Improving appropriate urgent GP cancer referrals

A final report by the Behavioural Insights Team

August 2018

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Executive summary

Almost half of people who get cancer are diagnosed late which makes any treatment less likely to save people's lives.[1] The majority of cancers are identified by GPs, but emergency hospital admissions remain a major route to diagnosis.[2] Estimates suggest that earlier diagnosis could improve the survival chances of 52,000 patients and save the NHS £210 million a year.[3]

Urgent GP referral (when a GP refers a patient with suspected cancer to be seen by a specialist within two weeks) is a key tool for improving early detection of cancer. However, the use of urgent cancer referral varies substantially across England, even when accounting for demographic factors. However, Public Health England (PHE) currently uses the England average of crude referrals rate and the age-and-sex standardised ratio as benchmarks to measure performance and improve outcomes. Based on this metrics, there is a case to increase appropriate referrals in Greater Manchester where the overall referral rate is slightly lower than the England average (3003 per 100,000 individuals vs 3164 in 2016/2017).[4]

The trial

The Greater Manchester Health and Social Care Partnership (GMHSCP) commissioned the Behavioural Insights Team (BIT) to explore and evaluate how behavioural insights could be applied to improve the appropriate urgent GP referral.
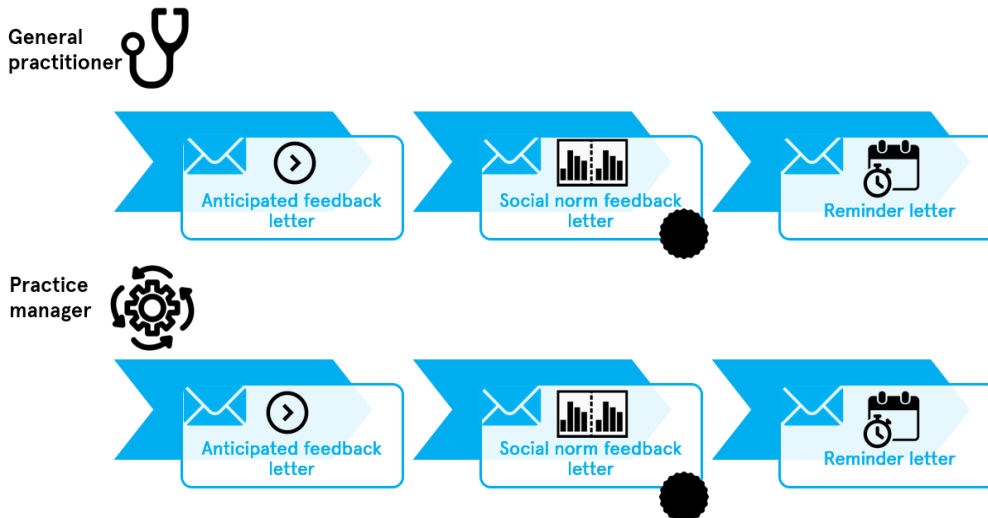
We conducted a stepped-wedge randomised trial between August 2017 and January 2018 with 244 GP practices which had an urgent GP referral rate below the England average. We tested the impact of a set of three behaviourally-informed letters on the urgent GP referral rates. Within the stepped-wedge design, practices were randomly allocated to a month during which they received the intervention (the three letters). Non-treated practices that did not receive any intervention served as our control group in the months before they were sent the letters.

Our main behavioural approach was to provide the under-referring GP practices with social norm feedback on their urgent GP referral rate: how it compared with other GP practice in GM. Research on social norms shows that letting individuals know how they compare to their peers can encourage them to adjust their behaviour. We sent three letters to each practice: a first letter announcing that the feedback would be sent, a feedback letter and a reminder letter. We sent two copies of each letter to every GP practice, one was sent to a named GP and the other was sent to the practice manager.

Control group

Business → as → usual

Treatment group

General practitioner

Anticipated feedback letter → Social norm feedback letter → Reminder letter

Practice manager

Anticipated feedback letter → Social norm feedback letter → Reminder letter

Results

We found a statistically significant positive effect of our intervention on the urgent GP referral rate. The GP practices that received the social norm feedback letters increased their urgent crude GP referral by 9.6% ($p < 0.05$ level), compared to the control group. This means that each of the treated GP practices referred on average 1.5 more patient per month, compared to 14 patients referred in the control group. Based on our available data, we estimate this effect persists for six months after the provision of feedback. The increase is substantially driven by a sizeable improvement in performance of the low referrers (i.e. practices in the bottom 30% of referrers nationwide). These practices urgently referred 17% more patients than before the trial.

During the trial, our 244 under-referring GP practices urgently referred 1,281 additional patients of whom 90 can be expected to have been diagnosed with cancer. We estimate that if all the 244 practices received the feedback at the beginning of the trial, they would have referred 2,196 more patients and diagnosed 154 more cancer patients in six months after the letter arrived. We estimate that GMHSCP could save £1.2m annually, thanks to the lower costs of early cancer treatment. These findings show that a low-intensity feedback intervention can be a cost-effective approach to meaningfully improve the urgent GP cancer referral rate of GP practices performing below the England average. We recommend to

GMHSCP to explore ways to embed the provision of social norm feedback to the bottom 30% of under-referring practices, to sustain the benefits of this trial.

Introduction

The Greater Manchester Health and Social Care Partnership (GMHSCP) commissioned the Behavioural Insights Team (BIT) to explore how behavioural insights could be used to encourage GPs to increase the number of appropriate urgent GP referrals. This report outlines the background to this policy issue and describes the design and results of a field experiment in which we tested the impact of social norm feedback letters on practices' urgent GP referral, compared to business-as-usual, i.e. no communication.

Background

The UK has a poor rate of early cancer detection compared to the rest of the EU.[5] Currently every fifth cancer is detected late through emergency hospital admissions, rather than through the key early detection route - the so-called urgent GP referral.[6] This diagnosis route ensures that urgently referred patients with suspected cancer are examined by a specialist within two weeks which improves chances of early treatment and recovery. Thirty-one percent of cancers are currently detected through urgent GP referrals but 22% are still only detected through emergency hospital admission.[7]

There is substantial variation in the urgent referral rates amongst different Clinical Commissioning Groups (CCGs) in England.[8] The differences cannot be fully explained by the differences in population composition and the prevalence of risk factors. In Greater Manchester, the overall referral rate is slightly below the national average (3003 vs 3164 per 100,000 individuals as of 2016/2017).[9]

To address the issue of late cancer detection, NICE have recently updated their guidelines for GPs on urgent cancer referrals to secondary care.[10] In order to increase the number of referrals, the cancer 'risk threshold' based on the positive predictive value (PPV)[11] of symptoms has been lowered from 5% to 3%. In practice, this means that a GP should refer all patients who have at least a 3% risk of cancer. For illustration, all patients aged over 40 with unexplained weight loss and abdominal pain should be examined by specialists. Complying with a 3% risk threshold is a difficult task for GPs and no data is collected on performance on this indicator. Instead, Public Health England (PHE) currently uses the England average of crude referrals rate and the age-and-sex standardised two-week wait ratio as benchmarks to measure performance of practices and aims to increase referrals by those practices who fall below this average.

Emerging evidence suggests that urgent referrals can be an efficient tool for early detection. In a cohort study of English practices, higher urgent referral rates were associated with a lower cancer mortality. Compared to practices with medium referral rates, the cancer mortality rate of GP practices who referred more patients was 4% lower, whilst those who referred fewer patients had a 7% higher mortality rate.[12] Another recent study found that the GP practices that urgently referred more patients had fewer late stage cancers.[13]

Higher demand for cancer assessment and treatment could put a strain on the secondary care system without further support and investment in its resources. According to the NHS Cancer Strategy, the volume of some cancer tests may grow by 70-80% by 2020[14] which raises questions about the local capacity to actually deliver on the new guidelines.

In March 2016, GMHSCP commissioned BIT to run a trial sending behaviourally-informed letters to GPs to improve the appropriate urgent GP referrals of under-referring GP practices (i.e. the practices with referral rate lower than the England average). The rest of this report outlines our exploratory work, the trial design and results.

Overview of literature review

To inform this project, BIT conducted a literature review to explore behavioural principles that can be applied to encourage GPs to increase the number of appropriate urgent GP referrals. We include a selection of the key findings on the barriers for GP referral and on promising approaches to influencing physician's behaviour which informed our intervention here. The full literature review is in Annex 3.

