

# From data to decisions? Exploring how healthcare payers respond to the NHS

## Atlas of Variation in Healthcare in England

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## Abstract

**Purpose:** Although information on variations in health service performance is now more widely available, relatively little is known about how healthcare payers use this information to improve resource allocation. We explore to what extent and how Primary Care Trusts (PCTs) in England have used the NHS Atlas of Variation in Healthcare, which has highlighted small area variation in rates of expenditure, activity and outcome.

**Methods:** Data collection involved an email survey among PCT Chief Executives and a telephone follow-up to reach non-respondents (total response: 53 of 151 of PCTs, 35%). 45 senior to mid-level staff were interviewed to probe themes emerging from the survey. The data were analysed using a matrix-based Framework approach.

**Findings:** Just under half of the respondents (25 of 53 PCTs) reported not using the Atlas, either because they had not been aware of it, lacked staff capacity to analyse it, or did not perceive it as applicable to local decision-making. Among the 28 users, the Atlas served as a prompt to understand variations and as a visual tool to facilitate communication with clinicians. Achieving clarity on which variations are unwarranted and agreeing on responsibilities for action appeared to be important factors in moving beyond initial information gathering towards decisions about resource allocation and behaviour change.

**Conclusions:** Many payers were unable to use information on small area variations in expenditure, activity and outcome. To change this what is additionally required are appropriate tools to understand causes of unexplained variation, in particular unwarranted variation, and enable remedial actions to be prioritised in terms of their contribution to population health.

## 1. Introduction

Over the past 40 years, medical variation research has largely focused on the identification and measurement rather than the management of variations in healthcare. Studies in particular from North America and increasingly also from other countries show that medical practice varies across regions, and that the magnitude of these variations cannot solely be explained by differences in demographic and illness profiles of regional populations [1–4]. Evidence of substantial variations in medical practice thus challenges the core societal objective of many health systems to provide equal access to safe and effective health care for equal need [5,6]. But while healthcare payers now have unprecedented access to data about variations in health service utilisation and performance, there is little research on how payers might actually use this data to improve resource allocation and outcomes. Studies so far have focused on shared decision making [7,8] and behaviour change interventions at a hospital level [9–11].

However, the ways in which regional variations data might inform resource allocation at a population level by those responsible for the management of the system, have not been explored. In this article we ask how a healthcare payer in charge of planning and purchasing health services for a geographical population might move from data awareness to decisions to improve quality and value in healthcare. Realising this basic quest may not be straightforward, as Glasziou and Haynes [12] point out in the context of guideline implementation, because the path from research to improved outcomes poses a series of hurdles to clinical and managerial decision-makers. Prior to acting on the research findings, they need to be aware of and accept the data, perceive the data as applicable to their situation, and be able to use the data. These barriers seem pertinent to research use in general [13]. Data on medical practice variations create the additional conundrum that, as opposed to a guideline, they rarely tell the user what to do.

There appear to be two general pathways for taking action on medical practice variation. The two principal aims of performance indicator systems stated in the literature relate to internal and external control and accountability [14,15] and formative learning [16,17]. Similarly, Carter et al. [18] distinguish between “dials” that show achievement against targets, and “tin openers” that simply indicate potential problems and then lead to in-depth analysis and action. For both types of indicators, action would require agreement on who is responsible for leading investigation and change, and how to identify and remedy the causes underlying those identified variations. A key feature of classic variations research, as presented in *Atlases of Variation* [19–21], is however the essential ambiguity over the meaning of observed variations. Generally this data does not allow for direct inferences from relative rates of activity to good or bad performance of the entities under investigation. As optimal performance is not identified, this data thus differs from benchmarking where all organisations are compared with the ‘best’ performer [22]. In

this case, geographic variations data is likely to serve as a “tin opener” rather than as a “dial”. As Evans [5] pointed out, dealing with the uncertainty how to address practice variations would thus first require defining and operationalising which part of the observed variations, if any, is unwarranted.

Fig. 1 suggests a model to frame the process of translating evidence of geographic variations into decisions to shape resource allocation and planning. This model comprises two main stages. The first stage is informed by the literature on guideline implementation [12] and research use [13] and consists of a series of prerequisites for staff in a healthcare purchasing organisation to be in a position to use such evidence: that they are aware of its existence, trust the information it provides, can see its relevance to them and are capable of using this information. The second stage is structured around the pathway for using the information [5]: identifying unwarranted variation; agreeing who will be responsible for action; identifying causes and appropriate remedies; and making decisions on resource allocation.

