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Age UK's Personalised Integrated Care Programme

Evaluation of impact on hospital activity

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About the report

This report presents the Nuffield Trust's findings on the impact of Age UK's Personalised Integrated Care Programme (PICP) on hospital activity.

Using person-level data linkage, we describe the amount and type of hospital care used by almost 2,000 older people in the nine months (and for a large subset, 16 months) after their referral to the scheme, and we compare this activity to that of a carefully selected matched control group.

Our aim was to determine whether there was any evidence of a reduction in hospital activity for those referred to the scheme.

Age UK commissioned this work, but it was carried out using methods that the Nuffield Trust controlled.

Suggested citation

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Find out more online at: www.nuffieldtrust.org.uk/research

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This work uses data that patients provide and the NHS collects as part of their care and support. Read more on our website: www.nuffieldtrust.org.uk/about/corporate-policies#information-security-and-data.

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Executive summary

Background

Age UK's Personalised Integrated Care Programme (PICP) is a scheme that aims to improve the lives of older people through the provision of practical support, underpinned by a transformation in the way that parts of the health and care system work together locally.

The scheme is targeted at older people who are at risk of a future emergency admission. A 'guided conversation' is used to identify a series of goals that the older person would like to achieve and a primary care-based multidisciplinary team (which includes Age UK staff) monitors progress against a resulting support plan. Support is provided for a limited period – approximately three months – after which time it is hoped that the person will have achieved their goals.

A key element of the programme lies in the development of local health and social care partnerships. And indeed the programme has attempted to act as a catalyst to bring together commissioners, NHS providers, local Age UK partner organisations and others. The local organisations share financial responsibilities and use a joint performance management framework to monitor the scheme's progress in their area.

Against a background of severe pressure on health and care services in England, the programme also aims to help reduce cost pressures in the local health and care systems.

Age UK commissioned the Nuffield Trust to carry out the research presented in this report to determine whether there is a subsequent impact on the levels of hospital use of older people referred to the PICP.

Methods

We linked data from eight Age UK PICP areas in England to person-level hospital datasets. We used advanced methods to select a very similar matched control individual for each one of 1,996 PICP clients on the date the scheme started. We drew the controls from areas not covered by the Age UK scheme and selected them so that they were a close match on a large number of important factors (including age, sex, risk of future admission and existence of health conditions).

We then examined the use of emergency and non-emergency inpatient care, and Accident & Emergency (A&E) and outpatient services, in the first nine months (and for a large subset, 16 months) after the start of each PICP client's service, comparing PICP clients with the matched controls. We also carried out a number of additional analyses to examine the impact of PICP on potentially preventable admissions, the causes of emergency admissions and variations in impact by subgroupings of clients.

Impact of PICP on subsequent hospital activity

We found higher levels of hospital activity in the PICP group compared with the matched control group after the start of the service. This was the case for A&E visits, emergency inpatient admissions (including potentially preventable admissions) and outpatient attendances. There was no difference between the two groups in non-emergency admissions.

The differences between the PICP and matched control groups were large and statistically significant: in the first nine months after the start of the service there were at least a third more A&E visits and emergency admissions in the PICP group, and nearly a quarter more outpatient attendances. This was equivalent to two additional emergency admissions, between two and three additional A&E visits and nine additional outpatient attendances for every 10 people who received a service from PICP.

The total cost of this additional hospital activity (expressed in terms of the costs that a commissioner would pay) was £906 per PICP client – 37% more than the matched control group's total hospital costs. The high levels of activity in the PICP group appeared to persist for as long as we had data – 16 months after the start of the service.

There was variation in the relative impact of the scheme for different groups of PICP client. For example, the youngest clients and those at the highest risk of future emergency hospital admission appeared most similar to the matched controls in terms of their subsequent hospital use – although still with relatively high costs. We found no apparent reduction in activity for any subgroup. At best, we found that a number of the PICP areas were no different from controls in terms of their clients' subsequent hospital activity. We also found no difference between PICP clients and controls for those whose service started in the latter months of the study period when followed over 16 months.

Conclusions

Age UK's PICP is an ambitious community-based scheme that, to date, has been rolled out in 14 areas. The service aims to improve the care that older people experience through direct support and by reducing fragmentation in the care system. It also aims to reduce local cost pressures.

In terms of this latter aim, the results of our analysis of nearly 2,000 clients in eight PICP service areas are disappointing. We found no evidence of potential cost savings from reductions in hospital activity. In fact, we found that secondary care costs may have been higher than they otherwise would have been for groups referred to the service, and not just in the very short term. However, the results suggest that the scheme may be identifying unmet need in the client groups, which manifests in greater use of hospital care. This might be to the ultimate benefit of the older people in the longer term.

While a full assessment of the impact of Age UK's PICP will need to take account of reported benefits to older people's wellbeing, in addition to considering how the scheme has affected how local health economies function, the scheme is far from alone in being unable to show an impact in terms of reductions in hospital activity; there are few well-evidenced interventions that appear to be able to achieve this aim.

Key points

1 Age UK's PICP aims to improve care for older people by providing personalised, practical, community-based support, underpinned by more closely integrated local health and care economies. It also aims to reduce cost pressures within local health and care systems by reducing unnecessary hospitalisations.

2 Using data linkage, we analysed the hospital use of 1,996 older people who had received a service from PICP in eight areas in England, and we compared their activity to that of a carefully selected control group.

3 In the first nine months after start of the PICP service, we found that A&E visits and emergency admissions were higher for the PICP group by 33% and 35% respectively compared with the matched controls. Outpatient attendances were also higher in the PICP group, by 23%. There was no difference between the two groups in terms of non-emergency admissions.

4 In the same period, total hospital activity costs were 37% higher in the PICP group, by £906 per person, compared with the matched controls.

5 We did not find any evidence that the programme reduced total hospital costs for any particular subgrouping of individuals in the study sample – for example, for older or younger clients, or for those at higher or lower risk of future hospital admission. At best, it appeared that clients in at least two of the eight PICP areas had a pattern of subsequent hospital activity that was no different from that of the matched controls.

6 For a large subset of PICP clients in the study sample (n = 1,601), we were able to compare hospital activity for 16 months after the start of the service. The relatively high activity levels in the PICP group (in comparison with the controls) persisted during this whole period.

7 In summary – with an analysis limited to hospital datasets – we found evidence of an increase in subsequent hospital activity and costs in the first 16 months after referral to the PICP. This result is broadly consistent with other studies of community-based hospital admission avoidance schemes.

1 Introduction

Background

As the NHS in England endures its most austere decade (Nuffield Trust and others, 2017), there has been a persistent increase in demand for its services (Maguire and others, 2016). Emergency hospital admissions of older people have played an especially significant role in this rise in demand. Between 2013/14 and 2016/17, the number of emergency admissions increased by 9.3%, with older people responsible for more than half of the total growth in numbers (National Audit Office, 2018).

Emergency admissions are almost always distressing and disruptive for patients, and for their families and carers. They are also often preventable; the National Audit Office (2018) has estimated that around a quarter of all recent admissions may have been potentially avoidable. For older people, many of whom will be living with several health conditions, emergency admissions can have a particularly destabilising effect – risking physical and cognitive decline, and increasing their dependence on statutory care services (Boyd and others, 2008; Lafont and others, 2011; Walsh and Bruza, 2008).

Emergency admissions are also extremely costly, accounting for a third of all acute hospital costs (NHS Improvement, 2017).

Community-based intermediate care services and the voluntary sector

Over the past decade, there has been widespread interest in identifying new ways of managing care for older people that could help to prevent their health from deteriorating to the point where otherwise avoidable hospital admissions become necessary.

National programmes have been developed with a focus on integrating health and social care services and improving out-of-hospital care, although with arguably limited success (National Audit Office, 2018). The National Audit Office (2018) has further noted a lack of capacity in the community to deliver intermediate care services[1] that might help to prevent unnecessary admissions to hospital.

In this context, there has been particular interest in the role that the voluntary sector might play in improving patients' experiences of care by providing types of support not offered by statutory care services and helping people to navigate gaps between fragmented care services.

A number of voluntary sector-led care and support interventions have been developed in recent years, with the aims of improving care and wellbeing, and reducing the number of admissions and readmissions and the costs of care. Given the value of these aims and the demanding national context, it is important that we question how well these schemes are working.

In recent evaluations of several such interventions, we found a number of positive impacts, but we consistently found no evidence of a reduction in emergency admissions in the shorter term. In fact, we found higher subsequent use of hospital services in some cases (Georghiou and others, 2016; Georghiou and Steventon, 2014).

The Nuffield Trust's independent evaluation of Age UK's Personalised Integrated Care Programme (PICP) aimed to provide further evidence of the impact of an ambitious voluntary sector-led scheme, one that has the integration of local services at its heart.

1 These are multidisciplinary services that provide support to people at risk of hospital admission or who have been in hospital. They aim to prevent unnecessary admissions to hospitals and residential care and to enable people to be transferred from hospital to the community in a timely way if they have been in hospital.

Age UK's Personalised Integrated Care Programme

Age UK's PICP is a scheme that aims to improve the lives of older people through the provision of practical support, underpinned by a remodelling of the way in which the care system operates at a local level. Its stated ambitions are outlined in Box 1.

Box 1: Aims of the Personalised Integrated Care Programme

- Improve the health and wellbeing outcomes for older people with long-term conditions who experience high numbers of avoidable hospital admissions.
- Improve the experience and quality of care and support amongst older people by tailoring services to meet their needs and providing the right support at every stage.
- Reduce cost pressures in the local health and social care economy.
- Support and deliver transformational change to the whole system by demonstrating how GPs, community care, hospitals, social care and the voluntary sector work together, with the older person at the centre.

Source: Age UK (n.d., p. 5)

PICP aims to offer support to older people who are at risk of a future emergency admission to hospital. The process begins with a 'guided conversation' between the client and an Age UK staff member. This conversation is used to identify a series of goals that the older person would like to achieve, and then a support plan is drawn up. A primary care-based multidisciplinary team, which includes Age UK staff, monitors progress against the plan. Support is provided to the client for a limited period – approximately three months – after which time it is hoped that the person will have achieved their goals.

A key element of the programme lies in the development of local health and social care partnerships. And indeed the programme has attempted to act as a catalyst to bring together commissioners, NHS providers, local Age UK partner organisations and others to co-design specific models of care in their area. The local organisations share financial responsibilities for the programme and use a joint performance management framework to monitor the scheme's progress in their area.

The programme started in west Cornwall as 'Living Well' in 2012, expanding to east Cornwall in late 2014 (which together Age UK has labelled 'phase 1'). In 2015, the scheme was rolled out in eight new areas in England ('phase 2'), with a five further areas following in 2017 ('phase 3').

The PICP model in more detail

With the programme co-designed in conjunction with partners in each area, there are some local variations in its delivery. But the programme broadly follows a model that Age UK has developed, which is outlined here.

Targeting older people

The programme is aimed at providing a service to a specific group of older people – those identified as being at high risk of a future unplanned admission to hospital. The intention is that a risk stratification tool is used within a primary care setting to identify a long list of individuals (aged 50 and over) who have this high risk.

GP practice teams then shortlist eligible individuals on the basis of the so-called 'two plus two' criteria. These are that the person has to:

- have two or more long-term conditions (from a list of nine reflecting conditions related to potentially avoidable admissions)[2] and
- have had two or more unplanned acute admissions in the previous 18 months.

2 These conditions are hypertension, diabetes, chronic obstructive pulmonary disease (COPD), congestive heart failure, urinary tract infection, pneumonia, dementia, stroke and Parkinson's disease.

The scheme is not available for permanent residents of a nursing home (or permanent residents of a residential care home more than six months after placement), nor is it available for people with a life-limiting diagnosis (such as cancer).

In practice, the selection criteria were loosened in all areas 'to better reflect local context, demand and need' (Fullwood, 2018, p. iii).

The service

Where an individual is eligible, and they would like to join the programme, an Age UK staff member (a 'personal independence coordinator' or 'changing lives coordinator') contacts them to make an appointment to visit them in their own home.

During this appointment, a 'guided conversation' is carried out. The aim of this is to talk through the challenges that the individual is facing and to identify specific goals that would help them to improve their quality of life. While there are a variety of tools available to the Age UK staff member to assist this process, the conversation is not intended to be an assessment carried out on the client, but rather one guided by the preferences of the client themselves.