Barriers to improving GP referrals

The literature identifies a number of doctor-centred barriers for compliance with referral recommendations, such as:

- Issues with information overload or low awareness[15]
- Low incentives and inertia[16]
- Acceptance of and beliefs about the relevance of new recommendations and their efficacy in improving patients' well-being[17]
- Organisational constraints[18]

Beyond these doctor-centred barriers, BIT's exploratory work suggested that further barriers which hamper change in the referral behaviour may stem from the system itself. These barriers include:

- **Conflicting messages:**[19] The new guidelines prompt GPs to increase their urgent referral rates, against the background of the overarching priority to reduce general GP referrals to secondary care.[20] We believe this mixed messaging could cause some confusion. If combined with a lack of awareness about the new cancer referral guidelines, the system may induce GPs to default into a generally low level of referrals.
- **Secondary care attitudes:** In parallel, secondary care is under significant strain which might give the impression that higher cancer referrals are inappropriate. For instance, sometimes when referrals had been made, GPs were reprimanded and patients sent back to primary care or put on a waiting list, instead of being examined.[21]

Behavioural insights for GP referral

Social norms and feedback

Feedback has been shown to be a reliable tool for influencing doctors' behaviour.[22] The effect size tends to depend on the context, the method of feedback and the specific behaviour being targeted. Research has found feedback to be more effective in the case of low baseline performance, low complexity of the target behaviour (e.g. test or drug ordering),[23] high feedback intensity (e.g. repeated feedback in different formats or from an influential messenger) and in combination with other interventions.[24]

Social norms, especially 'descriptive norms' – describing what the majority of people are actually doing – offer a powerful example for people to follow. This is because people are heavily influenced by the behaviour of those around them, as well as by implicit or explicit expectations within a particular society or group.[25]

Feedback drawing on social norms and letting people know how they compare to their peers (peer comparisons) can be very effective in encouraging people to adjust their behaviour. Local norms (indicating how groups similar to us behave)[26] [27] and minority norms (indicating that few people behave like us)[28] can be even more influential. For instance, in a BIT trial, we informed late tax payers that they were one of the few people who failed to pay their tax on time. This message increased the tax payment rate by 16%.[29]

BIT has also successfully used social norm feedback in health. Unnecessary antibiotic prescriptions decreased by 3.3% when we let GPs know that their practice was prescribing at a higher rate than the majority of other practices in their NHS Local Area Team.[30] Providing feedback has proved effective in several other healthcare experiments aimed at reducing prescription[31] or excessive diagnostic test use.[32]

Reminders

Timely reminders – via a letter, a text or a phone call – can stop people forgetting to do something and also improve follow through with a particular action. For instance, in a trial run by BIT and the Courts Service, sending people text message prompts to pay their court fines ten days before a bailiff visit tripled payment rates.[33]

In the healthcare context, reminders – provider or patient prompts and computer alerts – have been one of the most effective tools for influencing clinicians' behaviour.[34] Some studies suggested that reminders can achieve an average effect of around 13%[35] or deliver in the majority of cases.[36]

BIT has also found that reminders can influence healthcare professionals. For instance, sending weekly reminders to pharmacists significantly improved the engagement with the Summary Care Records (which provide a faster access to basic clinical information about patients).[37] In a recent trial with NHS Digital, introducing 'red alerts' for low capacity hospitals on the E-referral portal sizeably reduced the referral to hospitals with long waiting times.[38]

Personalisation, Salience and Messenger

GPs have to take in and process a lot of information on a daily basis. With our limited cognitive resources, people struggle to notice and remember what is important which can affect their ability to make effective choices. We are more likely to fail to do something when we work under pressure or are distracted by other pressing calls on our attention.[39]

Therefore, we need to find ways to make a particular message stand out. Behavioural science suggests that personalisation of communication – using a person's name,[40] referring to her profession[41] or adding a personalised message –

can help attract people's attention. A similar approach is to make a message more salient by using eye-catching envelopes, ink[42] or stamps.[43] Using an influential messenger can also increase the effect of a message. People tend to weigh information differently depending on the authority of[44] or their relationship with[45] a messenger who can heavily influence whether they follow through with an action.

> In this trial, we personalised our letters by using GPs and practice managers' names and by referring to their local area.
> We increased salience of letters through highlighting the costs and benefits of urgent GP referral. Some local GP cancer leads endorsed our intervention to increase its legitimacy.

The trial

In partnership with GMHSCP, we designed and ran a stepped-wedge field trial. In the trial, we contacted the 250 GP practices in Greater Manchester with an urgent GP referral rate below the England average. These practices were identified as under-referrers using PHE's age-and-sex standardised referral ratio in 2015/16.[46]

We tested the impact of a series of three behaviourally-informed letters on practices' urgent GP referral rates compared to business-as-usual (no communication). The main element of our intervention was to provide GPs with social norm feedback on their performance in urgent referral in 2015/2016, relative to other Greater Manchester practices. To better tailor our message, we also split our sample to two groups: low referrers (practices in the bottom 30% of referrers nationwide, N=121) and medium referrers (practices in the 20% of referrers closer to the England average, N=123).

We sent letters to 250 Greater Manchester GP practices. We sent three treatment letters over the course of a month (one every 5-7 days) to one named GP and the practice manager. So each GP practice received two copies of the anticipated feedback letter, the social norm feedback letter and the reminder letter (each GP practice received a total of six letters, see Figure 1. and Table 1. below). In total we sent 1,500 letters.

Figure 1. Trial design
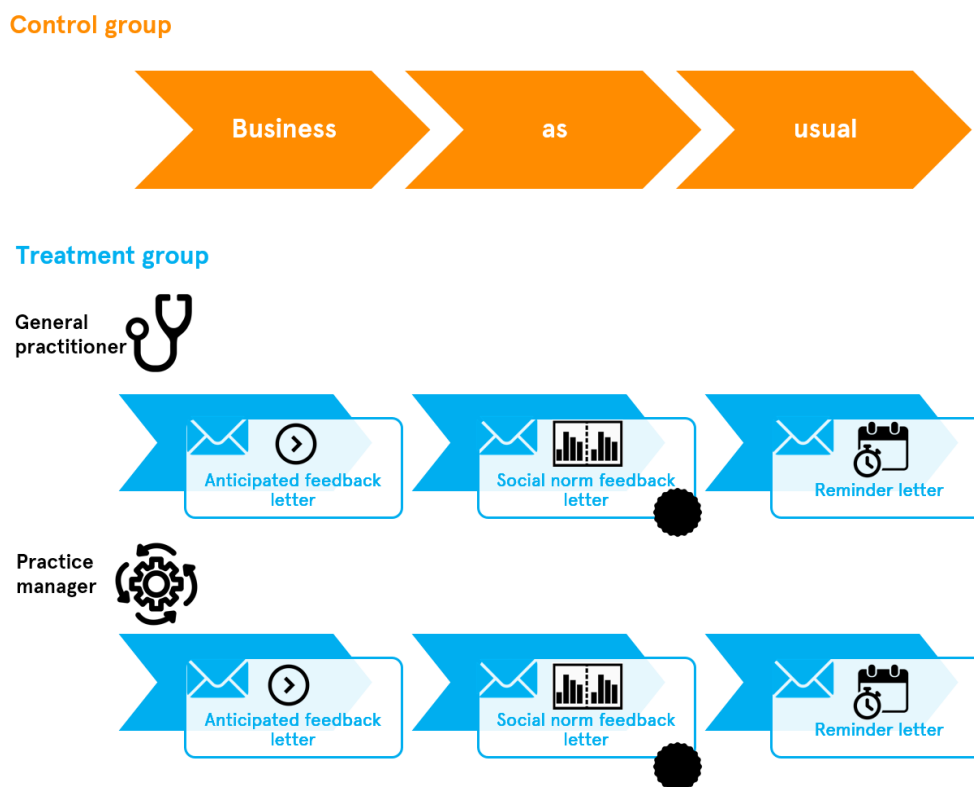
Intervention

We summarise the interventions below. The full material can be found in Appendix 1.

Table 1: Intervention Details

Condition	Details of intervention
Anticipated feedback letter	The first letter informed GP practices that they would soon receive feedback on their performance. The anticipation and concise information on social importance of the urgent referral was meant to increase salience of the issue. The letter was signed by the GP Cancer Lead for the given CCG. **"Almost half of people who develop cancer are diagnosed late. In the next few weeks I will be sending you feedback on how your practice's two week wait (suspected cancer) referral rate compares to other practices in your area."**
Social norm feedback letter,	The second letter contained the feedback, based on the PHE age-and-sex standardized two week wait cancer referral ratios in 2015-2016.

including reminder sticker	• GP Practices with low referral rate **"The vast majority (70%) of practices in Greater Manchester have a higher two week wait cancer referral rate than yours. GP two week wait cancer referrals are critical for detecting cancer early. "** • GP practices with medium referral rate **"Many practices in Greater Manchester have a higher two week wait cancer referral rate than yours. GP two week wait cancer referrals are critical for detecting cancer early."** The letter also included a reminder sticker and a number of suggestions to help increase appropriate referrals (such as discussing the referral with colleagues or completing online training modules on Gateway C). It was signed by the GP Cancer Lead for the given CCG.
Social norm reminder letter	The reminder letter was designed to reinforce the feedback message by again contrasting a GP practice's performance with the referral behaviour of the majority of practices. This letter was also signed by the GP Cancer Lead for the given CCG: • GP Practices with low referral rate **"Recently we wrote to you to tell you that your practice had a lower two week wait cancer referral rate than the vast majority (70%) of practices in Greater Manchester."** • GP practices with medium referral rate **"Recently we wrote to you to tell you that your practice had a lower two week wait cancer referral rate than many practices in Greater Manchester."** We also told practices that the 'data on referral will continue to be collected' hoping that the ongoing monitoring would encourage them to act.

Experimental design

We designed and conducted a stepped-wedge randomised trial with 250 GP practices across 10 CCGs[47] in Greater Manchester with the urgent GP referral below the England average. As our baseline measure of urgent referral, we used PHE's age-sex-standardised referral ratio in 2015/16.[48] To ensure a balanced randomisation, we sampled our treatment groups to be as similar as possible, so

as to contain GP practices from all different CCGs and both the low and medium referrers.