This model frames the questions our research sought to answer. As a case study we used the NHS Atlas of Variation in Healthcare, which in its first edition from November 2010 highlighted variation in expenditure, activity and outcomes across a wide range of clinical areas at the level of Primary Care Trusts (PCTs), the local payers in England [20]. Our aim was to examine: (1) the extent to which PCTs met the prerequisites for using the NHS Atlas; and (2) how they were using the NHS Atlas in local decision making. We emphasise that most of this study was done before the publication of the second edition of the Atlas. We would expect awareness and capacity to use information on variations to increase over time and see this study as helping with both.

## **2. Materials and methods**

### **2.1. Setting**

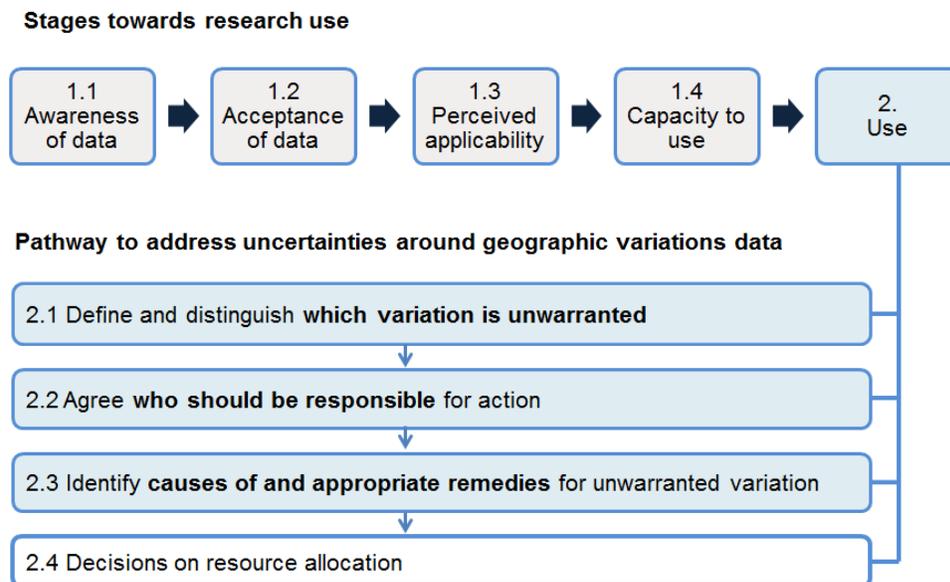
At the time of study (July 2011–March 2012), the planning and delivery of health services in the National Health Service (NHS) in England was entrusted to 151 PCTs. They received a fixed financial allocation for their local populations (median size 284,000, ranging from under 100,000 to over one million people [23]) with reference to a national resource allocation formula, that aimed to estimate an equitable distribution of funds against needs across the country [24]. Within allocated resources, PCTs were responsible for: improving health and reducing health inequalities, securing access to comprehensive, effective and efficient services, and appropriately responding to needs of their populations. They were responsible for commissioning health services across all service sectors (public health, primary care

services including dentistry, pharmacy and optometry, community health services, social care, mental health, elective and acute hospital care) and were required to engage in [25,26]:

- 1) **Strategic planning:** assessing needs, reviewing service provision, deciding priorities.
- 2) **Procuring services:** designing services, shaping the structure of supply, managing demand for services.
- 3) **Monitoring and evaluation:** supporting patient choice, managing performance, seeking public and patient views.

The English NHS at the time of study was under expenditure constraints and required to generate efficiency savings of about 4% of total annual resources every year between 2011 and 2015, in order to meet rising demand for health services [27]. The proposed organisational reform outlined in the government White Paper Equity and Excellence: Liberating the NHS of July 2010 [28], entailed the abolition of PCTs in April 2013, to be succeeded by general practitioner-led clinical commissioning groups. Thus, although information on variations has potential to help managers understand and focus on areas for efficiency savings in their local health economy, to be invested in areas of higher value, PCTs were likely to be distracted by their looming abolition.

**Fig. 1.** A framework for moving from data on geographic variations to resource allocation decisions.



Sources: adapted from [5,12].