As a result of the conversation, the client and the Age UK staff member mutually agree a personal support plan to help achieve the goals identified. The Age UK staff member then coordinates the response needed – identifying who should carry out what kinds of support, and when. The 'who' might include health and social care practitioners, voluntary organisations, volunteers and private sector workers. The goals themselves are shared – with permission – with local practitioners.

A central element of the programme is that Age UK staff members become an intrinsic part of local primary care-based multidisciplinary teams. These teams are used to monitor progress against the goals, and to come up with solutions where problems arise.

The programme is intended to be time-limited – with intensive support provided by the Age UK staff member, or an Age UK volunteer, for approximately three months – by which time it is anticipated that the person will have achieved their goals and attained greater independence.

This evaluation

Age UK commissioned the Nuffield Trust to carry out this research, using data linkage techniques to examine hospital use (and associated costs) for older people who had received a service from Age UK's PICP, and to compare their patterns of use with those of a closely matched control group.

A key question we posed was whether subsequent hospital use in the PICP group was lower (and so less costly) than that of the matched control group. Secondary questions included identifying any specific characteristics associated with relative differences in hospital use.

Potential changes to the use of other services – primary care or social care, for example – were outside the scope of our analysis.

Our analysis included phase 1 and 2 areas only (see Table 1).

Table 1: The eight PICP areas included in this analysis

PICP area code	PICP area name (programme dates included)	Local Age UK partner organisations
Phase 1 area (from January 2014 to May 2015)		
CO	Cornwall	Age UK Cornwall and the Isles of Scilly
Phase 2 areas (from April 2015 to September 2016)		
AC	Ashford and Canterbury	Age UK Ashford and Age UK Canterbury
BD	Blackburn with Darwen	Age UK Blackburn with Darwen
EL	East Lancashire	Age UK Lancashire
GW	Guildford and Waverley	Age UK Surrey
NT	North Tyneside	Age UK North Tyneside
PO	Portsmouth	Age UK Portsmouth
SH	Sheffield	Age UK Sheffield

Note: An eighth phase 2 area – Barking, Havering and Redbridge – was not included in this analysis as it was part of a broader primary care-based model of care called Health 1000, which the Nuffield Trust has evaluated separately (Sherlaw-Johnson and others, 2018).

At the outset, it was anticipated that approximately 6,000 older people would be recruited to the schemes in the eight areas, with targets of either 500 or 1,000 people in each area. However, recruitment was generally slower than expected.

In general, the schemes were joint funded, with half of the funding provided by Age UK, and half by one or more of the local clinical commissioning groups, local authorities and/or local foundation trusts. Age UK was additionally partially supported by funding from a variety of organisations.[3] The total budget for delivery that the local programmes received was equivalent to £400 per older person targeted.

We completed our analysis in two parts – phase 1 and phase 2 separately – with minor differences in the methods used for each phase. With one exception (see Chapter 6, section 'Phase 2 areas: progress over 16 months'), our results are presented for all eight areas together.

In evaluating the potential impact of participation in the PICP on subsequent hospital activity, this study addresses a crucial aspect of the performance of the programme. Age UK has commissioned separate work to evaluate other important factors. This includes a qualitative evaluation of the impact of the scheme and an assessment of changes in wellbeing among both clients and carers. A summary of the findings has recently been published (Fullwood, 2018).

3 Including Nesta and the Cabinet Office's Centre for Social Action Innovation Fund, the Mercers Charitable Foundation, the Evan Cornish Foundation, the Roger De Haan Charitable Trust, the Big Lottery Fund and the Stavros Niarchos Foundation.

2 Data and methods

This study made use of Age UK's PICP administrative data, linked to hospital datasets.

For seven of the eight PICP schemes analysed (the phase 2 areas), we linked Age UK data to national Hospital Episode Statistics (HES) data. For the other area (Cornwall – the phase 1 area), we linked Age UK data to locally supplied Secondary Uses Service (SUS) data – an HES equivalent.

We carried out the phase 1 and phase 2 analyses separately. In this section we describe the methods for the larger phase 2 analysis. We carried out the phase 1 analysis using similar methods; small deviations from the methods described here are outlined in Appendix A.

Data

For the analysis of the seven phase 2 areas, we relied on three sources of information:

Age UK's PICP client data

- An anonymised file with details of referrals to the PICP programme in the seven phase 2 areas.
- Where individuals had consented to data sharing for this analysis.
- Where guided conversations had taken place between April 2015 and September 2016.

Hospital Episode Statistics (HES) data from NHS Digital

- All activity in English NHS hospitals between April 2012 and January 2018, with pseudonymised person identifiers.
- This included inpatient, outpatient and A&E datasets.

Linkage file from NHS Digital

- This dataset provided the linkage between the anonymised PICP client data and the pseudonymous HES person identifiers.

With these three datasets we were able to (pseudonymously) identify almost every PICP client within national hospital datasets. We were able to describe the hospital activity for each of these clients for at least three years before the intervention start date, and for up to 16 months after.

Analytical approach

We carried out this evaluation using a retrospective matched control methodology (Davies and others, 2015). We constructed a matched control group such that, for every person referred to the PICP, we found one other individual[4] who had not received the service and who shared the following characteristics on or near the date of the guided conversation. The matched individuals:

- had an extremely similar calculated risk of a future emergency admission (see Appendix B)
- were of the same sex
- were very closely matched on age
- had a very similar history of recorded diseases/conditions (determined using two years' worth of prior hospital inpatient data)
- had a very similar pattern of use of hospital services (determined using two years' worth of prior hospital data)
- were not in hospital on the matching date.

To describe these characteristics for each PICP participant, we calculated several hundred variables using information from the HES datasets, looking at two years' worth of data before the person's guided conversation date. Where an individual was referred twice or more to the scheme, we looked only at their first referral.

4 This is called 'one-to-one matching'.

We also calculated the same large set of descriptive variables for a very large group of people who were available to be potential controls. For each of the potential controls, we calculated these variables multiple times: once for each calendar month in the evaluation study period: April 2015 to September 2016.[5]

Matched areas

We selected the matched control individuals from geographical areas not covered by the PICP. We carefully selected the local authority areas from which the controls were drawn to achieve two objectives:

- Matched local authorities had to be defined by the Office for National Statistics (2015) as being **extremely similar**, **very similar** or **similar** to the phase 2 site local authorities of residence. The Office for National Statistics' determination used 59 variables derived from the 2011 Census, covering demographics, household composition, housing, socio-economic factors and employment.

- Matched local authorities had to have indistinguishable rates of emergency admissions compared with the PICP local authority areas given the same population profile. We determined this factor using a modification of the national risk prediction model that we have developed at the Nuffield Trust (see Appendix B).

Where only a very small number of people (five or fewer) in the PICP group were resident in a particular local authority area, they were assigned to a better-represented neighbouring local authority. More details on the areas used for matching can be found in Appendix C.

From the final set of 23 control areas chosen, we extracted data on approximately 807,000 individuals aged 50 or over for our attempts at matching.[6]

5 We did this on a random date in each calendar month. We only allowed the random dates to fall on weekdays, as very few guided conversations took place at the weekend. We also checked that the person was not in hospital on the random date, and excluded them if they were (for each month separately).

6 With an Age UK PICP phase 2 matching group of 1,640 people, this was approximately 490 potential controls per Age UK PICP client.

Matching process

We carried out the matching using processor-intensive genetic matching methods (Diamond and Sekhon, 2012) to select the closest match for each individual on a carefully defined group of 20–30 descriptive data variables (including, importantly, risk score).

Controls were able to be selected as matches more than once, and it was possible for the same control individual to have been selected at two different time periods.[7]

After each attempt at finding a matched control group, we checked that the selected group matched the PICP group on several hundred data variables describing prior use of hospital services, relevant to the risk of future emergency admissions. Where we observed significant differences between the control group and the PICP group, we ran a further match, having slightly adjusted the matching parameters. The matching was thus an iterative process, carried out until we could achieve no better-matched group in the time available for analysis.

With several hundred variables describing characteristics of the PICP and control groups, and with only very modest differences between the competing control group options, we carefully made a final choice of control group. As a sensitivity analysis, we calculated outcomes for two of the most reasonable alternative control groups to ensure that the overall results did not differ markedly from those reported here (they did not).

The success of the matching is discussed briefly in Chapter 4, and in more detail in Appendix D.

7 So, for example, a control person might have been an almost perfect match for one PICP client who started receiving the service in May 2015, and additionally, an almost perfect match for a second PICP client who started receiving the service in August 2016.

Evaluation aims and interpretation

In the absence of an intervention, we would expect any two groups matched by the methods described above to have broadly equivalent use of hospital services after the matching date. The matching we carried out is called **prognostic matching** – the two matched groups had broadly the same prognosis of future hospital activity (Hansen, 2008).

In our case, one of the groups – the PICP group – had been subject to an intervention (which we took to start on the date of the guided conversation). Our analysis rests on the premise that any divergence between the two groups after the date of matching may be a potential effect of the intervention itself.

Our primary aim, then, was to calculate and compare the following measures of hospital activity in the first **nine months after the guided conversation date**[8] for both the PICP group and their matched controls:[9]

- number of A&E visits
- number of emergency admissions
- number of non-emergency admissions
- number of outpatient attendances.

In addition, we calculated the costs of all this hospital activity using 2016/17 Healthcare Resource Group (HRG) national tariffs and – where no tariff information was available – 2014/15 reference costs data. These costs therefore represented the costs that a commissioner would pay for hospital care, not the costs the acute hospital trusts incurred themselves.

In comparing all of these outcomes (both activity measures and costs), we used multivariate regression methods to adjust for the fact that there were still modest differences in characteristics between the matched control group and the Age

8 Although we had 16 months of follow-up data for the large group of phase 2 clients, we were limited to only nine months of data for the phase 1 area. Our primary results – for all clients – were therefore calculated over nine months.

9 For the matched controls this is not, of course, the guided conversation date, but the equivalent matching date.

UK PICP group. We ran mixed-effects models (negative binominal regression for rate ratios and normal regression for costs), treating the PICP–control group pairs as repeated measures.

We also carried out a number of secondary analyses to provide some context to our main findings. These included:

- an analysis of the causes of subsequent emergency admissions
- an analysis of the differences in preventable admissions in the two groups
- an analysis of the differences observed between the two groups by various subgroupings:
  - ‘two plus two’ versus non-‘two plus two’ groups
  - area
  - age bands
  - risk of admission bands
  - timing of the start of the intervention (earlier versus later).

The aim of the subgroup analyses was to determine whether there was any evidence for differential impacts of the scheme (that is, did it appear to perform better or worse) with respect to any specific groupings of individuals.

Finally, for the seven phase 2 areas, we also repeated the primary analyses (of differences in rates and costs of hospital activity) over the 16-month period after the guided conversation.

3 Characteristics of the PICP group

Numbers in the PICP group

We received data from Age UK covering 517 older people referred to the PICP scheme in Cornwall (the phase 1 area) up to the end of May 2015 and 1,693 older people referred to one of the seven phase 2 areas up to the end of September 2016 (2,210 people in total).

We eventually found matches for 1,996 people in total – 395 from phase 1 (76%) and 1,601 from phase 2 (95%)[10] – so our study sample consisted of 1,996 people in the PICP group and the same number in the control group.

PICP group demographics

Table 2 provides details of the demographics of the PICP group by area.

Sheffield was the area with the largest number of scheme participants (476, 24% of the total), followed by Cornwall (395, 20% of the total). North Tyneside had the fewest number of participants (75, 4% of the total).

The average age of the PICP participants was 79, with just under a third aged 85 or over. Guildford and Waverley, and North Tyneside, were the areas with the oldest clients (average age 84 and 83 respectively, with around a half aged 85 or over), while Portsmouth had the youngest clients (average age 73, with fewer than one in five aged 85 or over). Of the PICP group, 61% were female.

10 We excluded people from the PICP group for the following reasons. Phase 1: no linkage to the SUS dataset (n = 62), person was in hospital on referral date or recently in hospital (n = 46) and no matches found meeting the matching criteria (n = 14). Phase 2: no matches found meeting the matching criteria (n = 39), uncertainty about age (n = 27), no linkage to the HES dataset (n = 19) and inpatient stay during apparent guided conversation date (n = 7).