GP practices were randomly allocated to receive the letter intervention in a particular month between August 2017 and January 2018 (they all received it eventually). Prior to their treatment month, non-treated practices that were not receiving any intervention served as our control group. Of the 250 originally randomised practices, we received referral and demographic data for 244 practices which are our final analysed sample in this trial.[49]

BIT chose this trial design because the small sample size meant we would not have been able to detect the effect of an intervention using a standard randomised-controlled design. Instead, we eventually included all practices and only randomised *the order* in which they received the intervention. Another advantage of stepped-wedge trial is that it allows all trial participants to receive a potentially beneficial intervention. In a way, it is more similar to real-world policy roll-out, when a policy may be piloted first but everyone will receive it eventually.

Table 2. Illustration of stepped-wedge trial design

	Baseline	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
40 GP practices	Control	Treat	Treat	Treat	Treat	Treat	Treat
40 GP practices	Control	Control	Treat	Treat	Treat	Treat	Treat
40 GP practices	Control	Control	Control	Treat	Treat	Treat	Treat
40 GP practices	Control	Control	Control	Control	Treat	Treat	Treat
40 GP practices	Control	Control	Control	Control	Control	Treat	Treat
40 GP practices	Control	Control	Control	Control	Control	Control	Treat

In August 2017, we started the trial by sending treatment letters to lead GPs and practice managers of 41 practices. To evaluate the intervention's impact, we could then compare the urgent referral in treated practices to the remaining 203 practices in our sample. Every month, about 40 practices received the letters until all had been treated (see Table 2).

Table 3. Urgent GP referral final stepped-wedge

	Month 0	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Control	244	203	162	119	79	39	0
Treatment	0	41	82	125	165	205	244
Total	244	244	244	244	244	244	244

Results

We found a statistically significant positive effect of our intervention on the urgent GP referral rate, consistent across two different measures. Below, we present the aggregate results for all treated Greater Manchester practices. Given our small sample size, we cannot look at how and whether the effect varies depending on GP practice characteristics or across different CCGs.

Outcome measures

We looked at the standard PHE urgent cancer referral measure - the crude referral rate - as well as the number of referrals per month. In our analysis, we also took into account the potential influence of seasonality and the location in a given CCG (also a proxy for deprivation).

Together with the age-and-sex standardised ratio, these are currently the most robust methods of measuring practices' performance in the urgent cancer GP referral. To calculate the standardised ratio, PHE uses a special internal demographic dataset which could not be obtained in time to complete this analysis. The data can be produced additionally on request.[50]

We present the referral in treated practices compared to a robust control group, composed of two data groups. As usual for stepped-wedge, we use the control data generated during the trial period - i.e. the urgent cancer referral in GP practices just before they were treated. Secondly, we also combined this data with a model of practices' referral in pre-trial period (January - July 2017). This more rigorous approach enables us to get observations on the GP practices' referral over a longer time period and hence more robustly exclude that the effect is due to any seasonal variation. In Annex 2 we also include the results with just the simple control group (observations just from the trial period); we get essentially the same conclusions.
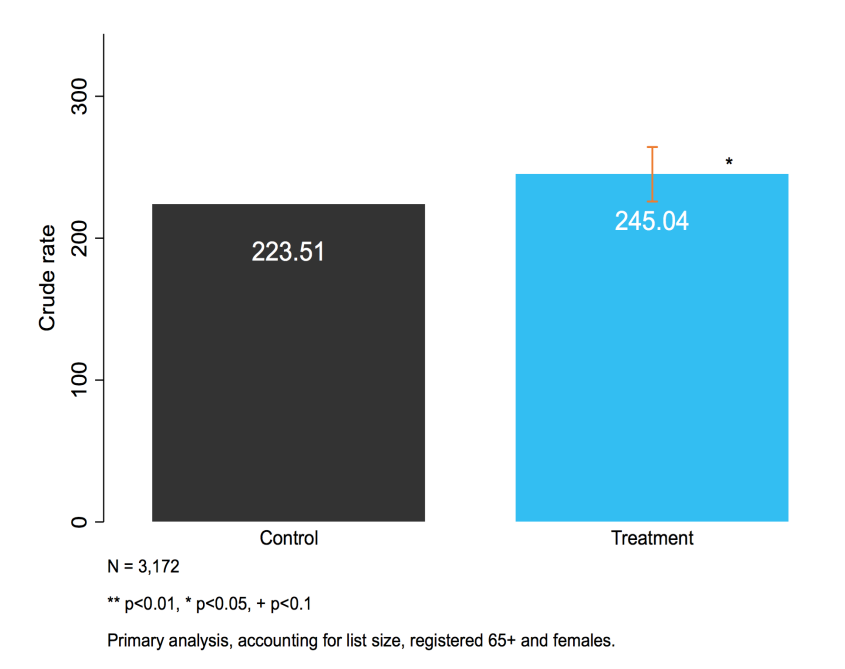
Crude referral rate

The crude referral rate is the number of urgent GP referrals multiplied by 100,000 and divided by the list size of the practice. In other words, this measure tells us what the incidence of cancer referrals is in a given GP practice, weighted for its population size.

We found that providing social norm feedback increased the crude referral rate by 9.6%, a change statistically significant at p <0.05 level. After receiving the letters, the under-referring GP practices referred 245 patients per 100,000 per month, compared to 223.5 people before the treatment (Figure 2). In practice, this means

that after receiving the feedback, the treated GPs in Greater Manchester referred 21.5 more people per 100,000 a month than before the intervention.
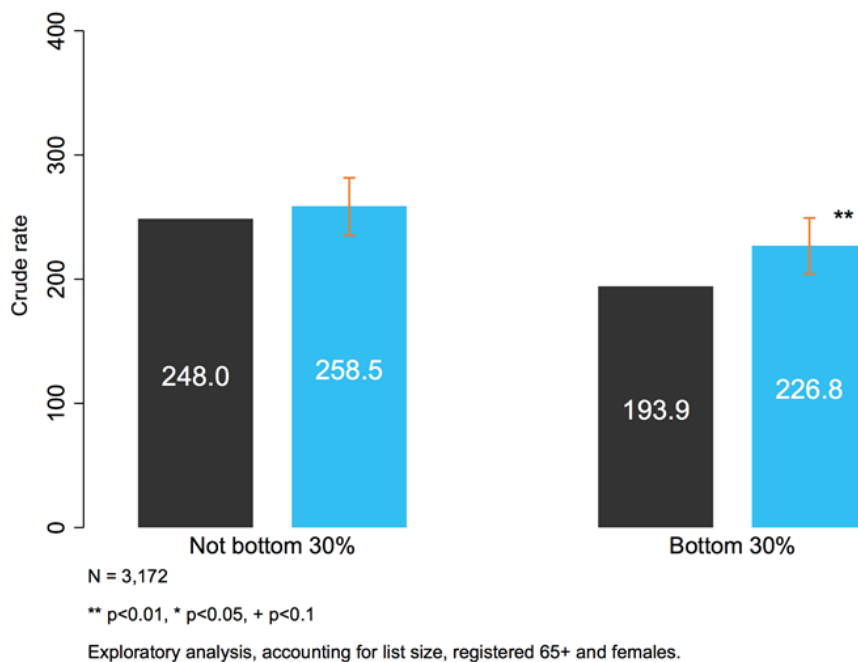
Figure 2: Treatment effect on the crude cancer referral rate per month

N = 3,172

** p<0.01, * p<0.05, + p<0.1

Primary analysis, accounting for list size, registered 65+ and females.

We looked at how this result compares to PHE Cancer data and found that the current monthly average referral across *all* Greater Manchester practices is 250 per 100,000.[51] This suggests that our intervention could have helped to reduce the gap between our sample of under-referring practices and the average performers.

We explored this hypothesis in our analysis and found that our feedback letters were more effective for the low referrers (practices in the bottom 30% of referrers nationwide). GPs from the low referring practices referred 17% more patients (227 up from 194 per 100,000), a change significant at *p* <0.01 level (Figure 3). This suggests that our overall effect was largely due to the low performers improving their performance[52] rather than an increase in referrals by the close-to-the-average performers.
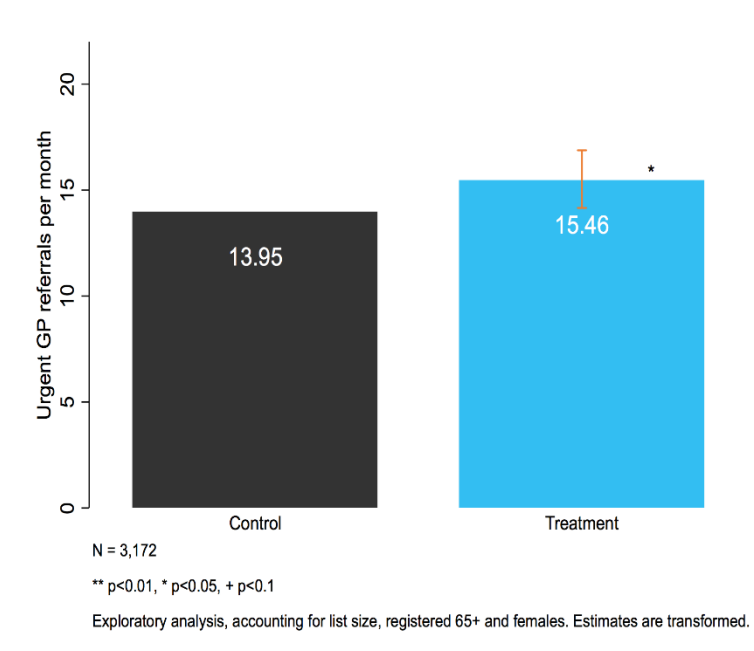
Figure 3: Treatment effect by referrer group by month

Crude rate

248.0 | 258.5

193.9 | 226.8 **

Not bottom 30%   Bottom 30%

N = 3,172

** p<0.01, * p<0.05, + p<0.1

Exploratory analysis, accounting for list size, registered 65+ and females.