## 2.2. The NHS Atlas of Variation in Healthcare

Since Glover's seminal study on variation in tonsillectomy rates among British school children in 1938 [29], research has repeatedly documented regional variation in medical practice in England [3,30–34]. Our focus was specifically on the NHS Atlas of Variation in Healthcare, because this Atlas for the first time highlighted variation in expenditure, activity and outcome across a large range of clinical areas at PCT level and was thus likely to be particularly relevant within a commissioning context. Inspired by the U.S. Dartmouth Atlas, the NHS Atlas was developed by the Department of Health's national Quality, Innovation, Productivity and Prevention (QIPP) programme, a large scale transformational programme intended to address these four major challenges confronting the NHS [27], through the Right Care workstream. The first NHS Atlas, published in November 2010 [20], consists of 34 maps of variation (2011 Atlas: 71 maps [35]). These maps represent the relative position of PCTs in quintiles across selected indicators, standardised for age and sex. The topics were selected in consultation with the National Clinical Directors as being of importance to their clinical specialty; for instance in terms of volume, cost, patient outcomes, or recent trends in delivery patterns.

The NHS Atlas was primarily targeted at those who manage and allocate resources for healthcare; commissioners and clinicians. Its objective was to provide information in ways that would stimulate local investigation into unwarranted variation in the NHS, its underlying causes, and remedial action. Given the complexity and variety of the different kinds of variations reported in the NHS Atlas, there was neither ranking nor evaluation of the performance of NHS organisations; nor are there any links with (external) financial incentives. This differs from NHS star ratings (2000–2005), and the Annual Health Check (2006–2009) which gave annual summative aggregate scores of performance [36]; and more recent care quality targets that clearly define successful achievement [37]. The NHS Atlas carefully avoids rating PCTs as 'good' or 'bad' performers based on high, middle or low indicator values. Targets or 'optimal' rates of activity are not defined. However, in the wide-ranging media echo to the NHS Atlas, several think tanks, academics, charities and politicians interpreted the magnitude of regional variations as indications of unwarranted variation, and urged PCTs and the government to take action [38–40].

## 2.3. Study design

The first part of data collection involved an email survey with open-ended questions among the Chief Executives of all 151 PCTs. Given the low response (18 of 151 of PCTs, 12%), non-respondents were followed-up by telephone (total response: 53 of 151 of PCTs, 35%). The survey was designed to gain an

indicative overview whether the Atlas was used, why or why not, in what form and by whom, and to identify interview partners. The second part of the research involved interviews based on a semi-structured protocol, in order to probe themes emerging from the survey.

Interviewees were chosen if they had used the Atlas or, if nobody in the organisation had used it, based on their job roles relevant to using such data. Both users and nonusers of the Atlas were interviewed as representatives of their organisations. If they were unsure whether others had used the NHS Atlas they asked other colleagues if they had. If at least one person reported using the NHS Atlas, the PCT was recorded as a 'user'. A working definition of 'use' of the Atlas was that PCT staff reported some form of engagement with the material. Before the interviews, permission for tape-recording was obtained. In total, 45 interviews with senior to mid-level executives involved in public health, commissioning and knowledge management from 29 PCTs were undertaken face-to-face or via telephone between October 2011 and March 2012. The interviews were transcribed verbatim and, guided by the conceptual framework, reviewed iteratively with the survey results to identify and confirm emergent themes. Themes were analysed using the Framework approach [41], a matrix based method to construct and organise an index of central themes and subthemes, and thereby facilitate a synthesis of the findings by theme and by respondent. The recruitment of interviewees was stopped when a stage of saturation was reached; that is when no new themes emerged [42].

