.7% change; $p < 0.001$). The number of urgent GP referrals for suspected abdominal cancers combined and for suspected gynaecological, urological, upper GI and lower GI cancers, for people aged 50 and over in the regional campaign and control areas, are shown in Table 4.

3.4 | Diagnostics in secondary care

For individuals aged 50 and over, there was a 0.3% decrease (150,760 to 150,265) in the number of imaging tests from GP direct access in February to May 2017, compared to these months in the previous year, although not statistically significant. There were also no significant changes in the number of diagnostic tests found in the control area.

3.5 | Cancers diagnosed

The numbers of all abdominal cancers within the regional campaign area were similar to, or higher than, the 2016–2017 median for the five-week period at weeks 18–22 in 2017 (mid-May to mid-June 2017), for persons aged 50 and over. This increase above the median also appears to have been sustained for a longer period in the control area (Figure S1).

Within the analysis period, an additional 97 cases were diagnosed compared with the expected number based on the median (1388 cases) for persons aged 50 and over (Table S1). In the control area, similar increases were observed with 176 additional abdominal

TABLE 3 Regional campaign: presentations per GP practice per week for patients aged 50+

Presentations per practice per week (adjusted[a])						
Campaign symptoms	**12-week period**	**2015/2016**	**2016/2017**	**Change (2016/2017 vs. 2015/2016)**	**% Change (2016/2017 vs. 2015/2016)**	***p*-value**
Bloating	Pre-campaign	0.39	0.28	0.11	**−28.4**	**0.037**
	Campaign	0.36	0.57	−0.21	**58.8**	**0.003**
	Post-campaign	0.37	0.48	0.11	31.5	0.074
Diarrhoea	Pre-campaign	1.91	1.98	0.07	3.7	0.574
	Campaign	2.11	2.23	0.12	5.7	0.443
	Post-campaign	1.95	2.31	0.36	**18.3**	**0.014**
Discomfort	Pre-campaign	4.27	4.40	0.13	3.0	0.502
	Campaign	4.45	4.36	−0.09	−2.1	0.672
	Post-campaign	3.86	4.34	0.48	**12.3**	**0.018**
Combined abdominal symptoms	Pre-campaign	6.54	6.64	0.10	1.5	0.673
	Campaign	6.87	7.10	0.23	3.3	0.409
	Post-campaign	6.15	7.14	0.99	**16.1**	**<0.001**
Control symptom (back pain)	Pre-campaign	5.75	5.63	−0.12	−2.2	0.561
	Campaign	6.57	6.06	−0.51	−7.7	0.058
	Post-campaign	5.78	6.26	0.48	8.3	0.050

Note: Pre-campaign period: 12 weeks from 21 November 2016. Campaign period: 9 weeks from 13 February 2017. Post-campaign period: 12 weeks from 17 April 2017. Results in bold indicate a statistically significant change between 2016 and 2017 (likelihood ratio test of two counts; $p < 0.05$).

[a]Analysis based on ISO week, adjusted for a 5-day working week excluding bank holidays.

TABLE 4 Number of urgent GP referrals for suspected abdominal cancers combined, and for suspected gynaecological, urological, upper GI and lower GI cancers for people age 50 ± in the regional campaign and control areas

			February–April				
						Referral rate	
Referral type	Area	Year	Referrals All ages	% change in number	*p*-value*	Estimate	95% CI
Abdominal (four referral types combined)	Regional campaign	2016	35,845	8.1	**<0.001**	3791.9	(3752.5, 3831.7)
		2017	38,737			4216.7	(4174.5, 4259.2)
	Control	2016	28,439	0.3	0.678	3544.7	(3503.3, 3586.5)
		2017	28,538			3659.3	(3616.6, 3702.3)
Gynaecological	Regional campaign	2016	5681	5.0	**0.008**	570.3	(555.6, 585.4)
		2017	5966			617.9	(602.3, 633.8)
	Control	2016	4445	−1.5	0.476	523.9	(508.5, 539.6)
		2017	4378			532.7	(517.0, 548.8)
Urological	Regional campaign	2016	9359	−0.3	0.815	1029.2	(1008.3, 1050.5)
		2017	9327			1055.5	(1034.0, 1077.3)
	Control	2016	7783	−7.6	**<0.001**	1015.9	(993.3, 1038.9)
		2017	7190			965.5	(943.1, 988.2)
Upper GI	Regional campaign	2016	8759	5.4	**<0.001**	920.8	(901.4, 940.4)
		2017	9230			1000.4	(979.9, 1021.2)
	Control	2016	6456	−1.4	0.422	799.2	(779.7, 819.1)
		2017	6365			808.8	(788.9, 829.1)
Lower GI	Regional campaign	2016	12,046	18.0	**<0.001**	1271.6	(1248.8, 1294.7)
		2017	14,214			1542.9	(1517.5, 1568.7)
	Control	2016	9755	8.7	**<0.001**	1205.7	(1181.6, 1230.1)
		2017	10,605			1352.3	(1326.4, 1378.5)

*p-values from a likelihood ratio test; significant results for increases shown in bold.

cancers (1859 compared to 168 median), comparing weeks 14 to 20 in 2017 (Table S1).