Referrals per month

Having looked at the standard PHE measure, we also looked at a much simpler measure to understand the average monthly number of referrals per practice. We found that when GP practices received the social norm feedback, they referred 15.5 patients per month, so one and half more people, compared to 14 patients referred in the control group (Figure 4.). This represent an increase of 10.7%, statistically significant at *p* <0.05 level.

Figure 4: Treatment effect on the number of urgent GP referrals made by month

N = 3,172

** p<0.01, * p<0.05, + p<0.1

Exploratory analysis, accounting for list size, registered 65+ and females. Estimates are transformed.

Looking at the effect over time, our results across the two measures show that GP practices changed their referral only after they received all three letters. Our analysis suggests that treated GPs continued to refer more patients for six months. Note that whilst the effect could persists after six months, we would not know because we only observed our treated practices for the maximum period of six months.

During the trial period, our 244 under-referring GP practices were in the trial for an average of 3.5 months, and referred 1,281 additional patients of whom 90 could be expected to be diagnosed with cancer.[53] Overall, if we provided the social norm feedback to all 244 practices in one go, we expect they would have referred 2,196 more patients and which equates to 154 more cancer patients receiving an early diagnosis over the following six months.[54]

Potential savings

We also calculated the potential annual savings that intervention could generate for Greater Manchester and England. We have assumed that all the under-referring GP practices would receive the feedback only once and increase their referral over the following 6 months, consistent with our treatment effect.

To estimate the savings for the NHS, we assume, for simplicity's sake, that the referred cancer patients would be diagnosed at stage 1 instead of stage 4. Such an early diagnosis would help the NHS to save £ 7,847 per cancer case, according to our calculations based on CRUK's estimations.[55]

Looking at Greater Manchester, if all 244 under-referrers received feedback, they would identify an additional 154 cancer patients over the following six months. Assuming these were diagnosed at stage 1 instead of stage 4, GMHSCP would annually save £1,207,218. The cost of sending the letters during the trial was just £1,220.

There are 3,716 GPs in England with below average referrals. If we scaled up this intervention to include them all we calculate they would refer 33,444 more patients. This would lead to 2,542 additional patients diagnosed with cancer in the next six months.[56] Assuming they were being diagnosed at stage 1 rather than stage 4, the NHS could save at least £19,945,854 annually. This only looks at direct cost savings to the NHS, the gains in terms of improved outcomes from earlier treatment would be valued substantially higher.

Conclusion

In this large field experiment with 244 GP practices, we found that providing social norm feedback to under-referring practices is effective at increasing the number of patients referred for suspected cancer. The crude urgent GP referral rate statistically significantly increased by 9.6%, thanks to our set of three behaviourally-informed letters. This increase was mostly due to changes in behaviour by the low referrers (i.e. practices in the bottom 30% of referrers nationwide) who sent 17% more patients to see specialists, compared to the pre-trial period. In other words, our feedback provision helped to reduce the gap between the under-referrers and the medium referrers in Greater Manchester, by bringing them closer to the England average.

Following the social norm feedback, a given GP practice monthly referred on average 1.5 more patient with suspected cancer over the six following months. During the trial, the 244 GP practices referred 1,281 additional patients of whom 90 are likely to have been diagnosed with cancer. Annually, this would amount to almost 2,200 more referrals and 154 cancer patients diagnosed earlier in GM, assuming the letters were sent once per year. If we scaled this intervention up to all England's under-referring GP practices, we estimate that GPs would annually urgently refer 33,444 more patients and diagnose 2,542 additional patients earlier. For comparison, this means that GPs would diagnose more new cancer cases annually than all the new cervical cancer cases in a given year.

The findings of this trial are encouraging in several ways. Firstly, we showed that a low-intensity letter intervention can be a cost-effective approach to meaningfully improve the urgent cancer referral rate of GP practices performing below the England average. Secondly, the fact that the treated practices only referred 1.5

more person per month on average seems proportionate, given that the average practice only sees 27 cancer cases per year.[57] This suggests our letters prompted GPs to consider the appropriateness of urgent referral in marginal cases, without a large hike in referral creating a major pressure on secondary care. Finally, the early success of our letter intervention suggests that there is a potential to explore other approaches to improve early cancer detection through the urgent GP referral. Promising areas for further research could be: interventions seeking to embed social norm feedback into NHS systems, other timelier interventions to encourage GPs to improve their referral (such as real-time computer alerts) or interventions encouraging patients with suspected cancer to visit their GP early on.

In the meantime, we recommend that the GMHSCP explores ways to embed the provision of social norm feedback to the bottom 30% of under-referring practices, to sustain the effect of intervention. We estimate that this intervention could save up to £ 900,000 annually,[58] thanks to lower costs of and better survival with early cancer treatment.

Annex 1. Treatment letters

Letter 1 – All practices

GMCA GREATER MANCHESTER COMBINED AUTHORITY

NHS in Greater Manchester

Greater Manchester Health & Social Care Partnership
4th Floor
3 Piccadilly Place
London Road
Manchester M1 3BN

Date

Dear [insert name]

Almost half of people who develop cancer are diagnosed late.1 In the next few weeks I will be sending you feedback on how your practice's two week wait (suspected cancer) referral rate compares to other practices in your area.

Greater Manchester's suspected cancer referral rate is lower than the national average. Increasing referrals of patients who may be at risk is a priority for us because research shows that patients at GP practices with higher referral rates have better cancer outcomes than those with lower referral rates.2

Thank you for helping to improve referrals of patients who may be at risk across South Manchester.

Yours sincerely,

Sarah Taylor
CRUK GP Cancer Lead for Greater Manchester

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1 Cancer Research UK (2014). Saving lives, averting costs: An analysis of the financial implications of achieving earlier diagnosis of colorectal, lung and ovarian cancer. Available at
http://www.cancerresearchuk.org/sites/default/files/saving_lives_averting_costs.pdf
2 Møller, H., Gildea, C., Meechan, D., Rubin, G., Round, T., & Vedsted, P. (2015). Use of the English urgent referral pathway for suspected cancer and mortality in patients with cancer: cohort study.

The Greater Manchester Health and Social Care Partnership is the body made up of the 37 NHS organisations and councils in the city region, which is overseeing devolution and taking charge of the £6bn health and social care budget.

Letter 2 – Low referral practices

GMCA GREATER MANCHESTER COMBINED AUTHORITY

NHS
in Greater Manchester

Greater Manchester Health & Social Care Partnership
4th Floor
3 Piccadilly Place
London Road
Manchester M1 3BN

Date

Dear [insert name]

Two week wait (suspected cancer) referrals in your practice

The great majority (70%) of practices in Greater Manchester have a higher two week wait cancer referral rate than yours.1 Two week wait cancer referrals are critical for detecting cancer early.

I know that making a referral is not a simple decision, but please consider whether you are referring all patients who may be at risk as we do not want anyone to be missed.

Here are 4 things you can do to increase your referral rates:

1. Put one of the enclosed stickers on your computer screen to remind you about using the two-week referral route. Give the remaining stickers to other GPs in your practice and encourage them to do the same.
2. Talk to other GPs in your practice to make sure they are referring in line with the NICE guidelines2 - referrals are recorded at a practice level.
3. Register with www.gatewayc.org.uk and complete the new online modules (which also carry CPD awards) to learn more about when to refer.3
4. Contact your local CRUK Engagement Facilitator Steve Jones (Steve.jones@cancer.org.uk) who can offer additional advice and training.

Thank you for helping us to catch cancer early.

Yours sincerely,

Sarah Taylor
CRUK GP Cancer Lead for Greater Manchester

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1 This is based on data held by Public Health England on age-and-sex standardised two week wait cancer referral ratios in 2015-16. Data is taken from practice profiles at https://fingertips.phe.org.uk/profile/cancerservices (which are adjusted to take into account GP list size, patient age and gender).
2 https://www.nice.org.uk/guidance/NG12
3 These modules carry Continuing Professional Development recognition and are endorsed by the Royal College of General Practitioners.

The Greater Manchester Health and Social Care Partnership is the body made up of the 37 NHS organisations and councils in the city region, which is overseeing devolution and taking charge of the £6bn health and social care budget.

Letter 2 – Medium referral practices

GMCA GREATER MANCHESTER COMBINED AUTHORITY

NHS
in Greater Manchester

Greater Manchester Health & Social Care Partnership
4th Floor
3 Piccadilly Place
London Road
Manchester M1 3BN

Date

Dear [insert name]

Two week wait (suspected cancer) referrals in your practice

Many practices in Greater Manchester have a higher two week wait cancer referral rate than yours.1 Two week wait cancer referrals are critical for detecting cancer early.

I know that making a referral is not a simple decision, but please consider whether you are referring all patients who may be at risk as we do not want anyone to be missed.