### **3. Results**

#### **3.1. Prerequisites for using the NHS Atlas**

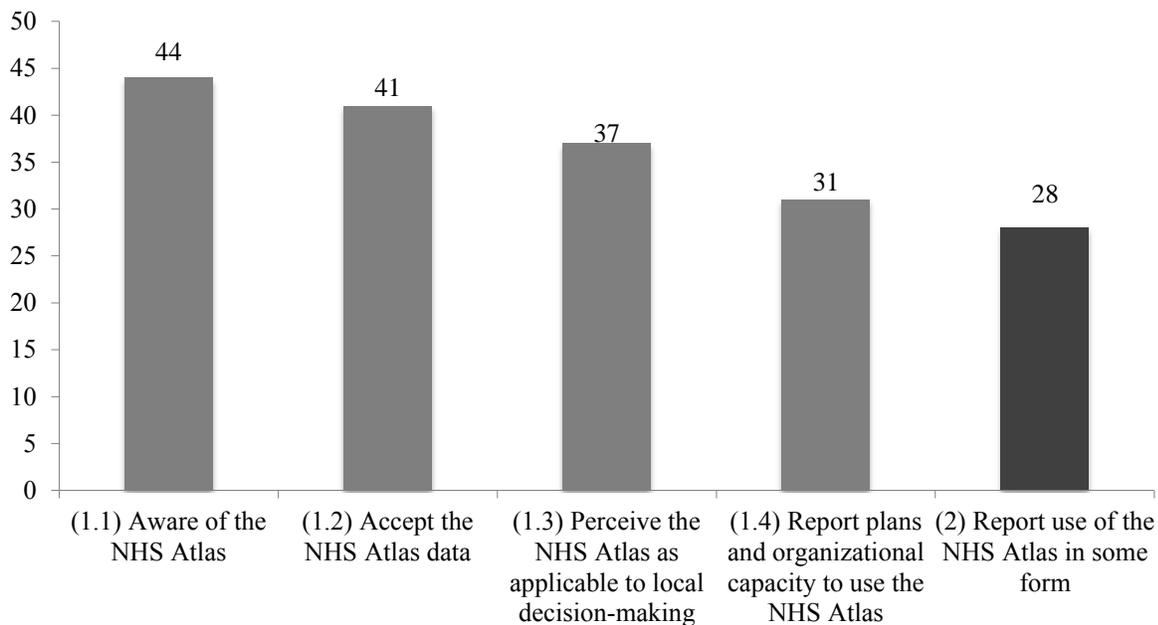
PCTs can be classified into four groups of 'non-users' (groups 1.1–1.4), according to the account they gave for not using the NHS Atlas, and 'users' (group 2). As the survey results (Fig. 2) suggest, the number of PCTs appears to decline along these stages from awareness to actual use. Emerging themes from the qualitative analysis (Table 1) point to possible underlying reasons, as reported by PCT staff.

Most PCTs were aware of the NHS Atlas (44 of 53 PCTs, group 1.1). Those who had not been aware of the Atlas, despite it being distributed to all PCTs and the relatively large media echo following its publication, referred to being distracted by the structural reorganisation which reduced their attention to information about healthcare delivery.

Group 1.2 was aware of and accepted the NHS Atlas data as generally valid and reliable, although several respondents cautioned about taking the data at face value. In contrast, staff in three PCTs perceived these regional comparisons not as credible due to differences in local management processes, for example in

coding patterns, and some noted their preference to work with local data. All PCT respondents recognised unwarranted practice variations as a challenge. This challenge was frequently linked to the NHS-wide economic constraints and the need to meet rising demand with fewer resources. However, only 37 PCTs (group 1.3) perceived the Atlas as applicable to their local situation. The main reasons for limited applicability were the difficulty of (i) inferring from observed variations what ought to be done along care pathways and (ii) discerning the relationship between relative rates of activity and absolute scale of impact on population health outcomes and total service expenditure. Six PCTs who viewed the NHS Atlas as applicable to local decision making noted organisational constraints to use. In particular, annual priorities for action had already been agreed prior to publication of the Atlas and PCTs lacked staff capacity to tackle new issues. Among 31 PCTs (group 1.4) who reported the capacity for using the Atlas, three PCTs had only recently been able to make this capacity available. These PCTs were planning to use the second NHS Atlas published in December 2011. Overall, at the time of study, just over half of the respondents (28 of 53 PCTs, group 2) had thus translated the perceived need to tackle regional variations into actual use of the NHS Atlas.

**Fig. 2.** Survey responses to the NHS Atlas (n = 53 PCTs).



### 3.2. Using the NHS Atlas in local decision making

Among the users (group 2; 28 of 53 PCTs), a first basic response to the NHS Atlas was to review all maps in order to gain an overview over the PCT's relative position across a range of indicators. PCT staff seemed predominantly concerned to understand where they were 'outliers'; indicators on which the PCT was in the highest or lowest quintile of rate of expenditure, activity or outcome relative to the national average. Qualitative themes on uses of the NHS Atlas in local decision making processes, and factors complicating and enabling its use, are illustrated in [Table 1](#) and explained in more detail below.