The areas were mixed in terms of deprivation levels: six out of ten clients in Blackburn with Darwen lived in one of England's most deprived Lower Super Output Areas (LSOAs)[11] (the most deprived quintile). This contrasted with Guildford and Waverley where almost six out of ten clients lived in one of England's least deprived LSOAs (the least deprived quintile).

Table 2: The PICP group by area: sex, age and deprivation

Area code	Area name	Number (% of PICP group)	Sex, % female	Age		Deprivation†	
				Average age	% aged 85 or over	% in most deprived quintile	% in least deprived quintile
Phase 1 area							
CO	Cornwall	395 (19.8%)	66.8%	81	37.5%	17.7%	0.0%
Phase 2 areas							
AC	Ashford and Canterbury	164 (8.2%)	59.1%	80	34.8%	7.3%	11.6%
BD	Blackburn with Darwen	265 (13.3%)	55.8%	78	23.8%	61.1%	4.9%
EL	East Lancashire	265 (13.3%)	60.4%	80	29.8%	46.0%	4.9%
GW	Guildford and Waverley	113 (5.7%)	71.7%	84	50.4%	0.0%	57.5%
NT	North Tyneside	75 (3.8%)	69.3%	83	48.0%	14.7%	29.3%
PO	Portsmouth	243 (12.2%)	59.3%	73	19.3%	37.0%	3.3%
SH	Sheffield	476 (23.8%)	58.6%	78	31.7%	42.4%	15.3%
ALL	**All areas**	**1,996 (100%)**	**61.4%**	**79**	**32.0%**	**33.5%**	**10.7%**

† With respect to all areas of England, measured using Index of Multiple Deprivation scores at Lower Super Output Area (LSOA) level.

11 Lower Super Output Areas (LSOAs) are geographical areas that the Office for National Statistics uses to report small area statistics in England and Wales. There are approximately 35,000 LSOAs in England and Wales, each with an average population of approximately 1,600 people.

Long-term conditions and prior unplanned admissions

In terms of individuals' history of long-term conditions and prior emergency admissions, the areas were split very broadly into three groups (see Table 3).

In one group were Ashford and Canterbury, Blackburn with Darwen, East Lancashire and North Tyneside. This group had a large proportion of people with two or more long-term conditions (69% to 80%) and a slim majority of people who had had two or more emergency admissions in the 18 months before the start of receiving the PICP service (51% or more).

Table 3: The PICP group by site: long-term conditions, prior emergency admissions and risk of emergency admission in the following year

Area code	Site name	Number	% with 2 or more long-term conditions†	Number of emergency admissions, 12 months	% with 2 or more emergency admissions, 18 months	% 'two plus two'	Top 10% risk	Top 2% risk
Phase 1 area								
CO	Cornwall	395	37.0%	0.56	19.0%	15.9%	41.0%	8.4%
Phase 2 area								
AC	Ashford and Canterbury	164	77.4%	1.75	54.9%	50.0%	75.6%	27.4%
BD	Blackburn with Darwen	265	79.6%	1.65	57.7%	49.8%	91.3%	41.1%
EL	East Lancashire	265	74.0%	1.60	51.3%	46.8%	83.0%	46.4%
GW	Guildford and Waverley	113	62.8%	0.99	33.6%	32.7%	66.4%	35.4%
NT	North Tyneside	75	69.3%	1.79	57.3%	50.7%	88.0%	53.3%
PO	Portsmouth	243	53.5%	0.99	32.1%	24.3%	59.7%	20.6%
SH	Sheffield	476	59.0%	1.27	41.6%	33.8%	73.5%	32.8%
ALL	**All areas**	**1,996**	**60.8%**	**1.23**	**40.6%**	**34.9%**	**69.3%**	**29.9%**

† From a list of nine conditions: hypertension, diabetes, chronic obstructive pulmonary disease (COPD), congestive heart failure, urinary tract infection, pneumonia, dementia, stroke and Parkinson's disease. Age UK identified this group as being particularly important in targeting the PICP.

In the second group – Guildford and Waverley, Portsmouth and Sheffield – there were smaller majorities of people with two or more long-term conditions (53% to 63%), and fewer people who had had two or more prior emergency admissions (42% or under).

In the third group was Cornwall, with only 37% of participants with two or more long-term conditions, and 19% who had had two or more prior emergency admissions.

With reference to the PICP referral criteria, we found that 47–51% of the first group, 24–34% of the second group and 16% of the third group had been selected according to the prioritised 'two plus two' criterion – two or more prior long-term conditions and two or more prior emergency admissions.[12]

Table 4: Prevalence of long-term conditions in the PICP group (n = 1,996)

Long-term condition	Prevalence
Hypertension	53.7%
Diabetes	25.4%
COPD	24.1%
Congestive heart failure	17.8%
Urinary tract infection	16.8%
Pneumonia	14.7%
Dementia	6.1%
Stroke	4.9%
Parkinson's disease	2.2%

12 However, it should be noted that since we relied on inpatient data to provide us with information on diagnoses, our estimates for the numbers of long-term conditions (and therefore people with 'two plus two') may be lower than those calculated locally, where primary care records would have been available.

Just under 70% of the PICP group were in the highest risk decile for emergency admission in the following year (measured with respect to all people in England aged 55 or over) and 30% were in the top 2% highest risk group. North Tyneside, East Lancashire and Blackburn with Darwen had the highest proportion of high-risk clients.

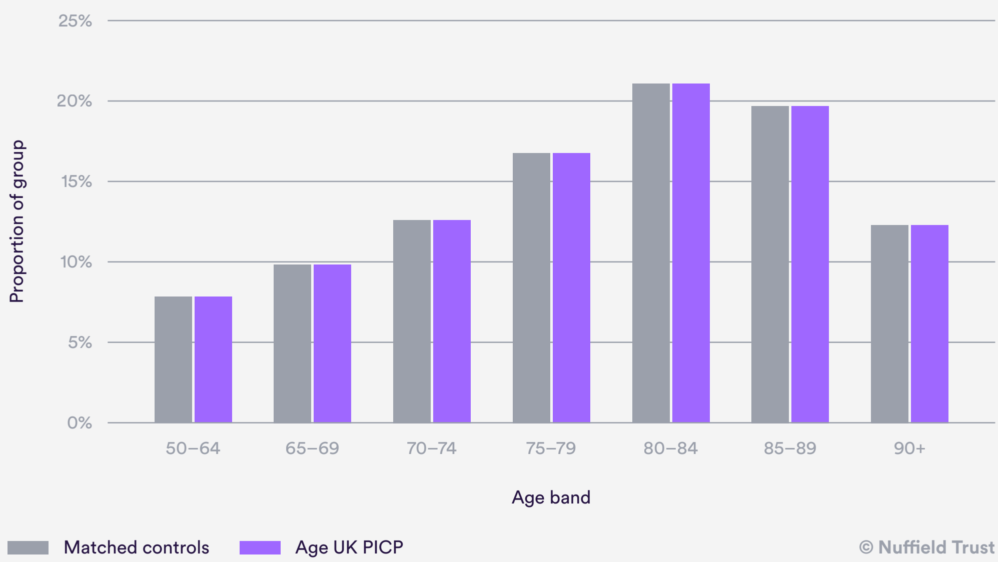
The prevalence of a selection of long-term conditions in the PICP group is shown in Table 4. The most common diagnoses were hypertension (54%), diabetes (25%) and chronic obstructive pulmonary disease (COPD) (24%).

4 Quality of the matching

The selected control group was very closely matched to the PICP group.

The average age of the control group was 78.8, compared with 78.9 in the PICP group, and the control group had exactly the same number of people in each of seven age bands as the PICP group (see Figure 1). The two groups also had exactly the same number of men and women (61.4% were women).

Figure 1: Matched control and PICP groups by age bands



The two groups had very similar levels of prior hospital activity. Table 5 shows the mean values of various measures of prior hospital activity and long-term conditions in the groups. The table also shows the **standardised differences** in those means. By convention, where this standardised difference is below 10%, the clients and their controls can be considered to be equivalent in terms of a particular characteristic (Austin, 2009). All measures shown in Table 5 are within this range. Even so, the results we present in following sections have been adjusted to take account of these small remaining differences.

Table 5: Prior admissions and other hospital contacts, long-term conditions and risk of emergency admission (means in the PICP and matched control groups, and standardised differences in the means†)

Measure	Control group (n = 1,996)	PICP group (n = 1,996)	Standardised difference
Hospital activity in prior year (mean number per person)			
A&E visits	1.47	1.58	6.6%
Emergency admissions	1.13	1.23	7.2%
Emergency avoidable (ambulatory care sensitive) admissions	0.35	0.40	7.3%
Non-emergency admissions	0.56	0.55	0.6%
Outpatient attendances	5.86	6.54	7.9%
Proportion with 2+ long-term conditions	61.3%	60.8%	1.0%
Proportion with 2+ emergency admissions, prior 18 months	39.4%	40.6%	2.5%
Proportion with 'two plus two'	34.3%	34.9%	1.3%
Proportion in top risk decile for emergency admission	68.7%	69.3%	1.3%
Proportion with long-term condition			
Hypertension	53.5%	53.7%	0.3%
Diabetes	23.5%	25.4%	4.3%
COPD	21.7%	24.1%	5.6%
Congestive heart failure	16.9%	17.8%	2.5%
Urinary tract infection	16.9%	16.8%	0.4%
Pneumonia	14.0%	14.7%	2.1%
Dementia	7.8%	6.1%	6.7%
Stroke	3.0%	4.9%	9.8%
Parkinson's disease	1.5%	2.2%	5.2%

† More than 10% signifies a meaningful difference.

Not only were the groups well matched on numbers of admissions and other hospital contacts in the year (and 18 months) before the service starting, they were also well matched on month-by-month hospital contacts. As an example, Figure 2 shows the average number of emergency admissions in each of the 24 months leading up to the guided conversation date (or equivalent date for the controls). The PICP group showed a threefold rise in admissions over the course of the two years, before dropping away slightly in the final month. With only relatively small differences, we observed the same pattern in the control group.

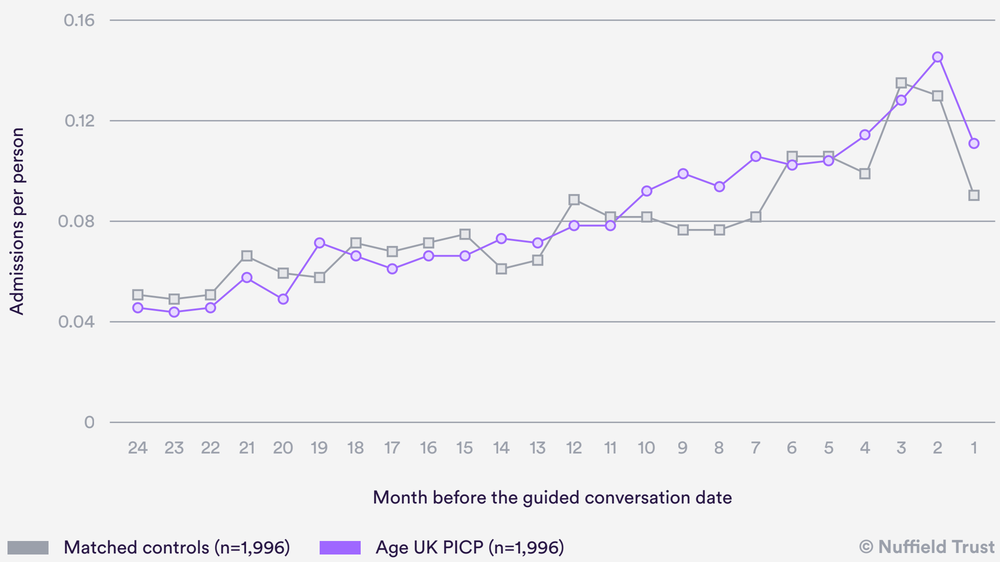
The PICP and control groups were well matched by date, with 70% of controls' 'guided conversation-equivalent' dates lying within seven days of the paired PICP clients' guided conversation dates (and 91% within 14 days). This meant that there were no biases between the groups in the pre- or post-intervention periods that might have been affected by patterns of seasonality in hospital activity.