Here are 4 things you can do to increase your referral rates:

1. Put one of the enclosed stickers on your computer screen to remind you about using the two-week referral route. Give the remaining stickers to other GPs in your practice and encourage them to do the same.
2. Talk to other GPs in your practice to make sure they are referring in line with the NICE guidelines2 - referrals are recorded at a practice level.
3. Register with www.gatewayc.org.uk and complete the new online modules (which also carry CPD awards) to learn more about when to refer.3
4. Contact your local CRUK Engagement Facilitator Steve Jones (Steve.jones@cancer.org.uk) who can offer additional advice and training.

Thank you for helping us to catch cancer early.

Yours sincerely,

Sarah Taylor
CRUK GP Cancer Lead for Greater Manchester

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1 This 's based on data held by Public Health England on age-and-sex standardised two week wait cancer referral ratios in 2015-16. Data is taken from practice profiles at https://fingertips.phe.org.uk/profile/cancerservices (which are adjusted to take into account GP list size, patient age and gender).
2 https://www.nice.org.uk/guidance/NG12
3 These modules carry Continuing Professional Development recognition and are endorsed by the Royal College of General Practitioners.

The Greater Manchester Health and Social Care Partnership is the body made up of the 37 NHS organisations and councils in the city region, which is overseeing devolution and taking charge of the £6bn health and social care budget.

Letter 3 – Low referral practices

GMCA GREATER MANCHESTER COMBINED AUTHORITY

NHS
in Greater Manchester

Greater Manchester Health & Social Care Partnership
4th Floor
3 Piccadilly Place
London Road
Manchester M1 3BN

Date

Dear [insert name]

Two week wait (suspected cancer) referrals in your practice

Recently we wrote to you to tell you that your practice had a lower two week wait cancer referral rate than the vast majority (70%) of practices in Greater Manchester.1

It is important to make sure that all patients who may be at risk in [insert location] are being referred. Patients at practices with lower two week wait referral rates achieve worse mortality outcomes than those at practices with higher referral rates.2

As a reminder, you may wish to:

1. Talk to other GPs in your practice to make sure they are referring in line with the NICE guidelines.

2. If you haven't already registered, join www.gatewayc.org.uk and complete the online modules to learn more about when to refer.3

Data on suspected cancer referrals in South Manchester will continue to be collected.

Thank you for helping us to catch cancer early.

Yours sincerely,

Sarah Taylor
CRUK GP Cancer Lead for Greater Manchester

---

1 This is based on data held by Public Health England on age-and-sex standardised two week wait cancer referral ratios in 2015-16. Data is taken from practice profiles at https://fingertips.phe.org.uk/profile/cancerservices (which are adjusted to take into account GP list size, patient age and gender).

2 Møller, H., Gildea, C., Meechan, D., Rubin, G., Round, T., & Vedsted, P. (2015). Use of the English urgent referral pathway for suspected cancer and mortality in patients with cancer: cohort study.

3 These modules carry Continuing Professional Development recognition and are endorsed by the Royal College of General Practitioners.

Letter 3 – Medium referral practices

GMCA GREATER MANCHESTER COMBINED AUTHORITY

NHS in Greater Manchester

Greater Manchester Health & Social Care Partnership
4th Floor
3 Piccadilly Place
London Road
Manchester M1 3BN

Date

Dear [insert name]

Two week wait (suspected cancer) referrals in your practice

Recently we wrote to you to tell you that your practice had a lower two week wait cancer referral rate than many practices in Greater Manchester.1

It is important to make sure that all patients who may be at risk in [insert location] are being referred. Patients at practices with lower two week wait referral rates achieve worse mortality outcomes than those at practices with higher referral rates.2

As a reminder, you may wish to:

1. Talk to other GPs in your practice to make sure they are referring in line with the NICE guidelines.

2. If you haven't already registered, join www.gatewayc.org.uk and complete the online modules to learn more about when to refer.3

Data on suspected cancer referrals in South Manchester will continue to be collected.

Thank you for helping us to catch cancer early.

Yours sincerely,

Sarah Taylor
CRUK GP Cancer Lead for Greater Manchester

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1 This 's based on data held by Publ'c Health England on age-and-sex standard'sed two week wait cancer referral ratios in 2015-16. Data is taken from practice prof'les at https://fingertips.phe.org.uk/profile/cancerservices (which are adjusted to take into account GP list size, patient age and gender).
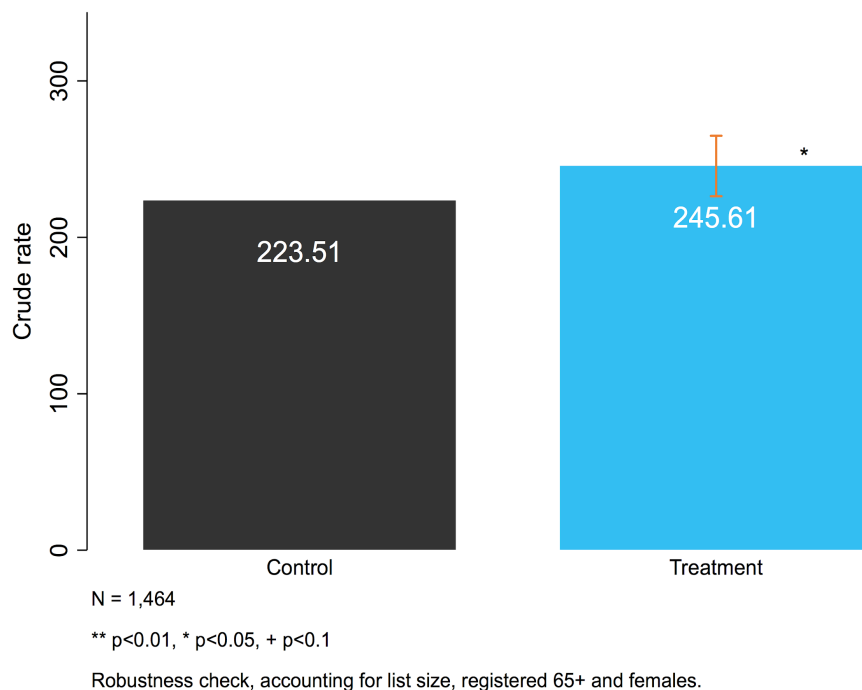2 Møller, H., Gildea, C., Meechan, D., Rubin, G., Round, T., & Vedsted, P. (2015). Use of the English urgent referral pathway for suspected cancer and mortality in patients with cancer: cohort study.
3 These modules carry Continuing Professional Development recognition and are endorsed by the Royal College of General Practitioners.
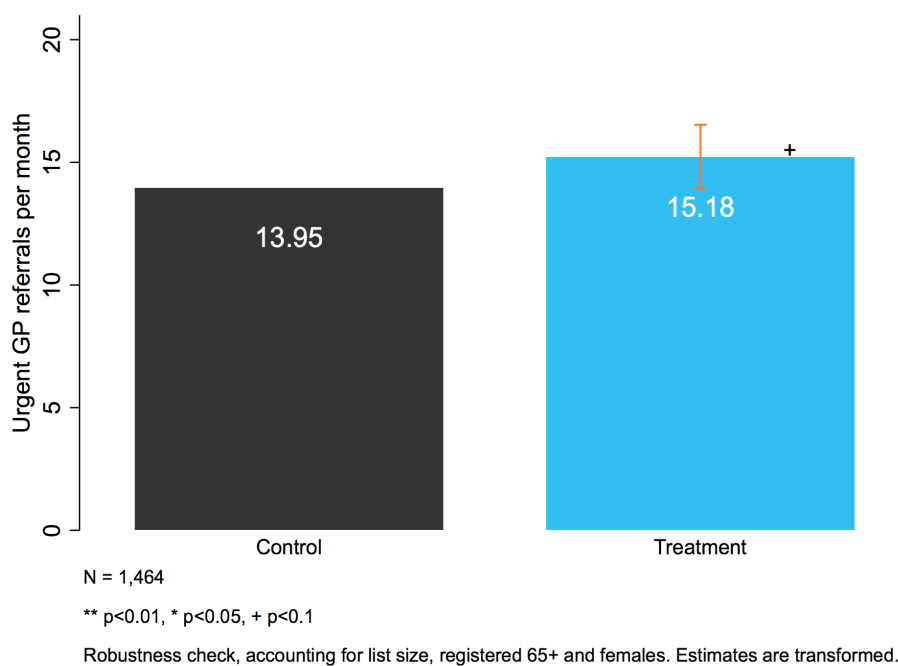
Annex 2. Results with just the simple control group

Figure 5. Crude rate for practices by treatment, using the simple control group (observations just from the trial period)

N = 1,464

** p<0.01, * p<0.05, + p<0.1

Robustness check, accounting for list size, registered 65+ and females.

Figure 6. Urgent GP referrals per month for practices by treatment, using the simple control group (observations just from the trial period)

N = 1,464

** p<0.01, * p<0.05, + p<0.1

Robustness check, accounting for list size, registered 65+ and females. Estimates are transformed.

Annex 3. Literature review

Introduction

This review was produced by the Behavioural Insights Team (BIT) for the Greater Manchester Health and Social Care Partnership (GMHSCP). The aim of this literature review is to draw upon existing research to identify ways in which behavioural insights may be applied to improve GP cancer referrals. This review discusses behavioural biases and their potential solutions looking at how to encourage GPs to increase the number of referred patients.