The numbers of colorectal, pancreatic and stomach cancers were similar to, or higher than, the 2016–2017 median for people aged 50 years and over for five or more consecutive weeks in the regional campaign area (Figure 1). There were an additional 61 colorectal cancers diagnosed compared with the expected number (based on the median of 1056 cases); an additional 102 pancreatic cancers diagnosed (based on median 284 cases), and for stomach cancer there were an additional 17 cancers diagnosed (based on median of 126 cases) (Table S1). There was no sustained increase observed in the control area for these cancers diagnosed in people aged 50 years and over.

There were no sustained periods where the numbers of oesophageal or ovarian cancers were the same as or higher than the 2016-to-2017 median for either the regional campaign area or control area for people aged 50 years and over (Figure 1).

3.6 | Sensitivity analysis

Sensitivity analyses examining persons of any age revealed similar results to the main analyses restricted to people ages 50 years and over (Tables S1–S3). However, the increase in GP attendances for combined abdominal symptoms during the campaign period reached statistical significance (5.8% increase, $p = 0.026$) in addition to the increase observed in the post-campaign period (also observed for persons aged 50 years and over).

4 | DISCUSSION

This regional 'Be Clear on Cancer' campaign for abdominal symptoms was aimed at people aged 50 years and over to encourage symptom awareness, and early presentation in primary care. Overall, the findings suggest that there was some evidence of an increase in public awareness of symptoms and a modest increase in the number of GP attendances, which may have had an impact on the number of urgent GP referrals for suspected cancer. There was no evidence of a significant impact on the number of diagnostic tests carried out in secondary care; however, there may be variation in Diagnostic Imaging Dataset coverage over the analysis period. For people over 50 years, additional cancers for pancreas, stomach and colorectal were diagnosed in the campaign region, but no sustained increases were observed in the control area.

Patients presenting with symptoms are typical and important drivers of primary care use (McAteer et al., 2011). In a qualitative