Finally, we checked for differences in in-hospital deaths during the nine months after the guided conversation date,[13] and although deaths were more common in the PICP group (94 deaths in total compared with 76 in the control group), the difference was not statistically significant at the 95% confidence level (p value = 0.095).

Appendix D includes a more detailed discussion of the quality of the matching.

Ultimately, the PICP and control groups were well matched in terms of the large majority of relevant factors available in the data. However, it is important to appreciate how unlikely it is that any match would be perfect over all important measurable characteristics, and for this reason, the results in the next two chapters have been adjusted using multivariate regression methods to account for some of the relatively small remaining differences between the two groups.

Figure 2: Average number of emergency admissions per person per month, in the two years before the guided conversation date



13 We did not have any information on out-of-hospital deaths.

5 Findings: differences in subsequent hospital activity

Hospital activity after guided conversation

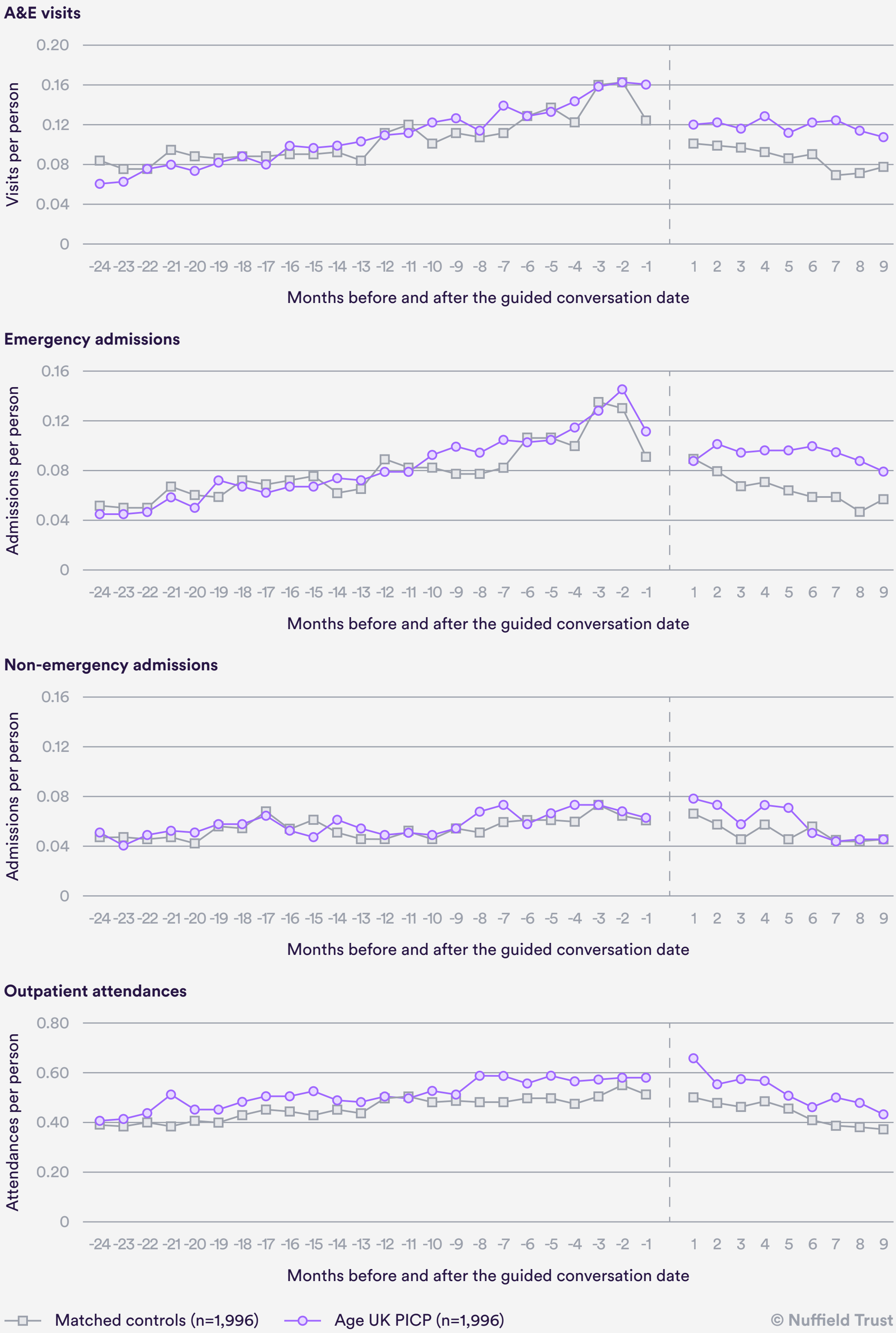
Figure 3 shows charts of hospital activity in the two years before the guided conversation date (labelled months -24 to -1) and in the nine months after the guided conversation date (labelled months 1 to 9) for different types of hospital care.

There was a clear divergence between the two groups after the guided conversation date in unplanned care events – A&E visits and emergency admissions.

In terms of emergency admissions, in the month just after the guided conversation date (month 1) the two groups had almost exactly the same numbers of emergency admissions, at a level that was generally lower than that of the prior six months. From the second month, however, the number of control group admissions tended to fall month by month, while the number of PICP group admissions remained at broadly the same level as month 1. We observed roughly similar patterns with A&E visits, although with a relatively high rate of visits in the PICP group from the very first month.

In terms of non-emergency admissions, the PICP group had slightly more admissions than the control group – but only for the first five months after the guided conversation date. For the last four months of the nine-month period, non-emergency admissions were almost perfectly matched in the two groups.

Figure 3: Average number of hospital contacts per person per month, in the two years before and nine months after the guided conversation date



Outpatient attendances in the control group underwent a gentle decline from the peak two months before the guided conversation-equivalent date. Meanwhile, outpatient attendances in the PICP group appeared to rise slightly in the month immediately following the guided conversation date, before dropping back to their prior levels, and then also declining as the months progressed.

Rates of hospital activity after guided conversation

We calculated the average number of hospital contacts during the nine months after the guided conversation in the two groups (see Table 6). The ratio of the means is also given in the table (such that values greater than 1 represent more hospital activity in the PICP group than in the control group), as is the adjusted ratio.

Table 6: Rates of hospital contacts and rate ratios during the nine months after the guided conversation date

Type of hospital contact	Mean number per person (standard deviation)		Rate ratio† (95% confidence intervals)		Higher or lower compared with controls? (adjusted ratio, at 95% statistical significance)
	Control group (n=1,996)	**PICP group (n=1,996)**	**Unadjusted**	**Adjusted**	
A&E visits	0.77 (1.33)	1.06 (1.52)	**1.36**** (1.25 to 1.49)	**1.33**** (1.21 to 1.47)	**Higher** (33% higher)
Emergency admissions	0.58 (1.08)	0.83 (1.32)	**1.42**** (1.28 to 1.56)	**1.35**** (1.22 to 1.50)	**Higher** (35% higher)
Non-emergency admissions	0.46 (1.58)	0.54 (2.50)	1.16 (0.90 to 1.49)	1.06 (0.90 to 1.25)	No difference
Outpatient attendances	3.89 (6.27)	4.68 (7.07)	**1.21**** (1.10 to 1.32)	**1.23**** (1.12 to 1.34)	**Higher** (23% higher)

† > 1 means that rates were higher in the PICP group than in the control group.
* $p < 0.05$ (statistically significant at the 95% confidence level).
** $p < 0.001$ (statistically significant at the 99.9% confidence level).

We calculated the adjusted ratios using multivariate regression methods; these corrected for some of the remaining differences in characteristics between the two groups. As such, the adjusted ratios (highlighted) should be considered the key measures of difference between the two groups.

After adjustment, we found that the PICP group had 33% more A&E visits (equivalent to 25 extra visits per 100 people) and 35% more emergency admissions than the matched control group (equivalent to 20 extra admissions per 100 people). Outpatient attendances were also higher in the PICP group, by 23% (equivalent to 89 extra attendances per 100 people). These were all statistically significant differences at greater than 99.9% confidence levels.

Differences in the rates of non-emergency admissions were not statistically significant at the 95% confidence level.

Costs of hospital activity after guided conversation

Table 7 accounts for this same activity in terms of hospital costs. Emergency admissions in the nine months after referral cost £1,463 per person for the matched control group and £2,295 per person for the PICP group. Once adjusted for some of the remaining differences between the two groups, emergency admissions cost £731 per person more for the PICP group than for the control group – a statistically significant difference at greater than 99.9 % confidence levels. There were also statistically significant differences in A&E and outpatient costs, all being higher in the PICP group.

Overall hospital costs in the nine months after the guided conversation for the PICP group were £3,504 per person compared with £2,455 for the matched control group. After adjustment, the PICP group was more costly per person by £906 (representing an additional 37% on top of the control group's costs).

Table 7: Hospital costs during the nine months after the guided conversation date

Type of hospital contact	Mean cost, £ per person (standard deviation)		Difference in mean costs, £ per person† (95% confidence intervals)		Higher or lower compared with controls? (adjusted difference, at 95% statistical significance)
	Control group (n=1,996)	**PICP group (n=1,996)**	**Unadjusted**	**Adjusted**	
A&E visits	101 (178)	138 (208)	**37**** (26 to 48)	**29**** (18 to 40)	**Higher cost** (by 29%)
Emergency admissions	1,463 (3,213)	2,295 (4,215)	**833**** (611 to 1,054)	**731**** (509 to 953)	**Higher cost** (by 50%)
Non-emergency admissions	457 (1,511)	550 (2,527)	94 (-34 to 221)	64 (-60 to 188)	No difference
Outpatient attendances	434 (603)	521 (705)	**87**** (51 to 123)	**82**** (46 to 119)	**Higher cost** (by 19%)
All contacts (total hospital costs)	2,455 (3,912)	3,504 (5,341)	**1,050**** (777 to 1,323)	**906**** (633 to 1,179)	**Higher cost** (by 37%)

† > 0 means that the PICP group had higher costs than the control group.
* $p < 0.05$ (statistically significant at the 95% confidence level).
** $p < 0.001$ (statistically significant at the 99.9% confidence level.)

6 Further detail on the findings

In Chapter 5 we outlined our primary findings: for people referred to the PICP, subsequent emergency hospital activity was more common than for a very similar group of people, and total hospital costs were higher.

This chapter explores the hospital data in further detail to try to provide some context to these findings. We start by looking at the main causes of emergency admissions in the two groups, and then carry out an analysis of differences in potentially preventable admissions. We also outline observed differences in total hospital activity by a variety of subgroupings of individuals (for example, by age and by area).

Finally, for the large group of phase 2 areas, we report key results over a longer period: 16 months.

What were the main causes of emergency admissions?

We extracted the primary diagnosis from each of the emergency admissions[14] during the first nine months after the guided conversation date (or equivalent date for the matched controls) and translated each of the diagnosis codes into one of up to 260 'Clinical Classifications Software' (CCS) condition groups (Agency for Healthcare Research and Quality, 2016).

Table 8 shows the 30 most common causes of admission in the two groups after referral. These conditions represented 70% of all emergency admissions in the two groups.