The principles discussed in this paper are grouped according to the Behavioural Insights Team's "EAST" framework,[59] which is based on BIT's own work and the wider academic literature. The framework suggests that if you want to encourage a behaviour, you should make it **Easy**, **Attractive**, **Social** and **Timely**:

1. **Make it Easy**
   - Harness the power of defaults
   - Reduce the 'hassle factor' of taking up a service
   - Simplify messages
2. **Make it Attractive**
   - Attract attention and cut through the 'noise' of everyday life
   - Design rewards and sanctions for maximum effect
3. **Make it Social**
   - Show that most people perform the desired behaviour.
   - Use the power of networks
   - Encourage people to make a commitment to others
4. **Make it Timely**
   - Prompt people when they are likely to be most receptive.
   - Consider the immediate costs and benefits
   - Help people plan their response to events

Background

Late cancer detection is a major cause of poorer survival rates in the UK.[60] If patients were diagnosed at an earlier stage up to 10,000 deaths could be avoided every year.[61] Approximately one-third of the population will develop a cancer during their lifetime. Early symptom identification usually happens in primary care, but there remains a substantial variation in the urgent referral rates amongst different Clinical Commissioning Groups (CCGs) in England[62] (six-fold in Scotland),[63] which is not fully explained by the variation in population and prevalence of risk factors. In Greater Manchester, the total referral rate remains below the national average (2,742 vs 2,975 per 100,000 individuals as of

2015/2016). This means that in Greater Manchester approximately 6,500[64] more individuals would need to have been referred in 2015/16, if referrals were to have been the same as the England average.[65]

To address the issue around late cancer detection, NICE have recently updated their guidelines for GPs relating to the threshold for making suspected cancer referrals to secondary care.[66] In order to increase the number of GP referrals, the cancer 'risk threshold' based on the positive predictive value (PPV)[67] of symptoms has been lowered from 5% to 3%. In practice, this means a GP should refer all patients who have only a 3% risk of cancer. For illustration, GPs should refer all patients aged over 40 with unexplained weight loss and abdominal pain. Unfortunately data is not available on whether GP practices are referring in line with the NICE guidelines, given the complex nature of identifying whether patients have a 3% risk of cancer. At the least Greater Manchester should aim to be referring at the England average (which would mean making approximately 6,500 more referrals a year), however referring in line with the NICE guidelines could be a lot larger than this.

Evidence suggests that urgent referrals can be an efficient tool of early detection as there is a positive correlation between the two week wait (2ww) referrals and the detection rate. In a cohort study of English practices, higher urgent referral rates were found to be associated with lower cancer mortality: the GP practices with high urgent referrals experienced a 4% decrease in mortality, while the practices with low urgent referral rates had 7% increase, compared to the intermediate referral practices.[68] The most significant positive impact is expected to come from increased identification of "lung and pleural cancers, upper gastrointestinal tract cancer and lower gastrointestinal tract cancer".[69] Yet, higher demand for cancer assessment and treatment could put a strain on the secondary care system, without further support and investment in its resources. For instance, it has been suggested that the number of endoscopies may rise by up to 79% between 2013/14 and 2019/20, which raises questions about the local capacity to actually deliver on the new recommendations.

In order to achieve the increased rate of referral and cancer assessment, it will be key to influence GPs behaviour. The second important aspect is ensuring patients attend the subsequent secondary care appointment. Lastly, the referral process could provide a 'teachable moment' to encourage individuals who experience a cancer scare to adopt healthy behaviours. GMHSCP is interested in all three of these stages and this document outlines the behavioural biases and potential solutions for each of these.

The table below provides an overview of behavioural insights approaches that could be applied at these three points in the cancer referral process. More details on these approaches are outlined throughout this review.

Table 1: Overview of behavioural insights for GP cancer referral

Influencing GP behaviour	
Easy	Clear guideline messaging Remove 'friction costs' of diagnostics
Attractive	Attract attention to the guidelines Loss framing
Social	Audit and peer-feedback Naming and shaming
Timely	Reminders Implementation intentions

SECTION 1: Increasing GP cancer referrals

Actual compliance with the new guidelines on cancer referrals depends on several factors, both practical and behavioural, either at the GP level or due to failures of the administrative system. This section sets out these barriers, followed by potential solutions of how to overcome these issues, using behavioural science approaches.

Barriers to increasing referrals

Clinical guidelines are gradually updated based on the newest medical research. Yet, evidence suggests that the transfer of these guidelines into an actual practice is haphazard. Evidence from different countries suggests that guidelines are on average followed in only 70% of decisions.[70,71] As for cancer referrals, compliance varies substantially across GPs.[72]

The most frequently cited reasons for physician's low compliance with clinical guidelines are the following:

- **Information overload or awareness issues:**[73,74,75,76] On top of a substantial workload, GPs are expected to keep up to date with lots of new/revised

recommendations, often under severe time constraint. Lack of familiarity can be a bigger issue for older professionals, who may tend to rely on their expertise to a greater extent.[77][78]

- **Low motivation and inertia:**[79,80] Especially with preventive guidelines, there are often few incentives and/or penalties in place to influence behaviour[81] and physicians may tend to default to follow their existing routines.[82][83]

- **Acceptance and beliefs about the relevance of new recommendations and their efficacy in improving patients' well-being:**[84,85,86] Lack of trust in research underpinning the guidelines and disagreement with,[87,88] or confusion about, the aims of authorities are important reasons for non-compliance. Related to this is some patients' perception that following the guideline is unnecessary in their case.[89,90]

- **Organisational constraints:**[91] Lack of time and insufficient staff resources can be constraints,[92,93,94] as well as the negative attitudes of peers or superiors[95] (in this case, the (non)receptiveness of secondary care due to pressure on their services).[96]

Beyond the physician-centred barriers identified in the behavioural literature, BIT's exploratory work undertaken as part of this project, suggests further barriers which hamper change may stem from the system itself. These barriers include:

- **Conflicting messages:**[97] The new guidelines prompt GPs to increase their *cancer* referral rates, against the background of the overarching priority to reduce referrals in general to secondary care.[98] We believe this mixed messaging could cause serious confusion. If combined with a lack of awareness about the new cancer referral guidelines, the system may induce GPs to default into a generally low level of referrals.

- **Secondary care attitudes:** In parallel, secondary care is under significant strain which might give the impression that higher cancer referrals are inappropriate. In some situations when referrals have been made, GPs have been reprimanded, patients sent back to primary care or put on a waiting list, instead of being seen through the urgent referral process).[99]

Application of behavioural insights

Taking these barriers into account, BIT have generated the following ideas of how to increase cancer referral rates. These have drawn of the academic literature and are structured by BIT's EAST framework.[100]

1. MAKING IT EASY

Simplify messages

The human capacity to process[101] and retain[102] information is limited, this ability is reduced even more when someone has had to make multiple decisions.[103] GPs have a lot of medical and administrative tasks to attend to - hence, guidelines need to be as clear as possible to be most effective.[104] Behavioural research shows that more specific and precise guidelines are twice as likely to be implemented as guidelines that are vague and long.[105] Nevertheless, even with clear guidelines, passive dissemination alone has often proved to be ineffective.[106,107] A further complication is that the new NICE guideline serves as a mere benchmark for a quite complex evaluation of a patient's health. In other words, while having a 3% cancer 'risk threshold' can sound straightforward, GPs need to make a complex diagnosis, in order to translate the guidance into practice. Whilst data is not available on whether GP practices are referring in line with the NICE guidelines, **in Greater Manchester approximately 6,500[108] more individuals would need to have been referred in 2015/26 to be in line with England's referral average.**

So, while communication about the guideline can be simplified, its implications for actual clinical decision-making are complex and effortful.[109] **Simplifying both the content (for instance, by including easily actionable steps) and access to the guidelines, to increase awareness and understanding, is the crucial first step towards changing GP decision-making behaviour.**

Reduce 'friction'

The behavioural literature shows that 'friction' factors which make a task marginally more effortful have a disproportionate impact on whether people complete an action.[110] In other words, processes which are a lot of 'hassle' to complete are less likely to get done. The way in which choices are presented, known as the choice architecture[111] can help to eliminate these 'friction costs'. For instance, presenting a choice with a clearly predefined and limited set of options[112] greatly increases the likelihood of making an optimal decision.

Experimental evidence shows that this approach works well for clinician's behaviour: clearer, partly pre-filled prescription forms were shown to significantly reduce medication error,[113] while reducing the number of checkbox options improved laboratory test ordering.[114] Reducing hassle by streamlining decisions can also help clinicians with complex diagnostic decisions. For example, using 'decision trees' significantly improved clinicians' accuracy in recognising symptoms of heart attacks or cerebellar stroke.[115] Medical checklists, with clear steps and easily observable targets, help to check compliance with recommended practices and avoid error. [116] Most often used in preoperative[117] and operative care[118] or ICU,[119,120,121] the checklists have been shown to effectively improve diagnostic decision-making in primary care[122] too.

Compliance with the GP cancer referral guidelines could be enhanced by providing a risk factor checklist[123] (for example, listing specific symptoms and risk factors for each cancer type) or decision tree. Fortunately, some tools to simplify interpretation of the guidelines already exist: such as QCancer,[124] an algorithm that provides a cancer risk score based on patient symptoms and risk factors, and The Cancer Symptom Maps[125] which indicates possible cancers based on symptoms and risk factors. An intervention could focus on encouraging greater use of resources such as these.