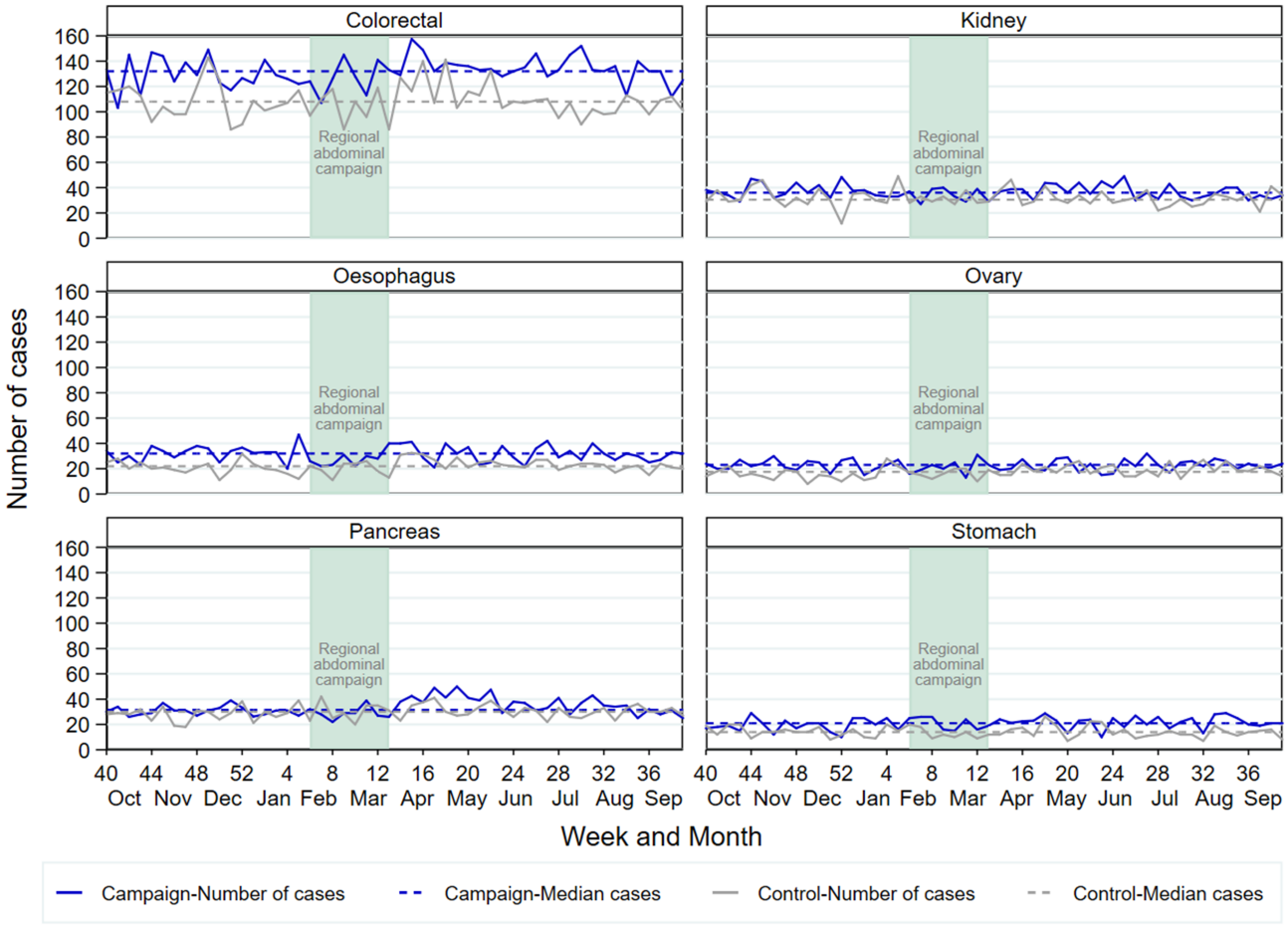

FIGURE 1 Number of newly diagnosed cases of cancer by abdominal site: week, October 2016 to September 2017, for patients 50 years and over in the campaign and control areas

study of patients recently diagnosed with lung or bowel cancer, participants reported difficulties in interpreting diffuse bodily sensations and symptoms and deciding when to consult (MacArtney et al., 2017). Abdominal symptoms are often unspecific and may be vague. However, they are the main reason for patient attendance in 10%–15% of GP consultations and have been found to be significantly associated with a new abdominal cancer diagnosis (Holtedahl et al., 2018).

The abdominal symptoms campaign marked a strategic approach for the 'Be Clear on Cancer' brand with a broadening of the campaign message that aimed to raise public awareness about the symptoms related to a number of different abdominal cancers, including some less common cancers. Previous campaigns focused on raising awareness of signs and symptoms of specific cancer sites, such as lung cancer (Ironmonger et al., 2015). In the abdominal symptoms campaign, it is also likely that some GP referrals for suspected gynaecological and urological cancers were made due to concerns about other symptoms, including bleeding, which was not a component of the campaign message.

Awareness-raising campaigns can increase knowledge of the disease and attendance at health services in the short-term, however those at lower risk are often the ones to respond, and evidence of longer-term impact is very limited (Austoker et al., 2009). In previous research, GPs were generally positive about an intervention to improve patients' awareness of gynaecological cancers but had concerns about increasing rates of attendance (Evans et al., 2014). GPs have previously reported that public health cancer awareness initiatives often resulted in extra consultations and investigations due to increased demand from patients they collectively termed 'the worried well' and that the campaign messages often missed their target audience (Green et al., 2016). It is possible that the campaign changed awareness and behaviour in GPs themselves, in addition to the public, although this was beyond the remit of this evaluation, future research may look to explore this. In this evaluation, there was a small increase in the average number of additional attendances during and after the campaign (one additional patient per GP practice per week) suggesting that the burden on the NHS primary care is limited. There was an increase in the number of urgent referrals but not diagnostic tests, which may have specific capacity issues (e.g. for specialist consultations) for the NHS. Further research is needed to quantify the benefits of increasing awareness of abdominal symptoms against resource costs such as referrals, increased consultations and investigations.

The data on health service utilisation were provided from a number of reliable sources of NHS routinely collected electronic data and have been used in previous evaluations (Ironmonger et al., 2015).