14 From the first episode of the admission spell, where there was more than one episode.

Table 8: Main causes of emergency admissions in the nine months after the guided conversation date

CCS† group number	Cause of emergency admission (CCS group)	Number of emergency admissions in each group (% in group)		Ratio‡	Statistically significant difference at the 95% confidence level? (*p* value)
		Control group (n = 1,167)	PICP group (n = 1,652)		
127	COPD and bronchiectasis	87 (7.5%)	214 (13.0%)	2.5	**Yes** (< 0.0001)
122	Pneumonia (except that caused by tuberculosis or a sexually transmitted disease)	89 (7.6%)	142 (8.6%)	1.6	**Yes** (0.003)
211	Other connective tissue disease	45 (3.9%)	82 (5.0%)	1.8	**Yes** (0.002)
159	Urinary tract infection	65 (5.6%)	76 (4.6%)	1.2	No (0.445)
102	Non-specific chest pain	69 (5.9%)	59 (3.6%)	0.9	No (0.449)
108	Congestive heart failure, non-hypertensive	43 (3.7%)	54 (3.3%)	1.3	No (0.330)
68	Senility and organic mental disorder	12 (1.0%)	35 (2.1%)	2.9	**Yes** (0.003)
135	Intestinal infection	13 (1.1%)	35 (2.1%)	2.7	**Yes** (0.003)
245	Syncope	13 (1.1%)	32 (1.9%)	2.5	**Yes** (0.009)
106	Cardiac dysrhythmias	30 (2.6%)	31 (1.9%)	1.0	No (0.911)
157	Acute and unspecified renal failure	21 (1.8%)	31 (1.9%)	1.5	No (0.189)
109	Acute cerebrovascular disease	19 (1.6%)	29 (1.8%)	1.5	No (0.165)
101	Coronary atherosclerosis and other heart disease	21 (1.8%)	26 (1.6%)	1.2	No (0.508)
239	Superficial injury, contusion	17 (1.5%)	26 (1.6%)	1.5	No (0.188)
125	Acute bronchitis	18 (1.5%)	25 (1.5%)	1.4	No (0.296)
155	Other gastrointestinal disorder	17 (1.5%)	24 (1.5%)	1.4	No (0.282)
2	Septicaemia (except in labour)	35 (3.0%)	23 (1.4%)	0.7	No (0.127)
153	Gastrointestinal haemorrhage	10 (0.9%)	21 (1.3%)	2.1	No (0.091)

CCS† group number	Cause of emergency admission (CCS group)	Number of emergency admissions in each group (% in group)		Ratio‡	Statistically significant difference at the 95% confidence level? (*p* value)
		Control group (n = 1,167)	**PICP group (n = 1,652)**		
134	Other upper respiratory disease	19 (1.6%)	20 (1.2%)	1.1	No (0.887)
197	Skin and subcutaneous tissue infection	15 (1.3%)	20 (1.2%)	1.3	No (0.435)
204	Other non-traumatic joint disorder	20 (1.7%)	20 (1.2%)	1.0	No (1.000)
226	Fracture of the neck of femur (hip)	16 (1.4%)	20 (1.2%)	1.3	No (0.520)
235	Open wounds of the head, neck and trunk	10 (0.9%)	20 (1.2%)	2.0	No (0.093)
237	Complication of device, implant or graft	15 (1.3%)	20 (1.2%)	1.3	No (0.485)
55	Fluid and electrolyte disorder	13 (1.1%)	19 (1.2%)	1.5	No (0.313)
100	Acute myocardial infarction	11 (0.9%)	19 (1.2%)	1.7	No (0.207)
149	Biliary tract disease	7 (0.6%)	18 (1.1%)	2.6	No (0.057)
117	Other circulatory disease	14 (1.2%)	17 (1.0%)	1.2	No (0.639)
205	Spondylosis, intervertebral disc disorder, other back	10 (0.9%)	17 (1.0%)	1.7	No (0.192)
95	Other nervous system disorder	8 (0.7%)	14 (0.8%)	1.8	No (0.207)

† CCS = Clinical Classification Software.
‡ > 1 means that there were more admissions in the PICP group than in the control group.

The most common cause of emergency admission in the PICP group was COPD (making up 13% of that group's admissions), with pneumonia the second most common cause (9% of the group's admissions). There were far fewer of these types of admissions in the matched control group.

At the 95% statistical confidence level, there were significantly higher numbers of admissions in the PICP group for six conditions: COPD, pneumonia, 'other connective tissue disease', senility and organic mental disorder, intestinal infection and syncope.

How did the two groups differ in terms of preventable admissions?

Ambulatory care sensitive (ACS) conditions are a set of conditions for which it is argued that effective primary and community care can prevent the need for future hospital admission. Emergency admissions for ambulatory care sensitive conditions are often used as a marker for suboptimal preventive care (see, for example, Blunt, 2013).

In the PICP group, of 1,652 emergency admissions in the nine months after the guided conversation date, 604 (37%) were of a type considered to be potentially preventable.[15] Of the matched control group's 1,167 emergency admissions, 392 (34%) were preventable.

Figure 4 shows the monthly average rates of emergency admissions before and after the guided conversation date as in Figure 3b, but split into preventable (ACS) and other emergency admissions. Note that the groups were well matched in terms of preventable admissions before the guided conversation date. After the guided conversation date, preventable admissions remained largely stable for the PICP group before declining towards the end of the nine-month period. There were consistently more preventable admissions for the PICP group than for the matched controls: we calculated these to be 38% higher in the PICP group after adjustment (see Table 9). The costs of preventable admissions were also higher in the PICP group (by £224 per person, see Table 10).

15 These conditions were angina, asthma, cellulitis, congestive heart failure, convulsions and epilepsy, COPD, dehydration, dental conditions, diabetes complications, ear, nose and throat infections, gangrene, gastroenteritis, hypertension, influenza, iron deficiency anaemia, nutritional deficiencies, other vaccine-preventable, pelvic inflammatory disease, perforated/bleeding ulcer, pneumonia and tuberculosis.

Figure 4: Average number of preventable (ambulatory care sensitive) and other emergency inpatient admissions per person per month, in the two years before and nine months after the guided conversation date

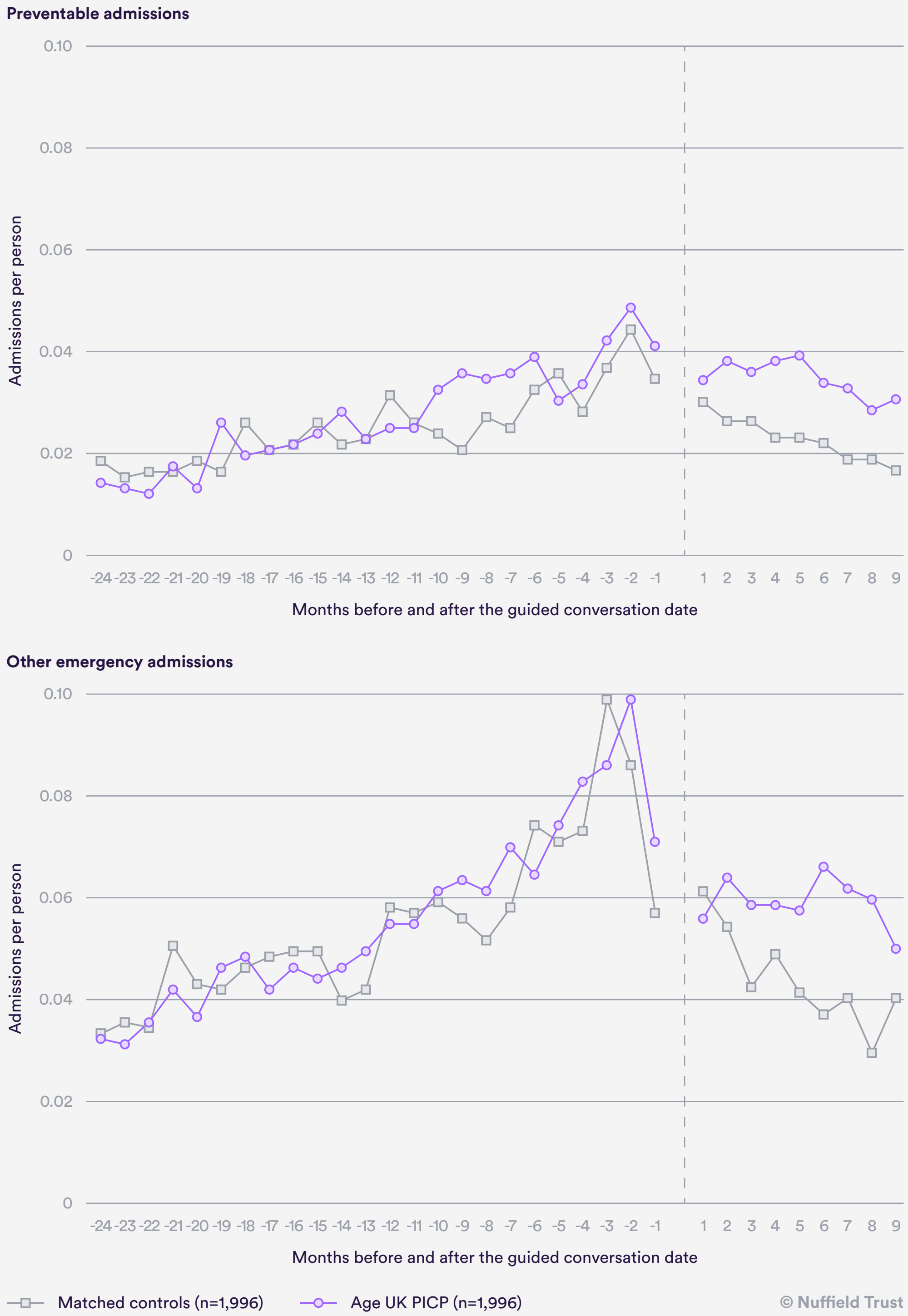


Table 9: Rates of preventable and other emergency admissions, and ratios, during the nine months after the guided conversation date

Type of hospital contact	Number per person (standard deviation)		Rate ratio† (95% confidence intervals)		Higher or lower compared with controls? (adjusted ratio, at 95% statistical significance)
	Control group (n=1,996)	PICP group (n=1,996)	Unadjusted	Adjusted	
All emergency admissions	0.58 (1.08)	0.83 (1.32)	**1.42**** (1.28 to 1.56)	**1.35**** (1.22 to 1.50)	**Higher** (35% higher)
Preventable emergency admissions	0.20 (0.6)	0.30 (0.79)	**1.54**** (1.30 to 1.82)	**1.38**** (1.16 to 1.64)	**Higher** (38% higher)
Other emergency admissions	0.39 (0.81)	0.53 (0.93)	**1.35**** (1.20 to 1.52)	**1.31**** (1.16 to 1.48)	**Higher** (31% higher)

† > 1 means that there were more admissions in the PICP group than in the control group.
* $p < 0.05$ (statistically significant at the 95% confidence level).
** $p < 0.001$ (statistically significant at the 99.9% confidence level).

Table 10: Hospital costs of preventable and other emergency admissions during the nine months after the guided conversation date

Type of hospital contact	Mean cost, £ per person (standard deviation)		Difference in mean costs, £ per person† (95% confidence intervals)		Higher or lower compared with controls? (adjusted difference, at 95% statistical significance)
	Control group (n=1,996)	PICP group (n=1,996)	Unadjusted	Adjusted	
All emergency admissions	1,463 (3,213)	2,295 (4,215)	**833**** (611 to 1,054)	**731**** (509 to 953)	**Higher cost** (by 50%)
Preventable emergency admissions	539 (1,888)	823 (2,489)	**284**** (154 to 413)	**224**** (94 to 354)	**Higher cost** (by 42%)
Other emergency admissions	924 (2,297)	1,473 (3,225)	**549**** (379 to 719)	**507**** (337 to 678)	**Higher cost** (by 55%)

† > 0 means that there were higher costs in the PICP group than in the control group.
* $p < 0.05$ (statistically significant at the 95% confidence level).
** $p < 0.001$ (statistically significant at the 99.9% confidence level).

Analyses of subgroups

This section presents the differences in subsequent hospital activity between the PICP and matched control groups for specific subgroups. The intention here is both to try to explain some of our findings, and also to provide information that might help better target similar schemes in future.

For these analyses we used **total hospital costs** in the nine months after the guided conversation date (or the equivalent date for the controls) as the summary measure of hospital activity in each group.

Some care should be taken when interpreting the results of the subgroup analyses. While we put in a great deal of effort to make sure that the controls were well matched with the PICP group overall (that is, for all 1,996 people), it is likely that the quality of the matching will have been somewhat poorer for individual subgroups.[16]

Table 11 shows the mean total hospital costs, and the differences in those costs (both unadjusted and adjusted), for various sets of subgroups.

Unsurprisingly, individuals in the **'two plus two'** group (those with two long-term conditions and two recent emergency admissions) had higher total costs in the nine months after the guided conversation date than those not in that group, but there was little difference between these two groups of clients when compared to equivalent controls. Both had costs that were more than a third higher in the PICP group than in the control group.

For all **age groups**, costs were higher for the PICP clients than for the controls. Those in the youngest age group (ages 50–74) had the lowest relative difference: 31% higher costs for PICP clients in this age group versus controls, compared with 37–40% higher costs for the older clients.

16 It is more likely that subgroups with the fewest people in them (for example, the smallest areas) will have had the poorest matching, although the multivariate adjustments attempted to correct for differences in baseline variables.