The initial interpretation of 'outlier' positions tended to be indicative rather than prescriptive. As respondents noted, the outliers shown in the NHS Atlas helped them to identify areas to focus on in their local health economy. Several interviewees referred to the concept of triangulation inasmuch as a view on variation complemented various other national and local sources of data (e.g. workforce, financial, activity and outcome data insofar as it was available). In their entirety, these multiple pieces of evidence could then help to frame strategic challenges for the PCT. As public health staff in twelve PCTs pointed out, the NHS Atlas supported learning about strategic problems both internally and externally with clinicians. While the Atlas sometimes confirmed existing local suspicions rather than providing new information to PCT staff, map-based visualisations did help to communicate this understanding to clinicians who were not familiar with the statistical data, thus placing it on the management agenda. Messages from the NHS Atlas were then locally disseminated through newsletters, the Annual Public Health report, integration into evidence-into-practice packages or presentations to clinicians.

Beyond the description and illustration of variations, the evaluation of what were perceived as unwarranted variations appeared to be painstaking. As interviewees explained, they attempted to draw as much as possible on existing outcomes research and cost-effectiveness guidance. Further indications of unwarranted variations related to perverse incentives induced by payment systems, and hospital admissions perceived to be avoidable with timely diagnosis and treatment in primary care. For most PCTs, a position in the highest or lowest quintile served as but one indication of unwarranted variation, that was further explored with other data sources. In turn, however, many PCTs associated a position in the medium quintile with a lower priority for any action. In some PCTs, this was because a position around the national average was, implicitly, equated with an appropriate rate of activity. These PCTs appeared to take the NHS Atlas at face value, rather than as a prompt for further investigation. In other PCTs, in contrast, respondents conceded that limited staff capacity prevented them from exploring all possible sources of unwarranted variation. These respondents pointed out that, although a position in the medium quintile might not be optimal, they had decided to start exploring areas where they were outliers,

relative to peers, because these areas might provide larger opportunities to reveal wasteful spending or perceived underinvestment. While PCT respondents confirmed the difficulty of defining and identifying unwarranted variation, they also pointed out that this challenge had to be considered within the wider problem of where they should start in improving resource allocation by investing limited funds more wisely in order to improve outcomes.

Agreements on responsibilities for action appeared to be decisive in using variations data for local decision making. For the few target-like indicators in the NHS Atlas, where existing clinical guidance would stipulate preferably high values, six PCTs emphasised the importance of involving clinicians at an early stage, as they would ultimately allocate healthcare resources. In two PCTs, for example, maps of variation showing less than 30% of patients with diabetes had received nine key care processes, as opposed to over 70% in the 'best' PCT, helped to convince general practitioners that not only performance was unacceptably poor, in relative and absolute terms, but also that improvements were possible. PCT staff perceived the NHS Atlas as a "catalyst which motivated clinicians to take action sooner than they might have done otherwise" (Director of Commissioning, PCT22).

Among the 28 PCTs where staff had reviewed the Atlas, 18 engaged in further in-depth analysis of possible causes underlying variation. An essential factor appeared to be leadership; both in terms of support from the executive management and local champions from the PCT and clinicians who took the analyses forward. The development of structures to use data on variations also appeared to be important. Some PCTs noted the increasing role of Priority Forums to engage multiple stakeholders in order to improve value, in terms of the relationship between expenditure and health outcomes, in resource allocation. At an operational level, these PCTs had also established regular meetings with providers from primary and secondary care, in order to agree local objectives for action and foster continuous monitoring and feedback against these objectives at hospital or practice levels. In contrast, in PCTs which did not report further action on the observed variations, interviewees also frequently noted a lack of Executive and Board level support, public health and analytical capacity to address the observed variations.

[Table 2](#) exemplifies some of the different logics for moving from variations data to in-depth analysis and decisions about resource allocation. An approach to understanding variations in high-level aggregate indicators, such as total spending on a disease area as in PCT A, was to break down the data into the underlying procedures and settings of care. The objective was to identify the specific drivers of expenditure in a local health economy. Understanding variations in activity involved the exploration of specific hypotheses regarding commissioning policies and supplier behaviour, as in PCTs B and C.

Depending on the particular causes identified as underlying variations in practice, PCTs decided whether changes in planning, contracting or service design would be necessary.