2. MAKING IT ATTRACTIVE

Personalisation and Salience

Overcoming GPs potential lack of awareness about the details of the new NICE guidelines requires their attention to be captured. The behavioural literature recommends that this can be achieved through personalisation of communication and increasing salience of the desired action's costs and benefits.[126]

Personalisation of communication has proved successful in increasing response rates in a range of situations. Ways of doing this have included: adding a handwritten note (increasing survey response rate[127] or sewer bill payments[128]), using a person's name in text messages (increasing court fines payment),[129] including a customised message (increasing doctors' repayment of outstanding liabilities).[130] Other methods of attracting attention have also been shown to be effective, such as using more attractive envelopes, ink[131] or visually salient stamps.[132] **Make communications to GPs personalised (e.g. through using their name and tailoring the information to them, their GP practice or local area) and making key information salient (e.g. through the use of bolding and colours).**

Framing

The behavioural science literature suggests that people are influenced by the way in which a message is framed, for example whether the message highlights the losses or gains of an action.[133]

People tend to experience a loss as twice as powerful as an equivalent gain[134] – a concept known as loss aversion. [135] For instance, when hypothetical medical decisions were framed in positive terms (probability of living), as opposed to negative terms (probability of dying), people were more likely to opt for a procedure.[136]

In the healthcare context, there is an important distinction between *illness detecting* behaviours, for which a loss-framing is more effective; and *health enhancing* behaviour, which is more responsive to gain-framing.[137] In other words,

while the gain-framing helps stimulate preventive behaviours (such as physical exercise,[138] smoking cessation,[139] sunscreen use[140] or even some surgical procedures[141]), loss-framing is more effective at encouraging early detection behaviours (such as the breast,[142] cervical[143] or HIV screening[144]).

As GP cancer referrals belong among detective behaviours, using a loss-framed message in communication with GPs might be more effective. In practice, the information about cancer referral outcomes should be presented in terms of the human loss (for patients) or the financial loss (for the NHS) that GPs can avoid if late cancer detection is prevented. For instance, GPs could be made aware that low-referring practices tend to have higher mortality rates.

The new cancer referral NICE guideline reduces the risk threshold ratio from 5% to 3%, with the aim of increasing the number of patients receiving further assessment. This change needs to be understood within the context of the NHS Cancer Strategy, which estimates that the volume of some cancer tests needs to grow by 70-80% over the next five years.[145] As a result of the lower risk threshold, GPs are expected to refer more people with a lower likelihood of having cancer. As a result, the share of positive cancer cases among referrals (the conversion rate – the precision of referral) is automatically set to fall.[146] This in turn may negatively affect GPs perception about the gains and losses associated with their referrals. They may gain the impression that the effectiveness of increased referral is low, while the higher flow of patients further encumbers the secondary care. **To counteract this perception, GPs should be informed that the higher-referring practices achieve better mortality outcomes than the low-referring ones.[147]**

Physicians' reluctance to increase referrals may stem from their focus on the present costs and underestimation of the costs of late treatment.[148] Hence, we could highlight the costs of late cancer detection: both the human costs, in terms of the lower likelihood of successful treatment and survival; and financial costs to the NHS for more extensive treatment. Previously, this kind of a 'cost message' method was successful at encouraging physicians to reduce the number of unnecessary diagnostic tests (reducing demand by 32% without compromising patient outcomes),[149] or to reduce the number of missed hospital appointments (see below for detail).[150] As for the urgent referral, GPs could be informed about the estimated costs of non-referral (e.g. computed as a difference between the costs of early and late detected cancer). Arguably, this would be a weaker message compared to a more explicit cost of an extra test or a missed appointment. **That being said, a cost message stressing the human and financial costs associated with late detected cancer could be considered.**

3. MAKING IT SOCIAL
Social norms and feedback

Feedback has been shown to be a reliable tool for influencing physicians' behaviour.[151] The effect size seems to depend on the context, the method of feedback and the specific behaviour being targeted. Feedback has been shown to be more effective in the case of low baseline performance, low complexity of the target behaviour (e.g. test or drug ordering),[152] high feedback intensity (e.g. repetitive feedback in both verbal and written formats, and from an influential messenger – supervisor or colleague) and in combination with other interventions.[153]

Humans are social animals and the behaviour of our peers heavily influences our actions. Recent behavioural research points at the potential of using adherence to social norms to upscale the traditional forms of feedback. Social norm messages, especially 'descriptive norms' – which make people aware of what the majority of people are doing - and highlight when people are outliers to the social norm have proved highly effective in encouraging people to adjust their behaviour.[154]

BIT has successfully used social norm feedback a number of times, most recently to alter physician behaviour. Unnecessary antibiotic prescriptions decreased when GPs were informed that their practice was prescribing at a higher rate than the majority of other practices in their NHS Local Area Team.[155] Peer-comparison feedback has proved effective in several other experiments aimed at reducing prescription[156] or excessive diagnostic test use.[157] **In this context, providing social norm feedback to GPs on how their cancer referral rates differ from other practices could help to change behaviour.**

In the GP referral context, feedback interventions have delivered sizeable results. That being said, these interventions usually focus on *decreasing* referral: providing regular feedback on benchmark referral rates reduced referrals by 20%,[158] while more intensive weekly peer review discussions reduced referral rates by up to 50%.[159] It should be noted that peer feedback has to be carefully designed, mindful of potential 'backfire effects' if a given physician's performance is already better than average. To prevent a GP who is already referring at the correct rate from worsening their performance, a further 'injunctive norm' could be used – e.g. acknowledging and praising the individual for better than average performance.

'Naming and Shaming'

Publicly available social norm feedback, which can sometimes be presented as 'naming and shaming' has been proven to be effective in some healthcare contexts. For instance, using public reporting to inflict reputational damage to a group of

poorly performing US hospitals motivated quality improvement of services.[160] Key for 'naming and shaming' to work is to design a ranking system that can be easily understood, is widely disseminated and accessible to the public, with follow-up reports on performance evolution over time.[161] The 'star system', introduced to rank health care providers in the UK, managed to satisfy all these criteria[162]– and helped to substantially reduce hospital waiting times in England, compared to Wales where such a system was not put in place.[163] Similarly, stopping publication of the school league tables in Wales lead to a significant deterioration in school performance.[164] Accessibility of this kind of feedback can be increased thanks to the spread of digital platforms.

The behavioural rationale behind 'naming and shaming' is two-fold.[165] Firstly, the public exercises direct pressure to change, as poor ranking increases the salience of providers' accountability. Secondly, 'naming and shaming' works on a private, internal level, too.[166] Research shows that ordinal ranking within a comparison group can be more important than relative or absolute performance.[167,168] 'Naming and shaming' amplifies the importance of ranking by a spotlight effect.[169] It points at behaviour inconsistent with individual's general self-perception as moral and honest[170] - or in this particular context, their perception of themselves as hardworking public servants.

Yet, 'naming and shaming' can backfire in the situations when the adjustment of performance is not fully within the discretion of a 'shamed' individual. Unfortunately, GP referral may fall into this category, because of several factors. For instance, low number of cancer cases and random case mix in a given year make it difficult to attribute a low referral solely to GP performance. Patients with some backgrounds (socio-economic, cultural) may be less likely to visit their GP, while the secondary care in certain areas may be less receptive and more vocal about the urgently referred patients.

For GP cancer referrals, 'naming and shaming' may not be an appropriate method of behaviour change if adjustment of performance is not fully within the discretion of individual (e.g. due to the random case mix) and it may have a demoralising effect. Arguably, this kind of reasoning might have previously led to the abandonment of publishing of GP practice level data on cancer referrals (even though it still remains accessible[171]).

4. MAKING IT TIMELY

Timing is often overlooked, yet it is a vital aspect of the policy-making process. People's behaviour can vary significantly depending on when information is received.[172] Hence, timely prompts could help enhance GPs' compliance, if used at

the right moment. As discussed previously, primary care physicians are likely to be overwhelmed by information, potentially losing track of the change in guidelines – or simply, not having it on their mind at key moments.

Reminders

The behavioural literature have found timely prompts to be effective in a number of different situations: advance-warning text messages to improve court fine payment before bailiff visits,[173] using the moment individuals are writing their will to increase charitable giving[174] or milestone moments to increase attendance of cancer screening, for example.[175] Reminders - via a letter, a text or a phone call – are generally successful in helping people to remember to perform a particular action.

In the medical context, evidence shows that reminders - provider prompts, computer-assisted treatment plans, and patient prompts - are the single most effective tool for changing clinicians' behaviour: with the median improvement effect of 13%,[176] they altered clinician behaviour in 75% of trials according to one review.[177] In one trial, researchers placed paper stickers in the shape of a breast on the patients' records with space for GPs to record mammography referrals and completion. The sticker acted as a reminder for GPs and turned out to be more effective in increasing referrals than both individual feedback and financial incentives.[178] Computer-based reminders for clinicians have also proved effective for various clinical decisions: preventive care (e.g. vaccination),[179] obesity treatment,[180] diabetes management[181] and cancer screening.[182]

For test ordering and medication dosing, the size of improvement in process adherence ranges from 3-6%,[183] if the reminders do not directly engage the physician. But reminders which require an active choice[184,185] can achieve three times the effect of a passively displayed message alone.[186] As well as requiring an active choice, the power of reminders can be enhanced by the use of deadlines. Deadlines introduce a timely effect and increase the perception of a time limited opportunity, and hence enhance the desirability of an action. In the case of GP referral, GPs could be instructed to improve their referral numbers by a certain deadline.