Table 11: Total hospital costs during the nine months after the guided conversation date by various subgroups

Subgroup (number in PICP and control groups)	Mean cost, £ per person (standard deviation)		Difference in mean costs, £ per person† (95% confidence intervals)		Higher or lower compared with controls? (adjusted difference, at 95% statistical significance)
	Control group	PICP group	Unadjusted	Adjusted	
'Two plus two' group?					
No (n = 1,300)	1,940 (3,507)	2,755 (4,488)	**814**** (517 to 1,110)	**744**** (450 to 1,038)	**Higher cost** (by 38%)
Yes (n = 696)	3,442 (4,427)	4,904 (6,422)	**1,465**** (909 to 2,021)	**1,171**** (607 to 1,735)	**Higher cost** (by 34%)
Age band					
50–74 (n = 603)	2,460 (3,900)	3,356 (4,938)	**895**** (434 to 1,357)	**760*** (304 to 1,216)	**Higher cost** (by 31%)
75–84 (n = 755)	2,505 (3,937)	3,644 (6,038)	**1,139**** (658 to 1,621)	**935**** (455 to 1,415)	**Higher cost** (by 37%)
85+ (n = 638)	2,389 (3,899)	3,479 (4,807)	**1,090**** (624 to 1,555)	**955**** (492 to 1,418)	**Higher cost** (by 40%)
Area					
Cornwall (n = 395)	1,435 (3,335)	2,488 (4,582)	**1,053**** (494 to 1,613)	**964**** (433 to 1,495)	**Higher cost** (by 67%)
Ashford and Canterbury (n = 164)	2,722 (4,799)	2,971 (4,392)	249 (-695 to 1,192)	196 (-765 to 1,156)	No difference
Blackburn with Darwen (n = 265)	2,764 (4,016)	4,289 (5,323)	**1,525**** (752 to 2,299)	**1,314**** (548 to 2,080)	**Higher cost** (by 48%)
East Lancashire (n = 265)	3,312 (4,489)	3,631 (4,673)	319 (-424 to 1,062)	65 (-687 to 818)	No difference
Guildford and Waverley (n = 113)	2,437 (3,120)	3,709 (4,952)	**1,273*** (182 to 2,364)	**1,271*** (154 to 2,387)	**Higher cost** (by 52%)
North Tyneside (n = 75)	2,735 (3,982)	5,211 (6,319)	**2,476*** (825 to 4,127)	**1,982*** (125 to 3,839)	**Higher cost** (by 72%)
Portsmouth (n = 243)	1,967 (2,984)	2,850 (5,186)	**883*** (156 to 1,610)	700 (-15 to 1,414)	No difference

Subgroup (number in PICP and control groups)	Mean cost, £ per person (standard deviation)		Difference in mean costs, £ per person† (95% confidence intervals)		Higher or lower compared with controls? (adjusted difference, at 95% statistical significance)
	Control group	PICP group	Unadjusted	Adjusted	
Sheffield (n = 476)	2,768 (4,011)	4,039 (6,318)	**1,272**** (666 to 1,877)	**1,013*** (401 to 1,625)	**Higher cost** (by 37%)
Risk band (risk of future emergency admission)					
Low (n = 729)	1,152 (2,599)	2,073 (3,637)	**921**** (599 to 1,243)	**929**** (608 to 1,249)	**Higher cost** (by 81%)
Medium (n = 671)	2,393 (3,669)	3,257 (4,844)	**860**** (411 to 1,310)	**815**** (365 to 1,265)	**Higher cost** (by 34%)
High (n = 596)	4,155 (4,809)	5,533 (6,808)	**1,377**** (723 to 2,030)	**1,081*** (423 to 1,740)	**Higher cost** (by 26%)
Period of start of intervention					
Early (n = 663)	2,539 (4,119)	3,657 (6,182)	**1,118**** (586 to 1,650)	**912**** (379 to 1,445)	**Higher cost** (by 36%)
Middle (n = 641)	2,252 (3,457)	3,630 (5,275)	**1,378**** (912 to 1,843)	**1,252**** (788 to 1,717)	**Higher cost** (by 56%)
Late (n = 692)	2,561 (4,099)	3,241 (4,459)	**681*** (263 to 1,099)	**506*** (88 to 925)	**Higher cost** (by 20%)

† > 0 means that the PICP group had higher costs than the control group.
* $p < 0.05$ (statistically significant at the 95% confidence level).
** $p < 0.001$ (statistically significant at the 99.9% confidence level).

Splitting the groups by **area** (and using conventional 95% statistical confidence levels), we found that three PICP areas (Ashford and Canterbury, East Lancashire, and Portsmouth) had similar post-guided conversation costs compared with controls, while the other five areas (Cornwall, Blackburn with Darwen, Guildford and Waverley, North Tyneside, and Sheffield) had higher costs. However, a more nuanced view of the statistical confidence of these results suggests that the areas very broadly clustered into three groups:

- Ashford and Canterbury, and East Lancashire – high statistical confidence of no difference in costs compared with controls (*p* values > 0.69)
- Guildford and Waverley, North Tyneside, and Portsmouth – borderline confidence of higher costs compared with controls (*p* values 0.026 to 0.055)

- Cornwall, Blackburn with Darwen, and Sheffield – high statistical confidence of higher costs compared with controls (*p* values < 0.002).

In terms of **risk of emergency admission** categories (split into three roughly equal-sized groups), costs were higher for PICP clients in all groups, but there was a very large relative difference for the very lowest risk clients (81% more costly) than for the medium and higher risk clients (34% and 26% more costly respectively).

Finally, we split individuals – again in rough thirds – into three **time periods**: those recruited earliest into each scheme (typically in the first five to eight months), those recruited a little later (typically the next three to five months) and those recruited last (the final three to five months). These periods were determined for each area separately, and so the time periods do not line up precisely across different areas. However, the aim was to document results for the schemes at different stages of development – especially at the start, and then once they had had some time to 'bed in.' While we again observed higher costs for the PICP group for all starting time periods, the **relative** difference was lowest (20% higher) for the last group – those referred in the latter months of each area's evaluation period.

These results are somewhat ambiguous, and it is not clear that the observed differences between individual subgroups are in reality meaningfully different. The area-level results offer the greatest range of potentially meaningful variation with at least two areas (Ashford and Canterbury, and East Lancashire) showing levels of hospital activity that were no different from those of the controls.

It is possible that differences in some other subgroups, however, were due in part to these area-level differences. For example, Cornwall PICP – an area with significantly high subsequent costs compared with the control group – may have disproportionately influenced the result for the lowest risk group, as its clients tended to be of lower risk than those of the other areas (see Table 3).

Phase 2 areas: progress over 16 months

In Chapter 5 and so far in this chapter we have presented our main findings for all eight PICP areas, reporting on hospital contacts in the nine months following the start of the intervention (the guided conversation date).

However, for the seven phase 2 areas (n = 1,601), we were able to follow up PICP clients and controls for **16 months** after the start of the intervention.

Figure 5 shows, for the seven phase 2 areas, PICP and matched control groups' monthly average hospital activity levels before and after the start of the intervention. The key observation is that where we had found higher activity levels in the PICP group in comparison with the control group in the shorter term (over nine months), these continued over the longer term. There was very little sign of these higher activity levels eventually diminishing with respect to the control group. That is, the higher levels of A&E visits, emergency admissions and outpatient attendances did not just appear to be short-term effects, but were potentially lasting consequences of the service.

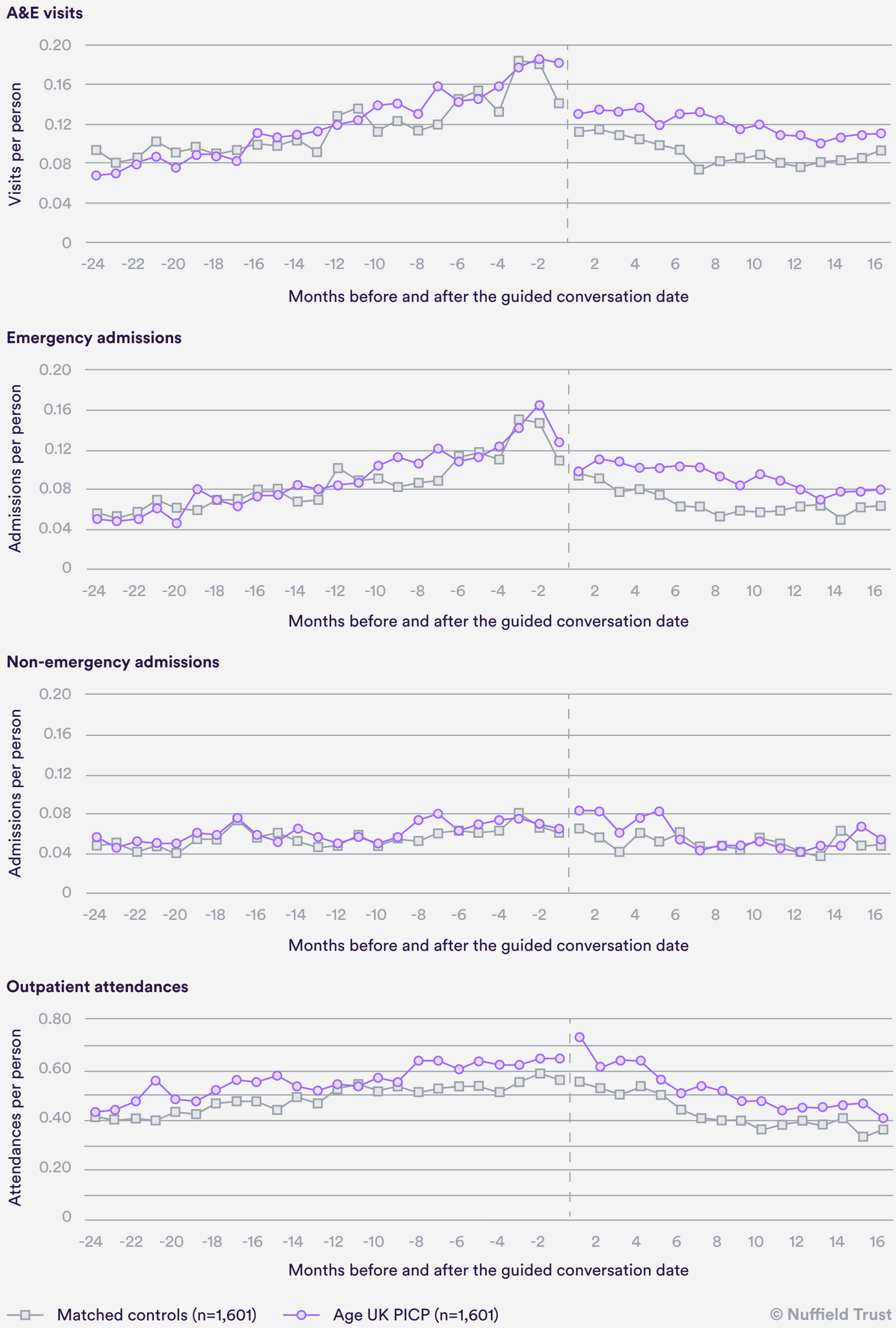
There continued to be no difference between the two groups in non-emergency admissions.

Table 12: Rates of hospital contacts and rate ratios during the 16 months after the guided conversation date, phase 2 areas

Type of hospital contact	Number per person (standard deviation)		Rate ratio† (95% confidence intervals)		Higher or lower compared with controls? (adjusted ratio, at 95% statistical significance)
	Control group (n=1,601)	PICP group (n=1,601)	Unadjusted	Adjusted	
A&E visits	1.46 (2.11)	1.91 (2.4)	**1.31**** (1.2 to 1.43)	**1.27**** (1.16 to 1.39)	**Higher** (27% higher)
Emergency admissions	1.08 (1.62)	1.48 (1.96)	**1.37*** (1.25 to 1.50)	**1.30**** (1.19 to 1.43)	**Higher** (30% higher)
Non-emergency admissions	0.82 (2.63)	0.94 (4.02)	1.15 (0.88 to 1.48)	0.99 (0.82 to 1.18)	No difference
Outpatient attendances	6.90 (9.98)	8.40 (11.39)	**1.22**** (1.12 to 1.33)	**1.25**** (1.14 to 1.37)	**Higher** (25% higher)

† > 1 means that the rate was higher in the PICP group than in the control group.
* $p < 0.05$ (statistically significant at the 95% confidence level).
** $p < 0.001$ (statistically significant at the 99.9% confidence level).