**Table 1.** Qualitative responses to the NHS Atlas

<b>Theme</b>	<b>Sub-theme</b>	<b>Example/illustration</b>
<b><i>1.1. Awareness of the data</i></b>	Distraction due to organisational reforms	<p>“The development of CCGs [clinical commissioning groups, successors of PCTs as from April 2013] left little room for anything else, such as improving services . . . we were mainly concerned with getting the new structures going”</p> <p>(Chief Operating Officer, PCT4)</p>
<b><i>1.2. Acceptance of the data</i></b>	Local management processes seen as too different	<p>“If you look at geographic differences in spending patterns, there may be distortions, in the ways costs are allocated . . . for example PCT spending on cancer may differ depending on the ways hospice costs are taken into account”</p> <p>(Director of Public Health, PCT7)</p>
	Preference to work with local data	<p>“I prefer to work with raw and more detailed local data, for many reasons. . . the data in the Atlas has been transformed and aggregated, which makes it sometimes difficult to understand what is in, and what is out . . . surely you can look up some of these issues in the meta-data [a file published by Right Care detailing the data sources and calculations of Atlas data] . . . but there is also the time lag of 1-2 years in the Atlas data, which is understandable as it takes time to do an Atlas, but at local level we have moved on since then, and have more recent data in some areas”</p> <p>(Information Analyst, PCT14)</p>
<b><i>1.3. Perceived applicability of the data</i></b>	Single indicators versus pathways of care	<p>“The Atlas is rather narrow in its focus on single indicators . . . what does this mean for the entire pathway, from community, primary to hospital care . . . is this variation in a single indicator actually meaningful, what does it mean for the pathway?”</p> <p>(Public Health Analyst, PCT3)</p>
<b><i>1.3. Perceived applicability of the data</i></b>	Other criteria besides the magnitude of variation	<p>“Looking at variations only can be misleading if you want to improve services. There may be large scope for improvement even for those in the top quintile nationally. Then of course some areas are simply too difficult to improve. So it’s not just about reducing variations but about where to start if you want to improve population health”</p> <p>(Director of Public Health, PCT6)</p> <p>“What I want to know is: where do we have the largest potential for efficiency savings, that don’t harm patients . . . the Atlas alone can’t tell me that”</p> <p>(Financial Director, PCT12)</p>
<b><i>1.4. Ability to use the data</i></b>	No staff capacity to use NHS Atlas	<p>“We had already agreed priorities for action when the Atlas was published, and had no further resources and analysts to tackle new issues”</p> <p>(Medical Adviser, PCT9)</p>
<b><i>2. Use of the</i></b>	Strategic problem	<p>“Surely the Atlas alone is not enough but we use it to triangulate with other</p>

<i>NHS Atlas</i>	framing	evidence. This helps us to see where we have most potential to improve, mainly financially”  (Head of Performance, PCT5)
	Problem communication	“The maps often confirmed our existing local suspicions. But they helped a lot to illustrate to GPs [general practitioners] where we stand compared to other PCTs”  (Public Health Analyst, PCT13)  “We used the Atlas to visualise problems to clinicians, in an accessible format . . . this in turn served as a catalyst which motivated clinicians to take action sooner than they might have done otherwise”  (Director of Commissioning, PCT1)
<i>Challenges in using the NHS Atlas</i>	Unclear basis for evaluating ‘unwarranted’ variation	“There is not always a clear-cut definition what variation is bad... usually we take NICE [National Institute for Health and Clinical Excellence] guidance as a basis, if it is available for this area”  (Public Health Analyst, PCT1)  “Variation is “unwarranted” for us if we could have avoided it with better organisation of the service, or better provider payment... but my concern is that we don’t always know what better payment or delivery should look like”  (Commissioning staff, PCT2)
	Role of the national average as an implicit reference point	“We were in the middle for most indicators . . . so nothing alarming really”  (Medical Adviser, PCT24)  “It’s difficult to know where to start . . . we also don’t have the resources to do everything. So we mainly looked at areas where we were large outliers . . . if you are very different from others, it’s likely that something goes wrong in your PCT. But for respiratory disease we are around the national average for most indicators in the Atlas and still I think we could improve a lot”  (Public Health Analyst, PCT2)
<i>Enabling factors for coordinating further analysis and action</i>	(Internal) responsibilities for action: Management structures and clinical involvement	“We have regular performance management meetings together with local clinicians to agree service objectives, and who does what . . . and then we monitor progress towards these objectives. The Atlas fit in naturally into our existing structures”  (Director of Commissioning, PCT16)  “It’s key to have some structures to get local clinicians on board, to have a team that visits the practices, talks to clinicians . . . asking them regularly about variations and why this local health economy might differ from others”  (Director of Commissioning, PCT25)
	Leadership and high-level support	“The PCT Board gave great support in using the Atlas . . . they discussed the Atlas at one of the Board meetings, and appointed a person to champion work into variations” (Public Health Analyst, PCT21)

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**Table 2.** Case studies.