There are limitations within these sources. For GP attendances, data were obtained from a variable sample of practices sourced from the THIN database, for which, although they had similar sociodemographic characteristics, there may be unknown differences. Deprived populations are less likely to seek healthcare and are therefore likely to be underrepresented. Furthermore, the accuracy of these data relies on GPs precisely recording abdominal symptoms in the patient's medical record and that appropriate Read Codes are assigned. The observational design and cross-sectional nature of the metrics affect the extent to which the results presented can be definitively linked to the campaign. The analysis period for cancers diagnosed was defined as 2 weeks after the start of the campaign to 2 months after the end. This relatively short timeframe has been used in previous campaign evaluations (Lai et al., 2021). It is possible that some patients attended their GP practice were referred and diagnosed towards the end of the campaign period, and this could potentially have resulted in under-counting of abdominal cancers related to the awareness campaign. The data included in this paper include cancers diagnosed through all diagnostic routes, including urgent GP referral for suspected cancer and the proportions of cancers diagnosed through an emergency presentation. The campaign did not appear to have an impact on these metrics individually; therefore, all cancers diagnosed within the specified timescales in relation to the campaign period were included in the data analysis. For many cancers, incidence has been increasing over the last few decades; therefore, an increase in the number of cancers diagnosed may have been expected irrespective of the campaign. However, this evaluation observed an increase in several cancers in the campaign region but not in the control area, suggesting that any increases observed were not solely due to long-term trends.

Separately, a national screening programme for colorectal cancers already exists in the NHS in England, with tests routinely offered to over 55s (Cancer Research UK, 2017). The main focus in the campaign reported in this paper was not to increase screening but to increase awareness of a number of abdominal symptoms related to cancer diagnoses. Increasing uptake of colorectal screening has been the focus of a separate campaign which ran in North West England, evaluation showed uptake was significantly increased.

Common presenting symptoms for cancers with a broad 'symptom signature' have been reported for a number of abdominal cancers that were included in this BCoC campaign (Koo, Hamilton, et al., 2018), and it is suggested that public health education campaigns could provide more information on symptom combinations. Previous BCoC campaigns focused on symptoms that relate to one cancer site (e.g. breast and lung) and have also been shown to be successful (Holland et al., 2019; Ironmonger et al., 2015) although we cannot speculate, from the data presented in this paper, that one strategy is better than the other. Early diagnosis initiatives such as public health campaigns aimed at raising awareness of possible symptoms of cancer and clinical guidelines for the assessment and investigation of patients with symptoms have the potential to help detect cancer at a non-advanced stage (Koo et al., 2020).

5 | CONCLUSIONS

This regional campaign had a modest impact on public awareness of abdominal cancer symptoms that are common to different types of cancer of the abdomen. There was some evidence of a patient impact on early parts of the care pathway, including increased awareness of some abdominal symptoms, an increase in the number of GP attendances and cancers diagnosed with abdominal symptoms, and in GP referrals for further investigation. It appears that there may have been an impact on the number of colorectal, kidney, pancreatic and stomach cancers diagnosed but not on the number of oesophageal or ovarian cancers diagnosed. Future evaluations should investigate campaign impact by socio-economic status.

ACKNOWLEDGMENTS

This work uses data that has been provided by patients and collected by the NHS as part of their care and support. These data are collated, maintained and quality assured by the National Cancer Registration and Analysis Service, which is part of Public Health England (PHE). PHE leads the Be Clear on Cancer programme working in partnership with the Department of Health and Social Care, NHS England and Improvement, and a number of cancer charities. The Early Diagnosis team at Cancer Research UK did the original scoping for the Be Clear on Cancer generic/multi-cancer approach on which the abdominal symptoms campaign was built. We thank the following individuals for their contributions to the campaign evaluation and advice on the manuscript: Emma Logan and Miriam Miller from PHE Marketing; Jodie Moffat from Cancer Research UK; Isobel Tudge, Ravneet Sandhu, Kwok Wong, Jennifer Lai and Christopher Lawrence from PHE NCRAS who completed parts of the initial analysis; Osa Adeghe, facilitated improved drafts and provided supportive admin and QA work; Lizz Paley and Georgios Lyratzopoulos, for their formative feedback and advice in an early draft of the paper. The Be Clear on Cancer Programme is led by Public Health England, delivered in partnership with NHS England, Departments of Health and Social Care, and Cancer Research UK.

CONFLICT OF INTERESTS

All authors have no conflict of interests to report.

AUTHOR CONTRIBUTIONS

Contributed to the project evaluation design and/or implementation: CB, HH, JF, VM, CG and LE-B. Statistical analysis and statistical advice: CB, VM and NT. First draft and submission draft: NT. Critical data review, comments on all subsequent drafts, final version of manuscript approval: all authors.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available at http://www.ncin.org.uk/cancer_type_and_topic_specific_work/topic_specific_work/be_clear_on_cancer/abdominalsymptomsevaluationresults. The row-level data used in initial analyses are not publicly available due to privacy or ethical restrictions.

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How to cite this article: Torrance, N., Bright, C. J., Hill, H. L., Fergusson, J., Kennedy, C., Mak, V., Gildea, C., Nordin, A., & Elliss-Brookes, L. (2021). Abdominal cancer symptoms: Evaluation of the impact of a regional public awareness campaign. *European Journal of Cancer Care*, *30*(6), e13500. https://doi.org/10.1111/ecc.13500