Figure 5: Average number of hospital contacts per person per month, in the two years before and 16 months after the guided conversation date, phase 2 areas



After adjustment, we found that the numbers of emergency admissions were 30% higher in the PICP group than they were in the control group, while the numbers of A&E visits and outpatient attendances were respectively 27% and 25% higher (see Table 12). While these are more modest relative differences than those of our overall nine-month follow-up results (where we found a 35% adjusted relative difference in emergency admissions, for example; see Table 6), this is almost wholly due to the removal of Cornwall – the phase 1 area – from the analysis. That is, the relative rates of hospital activity between the two groups in the latter seven months were very similar to those in the preceding nine months.

Table 13 accounts for this same activity in terms of hospital costs. Overall hospital costs in the 16 months after the guided conversation for the PICP group were £6,286 per person compared with £4,828 for the matched control group. After adjustment, the PICP group was more costly per person by £1,229 (representing an additional 25% on top of the control group's costs).

Table 13: Hospital costs during the 16 months after the guided conversation date, phase 2 areas

Type of hospital contact	Mean cost, £ per person (standard deviation)		Difference in mean costs, £ per person† (95% confidence intervals)		Higher or lower compared with controls? (adjusted difference, at 95% statistical significance)
	Control group (n=1,601)	**PICP group (n=1,601)**	**Unadjusted**	**Adjusted**	
A&E visits	194 (283)	254 (327)	**60**** (41 to 80)	**47**** (27 to 66)	**Higher cost** (by 24%)
Emergency admissions	2,959 (5,126)	4,110 (5,779)	**1,151**** (800 to 1,503)	**971**** (615 to 1326)	**Higher cost** (by 33%)
Non-emergency admissions	884 (2,786)	997 (3,447)	113 (-102 to 328)	79 (-129 to 286)	No difference
Outpatient attendances	792 (981)	925 (1,127)	**132**** (66 to 199)	**134**** (67 to 201)	**Higher cost** (by 17%)
All contacts (total hospital costs)	4,828 (6,410)	6,286 (7,495)	**1,458**** (1,007 to 1,909)	**1,229**** (777 to 1,681)	**Higher cost** (by 25%)

† > 0 means that the PICP group had higher costs than the control group.
* $p < 0.05$ (statistically significant at the 95% confidence level).
** $p < 0.001$ (statistically significant at the 99.9% confidence level).

Appendix E presents the results of subgroup analyses for the seven phase 2 areas with 16-month follow-up. Patterns of relative impact by subgroup were generally similar to those presented in Table 11, with the exception of some area-based results. While all seven areas had higher 16-month total costs for PICP clients than for the matched controls, only two of the areas reached the conditions for statistical significance at the 95% confidence level (although a third area was arguably of borderline significance). A notable area was Sheffield, whose very high relative costs over nine months of £1,013 per person ($p < 0.002$) became much more equivalent to the controls over the full 16 months, at £702 ($p = 0.131$).

In addition, results over 16 months for the 'late' intervention group (typically those who had a guided conversation in the last three to five months of the study period) had total costs that were not statistically significantly different from those of the control group ($p = 0.168$). This was in marked contrast to the earlier groups – leaving open the possibility that the programme's methods of service delivery – and resulting impact – may have altered over the course of the study period.

7 Discussion

For this evaluation we linked hospital datasets to information from Age UK to assess the impact of Age UK's PICP on hospital activity.

Our analysis found that subsequent levels of hospital activity were significantly higher for PICP clients than for a carefully selected group of matched controls. We found that this was true for all types of hospital activity with the exception of non-emergency (planned) inpatient care.

In the nine months following the service start date, there were over a third more emergency admissions for the group who received the PICP service compared with matched controls, equating to two additional emergency admissions for every 10 clients. Levels of potentially preventable emergency admissions were even higher in relative terms (by 38%). The relatively high level of emergency admissions (and A&E and outpatient attendances) appeared to persist for as long as we had follow-up data – 16 months.

Total hospital costs were higher for PICP clients than for matched controls by £906 per person over nine months and (for a large subset) £1,230 over 16 months (amounting to a 37% and 25% relative increase respectively).

We found no evidence of lower total hospital costs in the PICP group for any specific client subgroup. At best, two or three of the individual PICP areas had costs that were no different from those of the matched controls.

Strengths and weaknesses of the study

We were able to examine the hospital use of a moderately large group of nearly 2,000 older people who received a service from Age UK's PICP. For a large subset, we were able to follow hospital use for 16 months after the start of the service. This was an improvement on previous studies that had typically been limited to six to nine months of follow-up data. In addition, the design of this study allowed for the scheme to have matured in the local areas, with up to 18 months of referrals included in the analysis.

We used well-established methods for modelling the risk of future emergency admissions for the PCIP clients, and applied these methods to a very large number of people from carefully selected areas of England. From this large pool, we were able to select a control group with an extremely similar profile of risk to the PICP group. We used genetic matching methods to additionally ensure that the groups were well matched on a large number of characteristics: not just on age and sex, but also on a large number of measures of prior hospital activity and disease history.

We were ultimately successful in identifying a very well-matched control group – one that would be expected to have broadly the same prognosis of future hospital activity as the PICP group. We finally made multivariate adjustments to all our analyses to address the effect of modest remaining differences between the two groups.

However, we undertook the analysis using only hospital datasets and this has two main implications. First, we were not able to make any conclusions about the impact of the PICP on activity in any other care sectors. Second, access to other datasets might have allowed us to match people on additional characteristics relevant to levels of future hospital activity – for example, prior use of other care services, or personal factors such as the strength of people's social support networks, self-assessed health, housing status and so on. It is therefore possible that the matched control group was systematically different from the PICP group in some of these ways that we were not able to measure.

The control individuals were selected from areas not covered by the PICP. It is possible that some of the differences we found (especially at area level) may have been due to variation in the behaviour of local health economies, although we would not have expected this potential effect to have introduced a consistent bias across the whole sample. It is also possible that there were local interventions with similar aims to the PICP in the control areas themselves, but for a number of reasons it is unlikely that these could have been responsible for our findings.

We did not have information on out-of-hospital deaths, and so were not able to make a judgement on the relationship between deaths and the relative levels of hospital use in the two groups. Our analysis also did not distinguish between individuals in terms of the intensity and length of the service provided by the PICP.

Finally, this evaluation was somewhat limited in its scope: it was a data-focused analysis of the scheme's impact, and so we were not able to follow up on its findings with qualitative methods.

Other studies

Our results are generally consistent with previous findings related to schemes that were led by or involved the voluntary sector, which aimed to reduce pressures on hospitals. In an analysis of three community-based programmes (Georghiou and others, 2016), we found higher levels of emergency admissions, A&E visits and outpatient attendances, no difference in non-emergency inpatient admissions and higher total costs in nine months after the start of the interventions.

We also evaluated a number of schemes that aimed to provide support to people following an admission to hospital (Georghiou and others, 2016; Georghiou and Steventon, 2014), and in these we found higher levels of unplanned activity in the period following the start of the service.

Our recent evaluation of Health 1000 – a 'one-stop' primary care service for older people, which included Age UK as part of a primary care-based multidisciplinary team[17] – found no evidence that the service reduced use of hospital services (Sherlaw-Johnson and others, 2018). Similarly, we found no evidence of a reduction in emergency hospital activity as a result of eight Department of Health-funded schemes that aimed to 'shift resources and culture away from institutional and hospital-based crisis care for older people towards earlier, targeted interventions within their own homes and communities' (Steventon and others, 2011, p. 4). These schemes were led by local authorities, in partnership with their primary care trusts and representatives from the voluntary, community and independent sectors (Steventon and others, 2011).

More broadly, recent reviews of a wide range of initiatives that aimed to shift care away from hospitals have noted that while many had the potential to improve care for patients, few were able to demonstrate overall reductions in emergency admissions or cost savings (Imison and others, 2017; Steventon and others, 2018).

17 This included the phase 2 area of Barking, Havering and Redbridge, which was not included in this analysis.

Reflections on the findings

Age UK's PICP is an ambitious scheme that has to date been rolled out in 14 areas in England. The scheme ultimately aims to improve the care that older people experience through direct support and by reducing fragmentation in the care system. It also aims to reduce local cost pressures.

In terms of this latter aim, our results are disappointing. In contrast to some previously publicised local findings (O'Dowd, 2015), we found no evidence of cost savings from reductions in hospital activity. In fact, our results suggest that secondary care costs may have been higher than they otherwise would have been for groups referred to the PICP scheme, and not just in the very short term.

With Age UK's focus on each client's individual needs – in the initial guided conversation and during the subsequent months of support – it is likely that there was a corresponding increase in attention on potentially unaddressed health needs. Age UK's commissioned qualitative evaluation of the programme found a consensus that it had been helpful in discovering unmet need among the clients, and noted instances where referrals were made to NHS services (primarily physiotherapy and GP services) and to social care (Fullwood, 2018). It is possible in our study that the process of uncovering additional needs in the client group led directly or indirectly to increased hospital use, and for a sustained period beyond the relatively short duration of the service. While emergency hospital activity can be destabilising for older people, this additional care might ultimately have been to the benefit of those affected over the longer term.

Our secondary analyses attempted to unpick some details about how the programme performed. We found some evidence of differential impacts of the programme for different groups of client. The youngest clients, those at highest risk of future emergency admission and those recruited in the latter months of the schemes appeared most similar to the matched controls in their subsequent hospital use, although still with relatively high costs. However, these results are not sufficiently clear to allow us to recommend changes to how the PICP, or others like it, might be targeted.

The analyses by risk band are perhaps worth pausing to consider in a little detail. We appeared to find an inverse relationship between the PICP clients' risk of future emergency admission, and the relative increase in total costs versus the controls (for both the nine-month and 16-month analyses). That is, the lowest risk group of PICP clients had much higher post-intervention hospital costs relative to the controls as compared with the medium risk and higher risk individuals. These results may make some conceptual sense. We might speculate that the lower risk group were a mix of those at 'genuinely' low risk of admission, in addition to those simply not known to health services (and so who lacked sufficient data to trigger a higher risk score). Conversely, those at higher risk were almost by definition already well known to the health service. If the PICP scheme was helping to identify unmet need – which then manifested in a higher use of hospital services – it might have been expected to do so disproportionately for those at lowest risk. Note, however, that in absolute terms (that is, in the increase in hospital costs per person), the three groups behaved fairly similarly.

There was significant variation in outcomes at area level, with some areas performing no differently in comparison to the matched controls, and other areas' clients having much higher subsequent hospital activity, although this picture was complicated by differences between the nine-month and 16-month follow-up results. Nevertheless, there may be an opportunity for future work to try to understand these differences by looking in more detail at local variations in the schemes and in their supported clients.

This evaluation was not able to make any direct observations about the perceived value of the service to the clients themselves and to local practitioners. However, in a previous study of voluntary sector-led schemes (which included Cornwall PICP as one study area), we reported that our overriding impression from interviews with staff, volunteers and NHS colleagues 'was of services that were considered to be of considerable benefit to people and their families, but also to NHS and other statutory sector staff' (Georghiou and others, 2016, p. 11). We found that the schemes helped older people with unmet needs, helped to reduce feelings of isolation, had the potential to increase the productivity and satisfaction of health and social care staff, and benefited the families and carers of those referred to the service. The separate qualitative evaluation of PICP commissioned by Age UK has mirrored these findings, reporting additionally that there have been measurable improvements in wellbeing for the older people involved (Fullwood, 2018).

Conclusion

This study was not designed to be a complete assessment of the impact of Age UK's PICP, but rather one element within a wider set of evaluations. Our findings need to be considered alongside that other work.

Our work's primary aim was to answer an important question about whether the scheme has been able to reduce local pressure on hospitals. We have been able to conclude – with some confidence – that it has almost certainly not done so. While in some areas there was no apparent impact on hospital activity, overall there was a higher than expected use of emergency and outpatient services, and a corresponding increase in costs. These effects were detectable from the very start of the service and persisted for more than a year after.