	<b>PCT A</b>	<b>PCT B</b>	<b>PCT C</b>
<i>Data from the NHS Atlas</i>	PCT A was in the highest national quintile for total spending on cancer care	PCT B was in the highest national quintile for rates of cataract surgery	PCT C was in the highest national quintile for magnetic resonance imaging [MRI] activity
<i>Evaluating unwarranted variation and its causes</i>	<p>NHS Atlas data was disaggregated using data from the regional Quality Observatory: from total spending at regional level to patterns of spending across procedures and across settings of care</p> <p>The cancer care team identified two main drivers of unwarranted variation:</p> <ol style="list-style-type: none"> <li>1. Multiple charging for treatment events due to four separate charges for chemotherapy</li> <li>2. High levels of emergency admissions both at active treatment stage and at the end of life</li> </ol>	<p>Comparisons with neighbouring PCTs showed a lower clinical threshold for cataract surgery in PCT B (6/12 versus 6/9 in the worse eye)</p> <p>Reasoning about unwarranted variations was based on two main observations:</p> <ol style="list-style-type: none"> <li>1. The current clinical threshold was at the lower end of the driving standard set by the Driver and Vehicle Licensing Agency (between 6/9 and 6/12)</li> <li>2. A large national audit had shown that one in three eyes with a pre-operative visual acuity of 6/9 either had no benefit or a poorer outcome post-operatively. In eyes with a pre-operative visual acuity of 6/12, only one in eight did not improve</li> </ol>	<p>In one of the regular performance management meetings between PCT staff and hospital medical and operating managers, clinician discretion was identified as a likely driver of variation A</p> <p>retrospective audit was undertaken to compare clinical guideline recommendations with actual practice. The audit showed clinicians complied with current guidance in prompting the provision of MRIs</p>
<i>Responsibilities for action</i>	Monitoring by the PCT and regular performance meetings between the Director of Commissioning and local physicians	Review by the PCT's public health team as a basis for review by the PCT's Priorities Forum	Joint leadership by the PCT's commissioning team, the medical director and operating officer of the acute hospital
<i>Analysis and decisions on actions</i>	<p>Cancer-care specific decisions included:</p> <ol style="list-style-type: none"> <li>1. The revision of contracts to ensure appropriate payment</li> <li>2. Commissioning of new community services</li> </ol>	The Priorities Forum (which advises the PCT on the treatments that should be given high or low priority and comprises public health and commissioning staff, primary and secondary	Current practice and relatively high rates of MRI utilisation were considered to be appropriate

including Palliative Care Co-ordination and Rapid Response Teams to decrease the burden on hospital emergency facilities

care representatives, a lay representative and a librarian) agreed:

1. to increase the clinical threshold for cataract surgery to the 6/12 level
  2. to introduce special clauses for occupations in which small gains in binocular visual acuity can be essential to the ability to work (e.g. watchmakers, microsurgeons) to prevent inequities
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#### 4. Discussion

Internationally, there is a growing interest and information on geographic variations in healthcare. In a rising number of countries including Canada, England, Germany, Spain, the Netherlands, New Zealand and the United States, Atlases of Variation have either been or are being developed to raise awareness of regional differences in patterns of expenditure, activity and outcomes [43]. But although healthcare payers have unprecedented access to variations data, how to use such information to improve decisions about the value of resource allocation remains little understood.

The findings of this study suggest some general lessons for using Atlases of Variation. First, publishing an Atlas of Variation may have great merit in stimulating the search and understanding of variations, but it may not be sufficient for achieving an impact on decision making about resource allocation. Generic hurdles to using research evidence – such as awareness, acceptance and perceived applicability of the data [12,13] – also appear to be relevant for geographic variations research. Once these barriers have been overcome, it appears that Atlases of Variation can serve as a “tin opener” [18] to inform strategic planning by healthcare payers. They may also help communicate strategic problems to clinicians. However, additional factors appear to be necessary for moving beyond an initial stage of gathering and communicating data towards subsequent stages of the decision making process where data are analysed and action is taken. On the one hand, decision makers will need to be able to achieve some clarity and consistency on the definition and operationalization of the concept of unwarranted variation.