Reminders could be incorporated into the GP cancer referral process. For example, through the introduction of timely prompts on the GP IT system (EMIS) or through letter reminders highlighting how their referral rate compares to the national average and the NICE objective of increased referrals.

Implementation intentions

There is often an important gap between people setting an intention and fulfilling their goals. Behavioural research suggests that creating a concrete plan of action that specifies when, where and which actions need to be taken can help bridge this gap between intentions and outcomes.[187] In practice, this means people should be encouraged to come up with a specific plan of action, ideally written down. Evidence shows that this kind of advanced plan-making significantly improves the uptake of influenza vaccinations[188] and the attendance of colonoscopy appointments.[189] Another approach is to identify specific barriers beforehand and prepare a plan to overcome them. For instance, if one obstacle to a healthy diet is a tendency to impulsively choose a more unhealthy option for lunch in the canteen, we can plan to pre-order our lunches in advance.

For repetitive tasks, implementation intentions can help to substitute a prior undesirable habit with a new habit.[190] This creates an automated sequence of behaviour, activated by situational cues in the environment, which triggers the 'if-then' implementation intention. For instance, an implementation intention may be 'if I am hungry, I will eat an apple' which may be designed to overcome a habit of eating a chocolate bar to satisfy hunger.

To date, implementation intentions have not yet been tested in influencing GP behaviour, but they could be used as part of a reminder or feedback intervention. With respect to compliance with the NICE guidelines, implementation intentions could help achieve the formation of new habits.

Summary

This section summarises the behavioural insights approaches outlined throughout this literature review that could be applied to increasing GP cancer referrals.

 GPs are exposed to a substantial amount of information, as well as a heavy and complex workload. Hence, a clear and intelligible guideline is much more likely to get noticed and implemented. 'Friction costs' could be reduced by breaking down complex processes, narrowing down the options to be taken or creating handy checklists and decision trees to guide physicians throughout the decision making process of whether to make a referral. The choice architecture of the e-Referral system's interface could also be adapted to make the process intuitive and easy, however the feasibility of this would need to be explored. Lastly, we need to be mindful of the current behavioural default favouring low GP referral which may partially bias the cancer referral rate downwards.

Simplified, personalised and visually compelling communication about the NICE guidelines could be a first step for achieving increased referrals. Financial incentives are an effective tool, but have the potential to crowd out intrinsic

motivation or increase referrals irrespective of actual need. Loss framing has proved successful with illness detection behaviours, hence it could enhance compliance, for example by making the human and financial cost of late cancer detection salient.

Feedback can be a reliable instrument for influencing physicians' behaviour, even if the magnitude of the effect can be small. When letting GPs know how they perform compared to their peers, a powerful tendency towards conformity might prompt them to adjust their behaviour towards the social norm.

Reminders remain a reliable tool in achieving physician behavioural change. Automatically-generated computerised reminders are improving and becoming increasingly sophisticated and insightful. GP cancer referrals could be increased by a targeted use of timely prompts, especially if they require an active choice – i.e. physician engagement with the reminder or a deadline. Alongside this, implementation intentions could help to bridge GPs intention to follow the guidelines with the actual implementation.

Annex 4. Technical appendix

Randomisation

The trial period lasted from August 2017 until January 2018. For each GP practice, we randomly selected a month during this period when they would receive the intervention letters. Practices are considered "treated" during this month that they receive letters and all following months.

This randomisation was stratified by CCG and whether or not the practice was in the bottom 30% of referrers nationwide.

Balance checks

Each month during the trial, new practices received the letters and moved from control to treatment. We therefore check for imbalances between treatment and control on practice list characteristics for each month during the trial period. These characteristics are: the number of patients on the practice's list; the proportion of patients on the list that are aged 65 and over; and the proportion of patients on the list that are female.

The table below presents p-values from t-tests of comparisons between treatment and control practices for each month of our trial period. We define imbalances between treatment and control as any t-test with a p-value of less than 0.10.

We find one imbalance in August (on age composition), and one imbalance in November (on gender composition). However, since we make 15 comparisons between treatment and control, we would expect there to be at least one significant difference due to random chance. Moreover, the fact that each practice appears in both treatment and control at some point during our trial helps alleviate potential concerns about imbalance.

We are therefore confident that our randomisation has produced groups that are fairly comparable. To ensure our results are robust to these factors presented below, we control for them in our analysis (see Analysis model section below).

Month	List size	Proportion 65+	Proportion female
August	p = 0.92	p = 0.09	p = 0.21
September	p = 0.88	p = 0.79	p = 0.14
October	p = 0.48	p = 0.44	p = 0.15

November	p = 0.17	p = 0.66	p = 0.05
December	p = 0.89	p = 0.87	p = 0.17

Analysis model

In stepped-wedge trials, one drawback is that treatment delivery is confounded with time. In other words, earlier months like August and September have very few practices that have been treated, while later months have many practices that have been treated. If there are time trends which affect our outcome, and if we do not account for these time trends, the treatment effect we estimate may be biased.

We address the issue of the confounding of treatment with time by controlling for month fixed effects. This controls for the prevailing conditions at the time to account for the correlation between treatment and time. The way it controls for these differences is quite flexible: other techniques, like controlling for time trends, require more assumptions about the functional form of the relationship between the outcome and time, and may not account for seasonal effects well.

For our primary analysis (outcome = crude referral rate), we use Ordinary Least Squares regression. Our model takes the following form:

$$RR_{it} = \alpha_t + \beta_1 T_{it} + \beta_2 A_i + \beta_3 S_i + M\,\Gamma + CCG_i\,\Theta + \beta_4 E_i + e_{it}$$

Where:

RR_{it} is a the crude rate for GP practice i at month t;

T_{it} is a binary treatment indicator, equal to one if the individual GP practice i received the intervention during or before month t (equal to zero otherwise).

A_i is the proportion of the practice list aged over 65 (for practice i)

S_i is the proportion of the practice list that is female (for practice i)

M is a vector of month dummy variables (one for each month)

CCG_i is a vector of CCG dummy variables (one for each CCG)

E_i is a binary variable capturing whether practice i fell into the bottom 30%

of GP practices in terms of referrals[1]

α_t is the constant, and

e_{it} is the error term. (For standard errors, we use heteroskedasticity-robust standard errors).

For our secondary analysis (outcome = referrals per month), we use a Poisson regression. As exploratory analysis, we use a negative binomial regression model. In these specifications, we add a continuous variable to the equation stated above to account for the list size (e.g. how many people are registered at the GP).

Data

In our analysis, we have one observation per practice per month.

All regressions include data from the pre-trial months of January – July 2017. We include this data in order to improve our statistical power.

In all graphs, we present the control mean from the trial period (e.g. August 2017 – January 2018).

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[1] Note that practices received a slightly different letter depending on where they fell within this category; see Annex 1 for more information.

Endnotes

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[49] We cannot determine whether the 5 missing practices did not refer anyone or we are simply missing their data. We have one missing from each of these CCGs: Central, Tameside & Glossop, Bolton, Stockport and Bury. We could not obtain the demographic data for 1 more practice.

[50] Analysis of the data by BIT would require additional resource above that allocated for this trial.

[51] PHE Cancer data, Greater Manchester's annual crude referral rate in 2016/2017 of 3003 divided by 12 gives us 250 per month.

[52] We estimate that about 75% of the effect was driven by the low referrers (i.e. 50% of our sample).

[53] Our calculation: 244 GP practices referring 1.5 more person for on average 3.5 months, equals 244*1.5*3.5, so 1,281. With an average conversion rate (i.e. the proportion of patients referred who are subsequently diagnosed with cancer) of 7% in Greater Manchester (PHE Cancer Data, 2016/2017), this mean that 90 cancer cases would be diagnosed early (1,281*0.07).

[54] Our calculation: 244 GP practices referring 1.5 more person each month over a year (244*1.5*6) equals 2,196 additional patients referred. With an average conversion rate (i.e. the proportion of patients referred who are subsequently diagnosed with cancer) of 7% in Greater Manchester (PHE Cancer Data, 2016/2017), this means 154 cancer cases would be diagnosed early.

[55] https://www.cancerresearchuk.org/sites/default/files/saving_lives_averting_costs.pdf Our calculations: Cost of stage 4 cancer (average of colon, rectal, lung and ovarian): £13,123 - Cost of stage 1 cancer (average of above): £ 5,276 = Savings of £ 7,847 per cancer case.

[56] Our calculation: 3716 GP practices below the England average referring 1.5 more person each month over a year (3716*1.5*6) equals 33,444 additional referrals. With an average conversion rate of 7.6% in England(PHE Cancer Data, 2016/2017), this gives us 2,542 additional early cancer diagnoses.

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[58] Our calculation: 154 extra people referred in Greater Manchester over 6 months with a saving of £7,847 per case, minus the cost of intervention (£1,220), equals (154*7,847)-1,220 =1,207,218. The low referrers are responsible for 75% of our effect, hence 1,207,218*0.75 equals 905,413 .

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