The current paucity of scientific frameworks identified in a recent systematic review [44] argues this challenge. On the other hand, agreements on responsibilities for action and leadership also appear to influence the uptake of variations data. Although all 53 participants in this study emphasised addressing unwarranted practice variations as an opportunity to reduce inappropriate use of resources within increasingly tight economic constraints, only 18 of 28 PCTs who had reviewed the Atlas were also able to coordinate further analysis and action. This is a missed opportunity.

Second, who should lead in identifying and acting on variations in medical practice, and how other stakeholders should be involved, is increasingly becoming an issue as the public availability of geographic variations data continues to grow. The NHS Atlas mainly addresses commissioners and clinicians. Given the regionalised planning and purchasing structure, this perspective seems relatively straightforward for England, as the level of analysis – the Primary Care Trust – is thus consistent with the locus of responsibility for action. In countries with competitive social health insurance systems, in contrast, a regional level of analysis tends to conflict with more dispersed responsibilities for action. In Germany, for instance, no institutionalised bodies exist to exercise cross-sectorial planning and purchasing for geographically defined populations [45]. While the NHS Atlas is mainly targeted at health service professionals, a recently published German Atlas of Variation seeks to create pressure for change by targeting citizens and the wider public [46]. Further research might examine how a given health system context shapes the uses and users of data on variation in health service performance, and the respective interactions between stakeholder groups in identifying and addressing unexplained variations.

Third, the findings also illustrate the difficult relationship between relative rates of service provision and appropriate provision with regard to resource allocation. The purpose of an Atlas of Variation is to reveal variations, and among the respondents to this study, attention logically tended to focus on the top and bottom outliers. The downside of stimulating action based on ‘outliers’ was some indication of false assurance derived from an average position. However, research does not suggest a systematic relationship between high, average and low rates of activity and rates of inappropriate utilisation at a regional level [47,48]. Simulation studies also suggest that considerable variations at lower provider levels of analysis may in some cases be averaged out at a higher regional level of analysis [49]. While an ‘outlier’ position can be a powerful trigger for further scrutiny, healthcare payers thus need to be wary of not conceiving the national average as an implicit reference point or even target; the danger is complacency.

To prevent an overemphasis on individual outliers, future research may need to move from the measurement of single indicators towards a more systemic view of variation and its management. This may include not only the linkage of all three domains of quality of care – structure, process and health outcomes [50,51] – but also a value for money framework which relates outcomes to costs. Possible starting points may be the modelling of patients’ pathways across all settings of care [52,53] and, at a population level, explicit attention to the scale of population health gain from and expenditure on a given set of interventions [54]. Future research may need to focus more strongly on developing requisite models and designing them in such a way that they can easily be applied by health service professionals.

## 5. Limitations

This study was constrained by two main classes of limitations; those inherent to qualitative research, and those specific to this study. Interview-based research is well-suited to explore personal experiences and perceptions known only to the people involved. However, potential inaccuracies may arise due to poor recall and misrepresentation of facts, when respondents give answers they assume the interviewer wants to hear [42]. Interviews with multiple respondents per PCT, if possible, and emphasis on the open-ended, non-directive character of the interview questions were intended to address these challenges. A study-specific challenge was the potential for selection bias. It remains unclear whether the non-respondents to this study lacked the capacity to participate in the research, in light of the large scale structural reorganisation of the NHS at the time of study, or whether they were not interested in the topic of variations in healthcare. Despite the wide spectrum of responses to the NHS Atlas illustrated in this study, the respondents may have been more motivated or even pioneers in engaging with geographic variations data compared to their peers. PCTs who reported using the NHS Atlas also tended to be of a larger size (responsible for populations of about 400,000–700,000, compared with the national median size of 284,000 people [23]) or tended to be collaborating with a University. Presumably these PCTs thus had access to greater analytic capacity than the ‘average’ PCT.

## 6. Conclusions

Based on a case study from England, we have explored key considerations and challenges along the process of moving from data on geographic variations in medical practice towards decisions to improve the value of resource allocation. Explicit attention to these and other factors may help governments and

payers understand the pathways through which this information might inform decision making. Our findings illustrate that an Atlas of Variation can support healthcare payers in framing, communicating and prompting the search for strategic problems, but that its mere publication may not be sufficient to influence decision making even in an ideal context where responsibilities for planning and purchasing health services across sectors are integrated in one regional organisation. The provision of appropriate tools to help planners understand what variation is unwarranted, and to prioritise remedial actions on the basis of their contribution to population health, should be a key focus for promulgators of variations data.

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