Age UK's PICP is one of a number of schemes in recent years that have sought to prevent unnecessary hospital use in older people by the provision of community-based forms of care. It is far from alone in not being able to show corresponding reductions in hospital activity. There is a frustrating lack of evidence about what types of interventions might be able to achieve this aim. There is a strong case for future evaluations to consider a broader range of impacts – and over a wider set of care sectors – given the complex needs that such programmes address.

References

Age UK (n.d.) *Integrated Care Services*. Age UK. www.ageuk.org.uk/our-impact/programmes/integrated-care. Accessed 21 November 2018.

Agency for Healthcare Research and Quality (2016) 'Beta Clinical Classifications Software (CCS) for ICD-10-CM'. Agency for Healthcare Research and Quality. www.hcup-us.ahrq.gov/toolssoftware/ccs10/ccs10.jsp. Accessed 20 November 2018.

Austin PC (2009) 'Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples', *Statistics in Medicine* 28(5), 3083–107.

Blunt I (2013) *Focus on Preventable Admissions: Trends in emergency admissions for ambulatory care sensitive conditions, 2001 to 2013*. Quality Watch. Nuffield Trust and The Health Foundation. www.qualitywatch.org.uk/focus-on/preventable-admissions. Accessed 20 November 2018.

Boyd CM, Landefeld CS, Counsell SR, Palmer RM, Fortinsky RH, Kresevic D, Burant C and Covinsky KE (2008) 'Recovery of activities of daily living in older adults after hospitalization for acute medical illness', *Journal of the American Geriatrics Society* 56(12), 2171–9. doi: 10.1111/j.1532-5415.2008.02023.x.

Davies A, Ariti C, Georghiou T and Bardsley M (2015) *Evaluation of Complex Health and Care Interventions using Retrospective Matched Control Methods*. Nuffield Trust. www.nuffieldtrust.org.uk/research/evaluation-of-complex-health-and-care-interventions-using-retrospective-matched-control-methods. Accessed 20 November 2018.

Diamond A and Sekhon JS (2012) 'Genetic matching for estimating causal effects: a general multivariate matching method for achieving balance in observational studies', *The Review of Economics and Statistics* 95(3), 932–45. doi: 10.1162/REST_a_00318.

Fullwood Y (2018) *Blended Evaluation of Phase 2 of the Age UK Personalised Integrated Care Programme: Final evaluation report*. Age UK. www.ageuk.org.uk/globalassets/age-uk/documents/programmes/personalised-integrated-care-programme/picp-phase-2-blended-evaluation-report.pdf. Accessed 20 November 2018.

Georghiou T, Billings J and Bardsley M (2013) New Predictive Case Finding Models for the NHS: Report to accompany Nuffield Trust Predictive Risk Conference 2013. Nuffield Trust. www.nuffieldtrust.org.uk/files/new-predictive-models-for-the-nhs-13-08-13.pdf. Accessed 22 January 2019.

Georghiou T, Ariti C, Davies M, Arora S, Bhatia T, Bardsley M and Thorlby R (2016) *Harnessing Social Action to Support Older People: Evaluating the Reducing Winter Pressures Fund*. Nuffield Trust. www.nuffieldtrust.org.uk/research/harnessing-social-action-to-support-older-people. Accessed 20 November 2018.

Georghiou T and Steventon A (2014) *Effect of the British Red Cross 'Support at Home' Service on Hospital Utilisation*. Nuffield Trust. www.nuffieldtrust.org.uk/research/effect-of-the-british-red-cross-support-at-home-service-on-hospital-utilisation. Accessed 20 November 2018.

Hansen BB (2008) 'The prognostic analogue of the propensity score', *Biometrika* 95(2), 481–8.

Imison C, Curry N, Holder H, Castle-Clarke S, Nimmons D, Appleby J, Thorlby R and Lombardo S (2017) *Shifting the balance of care: great expectations. Research report*. Nuffield Trust. www.nuffieldtrust.org.uk/files/2017-02/shifting-the-balance-of-care-report-web-final.pdf. Accessed 10 January 2019.

Lafont C, Gérard S, Voisin T, Pahor M and Vellas B (2011) 'Reducing "iatrogenic disability" in the hospitalized frail elderly', *The Journal of Nutrition, Health & Aging* 15(8), 645–60.

Maguire D, Dunn P and McKenna H (2016) *How Hospital Activity in the NHS in England Has Changed Over Time*. The King's Fund. www.kingsfund.org.uk/publications/hospital-activity-funding-changes. Accessed 20 November 2018.

National Audit Office (2018) *Reducing Emergency Admissions*. Report by the Comptroller and Auditor General. National Audit Office. www.nao.org.uk/report/reducing-emergency-admissions. Accessed 20 November 2018.

NHS Improvement (2017) Reference Costs 2016/17: Highlights, analysis and introduction to the data. NHS Improvement.

Nuffield Trust, The Health Foundation and The King's Fund (2017) *The Autumn Budget: Joint statement on health and social care*. Nuffield Trust. www.nuffieldtrust.org.uk/research/autumn-budget-2017. Accessed 20 November 2018.

O'Dowd A (2015) 'Integrated care scheme for older people will roll out across England', *British Medical Journal* 350, doi: doi.org/10.1136/bmj.h2157.

Office for National Statistics (2015) '2011 area classifications'. webarchive.nationalarchives.gov.uk/20160114210841/http://www.ons.gov.uk/ons/guide-method/geography/products/area-classifications/ns-area-classifications/ns-2011-area-classifications/about-the-area-classifications/index.html. Accessed 20 November 2018.

Sherlaw-Johnson C, Crump H, Arora S, Holder H and Meaker R (2018) *Patient-centred Care for Older People with Complex Needs: Evaluation of a new care model in outer east London*. Nuffield Trust. www.nuffieldtrust.org.uk/research/patient-centred-care-for-older-people-with-complex-needs. Accessed 20 November 2018.

Steventon A, Bardsley M, Billings J, Georghiou T and Lewis J (2011) An Evaluation of the Impact of Community-based Interventions on Hospital Use: A case study of eight Partnership for Older People Projects (POPP). Nuffield Trust. www.nuffieldtrust.org.uk/research/an-evaluation-of-the-impact-of-community-based-interventions-on-hospital-use. Accessed 20 November 2018.

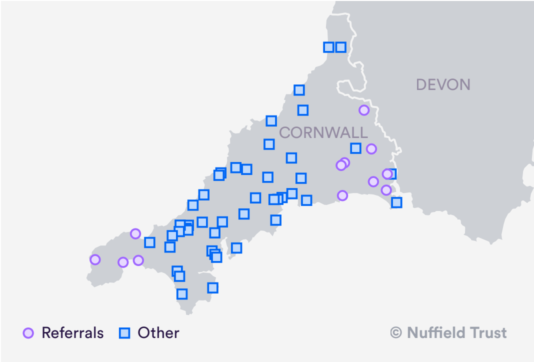
Steventon A, Deeny S, Friebel R, Gardner T and Thorlby R (2018) *Briefing: Emergency hospital admissions in England: Which may be avoidable and how?* The Health Foundation. www.health.org.uk/publications/emergency-hospital-admissions-in-england-which-may-be-avoidable-and-how. Accessed 20 November 2018.

Walsh KA and Bruza JM (2008) 'Hospitalization of the elderly', *Annals of Long Term Care* 15(11). www.annalsoflongtermcare.com/article/7997. Accessed 20 November 2018.

Appendix A: Differences between the phase 2 and phase 1 (Cornwall) analyses

Table A1: Differences between the phase 2 and phase 1 (Cornwall) analyses

Phase 2 – as described in Chapter 2	Phase 1 (Cornwall)
Data	
Age UK PICP client data • Guided conversations that had taken place between April 2015 and the end of September 2016. **Hospital Episode Statistics (HES) data from NHS Digital** • Inpatient, outpatient and A&E datasets between April 2012 and January 2018 (inclusive). **Linkage file from NHS Digital** • This dataset provided the linkage between pseudonymous HES person identifiers and the Age UK client data.	**Age UK Cornwall and IOS Living Well client data** • All referrals between January 2014 and the end of May 2015. **Hospital data from NHS Kernow Clinical Commissioning Group** • Inpatient, outpatient and A&E datasets from the Secondary Uses Service (SUS) – all hospital contacts for residents/registered of Cornwall, between April 2010 and March 2016 (inclusive). **Linkage file from NHS Kernow Clinical Commissioning Group** • This dataset provided the linkage between pseudonymous SUS person identifiers and the Age UK client data.
We were able to describe the hospital activity for PICP clients for **up to 16 months** after the intervention start date.	We were able to describe the hospital activity for PICP clients for **at least nine months** after the intervention start date (or at least, the referral date – see below).

Phase 2 – as described in Chapter 2	Phase 1 (Cornwall)
Analytical approach	
We used the **guided conversation date** as the start of service – and as the boundary between the pre-intervention and post-intervention period.	We used the **date of referral to Age UK** as the start of service – and as the boundary between the pre-intervention and post-intervention period.
For each of the potential controls, we calculated matching variables for each calendar month in the evaluation study period April 2015 to September 2016.	For each of the potential controls, we calculated matching variables for each calendar month in the period January 2014 to May 2015.
We selected matched controls from carefully **matched local authorities** from elsewhere in England.	We selected matched controls **from areas of Cornwall** not included in the Living Well scheme (defined by registered GP practices). These control practices are shown in blue in the figure below. 
The analysis was undertaken for all people aged 50 or over. (Note that 95% of the phase 2 group were aged 60 or over.)	The analysis was undertaken for all people aged 60 or over.

Appendix B: Predicting risk of emergency admissions for a general older population

Using HES datasets from April 2013, we built a national (all England) member file of people aged 55 or over who were not known to have died in hospital before April 2015.

We extracted people from this dataset and put them into two random 10% samples of 1.2 million people each. We fitted a multivariate logistic regression model to one of the samples. We modelled the event of **at least one emergency admission in the future year April 2015 to March 2016** (the dependent variable), using a large number of independent variables derived from the HES data describing each person (age, sex and disease history) and their history of hospital activity before April 2015. This was similar in approach to that taken by ourselves and others over the past decade (Georghiou and others, 2013).

We validated the model produced on the second 10% sample of people. This confirmed that the model was not overfitting, and was appropriate to use in general samples.

The performance of the model produced (see Table B1) performed as well as, or better than, other tools that aimed to predict emergency hospital admissions for a population who are not in hospital (Georghiou and others, 2013).

Table B1: Model performance† – positive predictive values and average number of future emergency admissions for selected risk bands (C statistic = 0.737), ages 55+

Risk band	% admitted within year (positive predictive value)	Future-year emergency admissions per person
Top 0.5%	68.3%	2.11
Top 1%	63.9%	1.75
Top 2%	57.9%	1.42
Top 5%	47.7%	1.03
Risk deciles‡	**% admitted within year (positive predictive value within decile band)**	**Future-year emergency admissions per person (within band)**
Risk decile 1 (highest)	39.0%	0.77
Risk decile 2	20.8%	0.32
Risk decile 3	13.6%	0.20
Risk decile 4	11.0%	0.15
Risk decile 5	8.8%	0.12
Risk decile 6	7.2%	0.10
Risk decile 7	6.1%	0.08
Risk decile 8	5.2%	0.07
Risk decile 9	4.5%	0.06
Risk decile 10 (lowest)	3.7%	0.05

† When applied to both 10% samples together (2.4 million people).
‡ n = 241,946 in each band.

Appendix C: Selection of matched control areas

Table C1 lists the local authority areas of residence of the phase 2 matching group. We determined these using HES hospital records from before each individual's guided conversation date.

Our intention was that each of the local authority areas listed in Table C1 would be matched with one, two or three similar local authority areas. The populations of these similar local authority areas would provide us with the pool of people we would use to select the controls.

However, the matching process can be a very time-consuming task, and the addition of each additional control area can increase the amount of time taken to find successful matches. Therefore, we made a pragmatic decision that for local authorities with very few group members (for example, Chichester and Shepway) we would treat those group members as living in a more common, neighbouring local authority area. So, for example, the three Chichester local authority residents were treated as living in the Waverley local authority area and the two Shepway local authority group members were treated as living in the Ashford local authority area.

Having made these switches, we had 15 local authority areas served by the PICP phase 2 schemes to match to similar local authority areas.

Table C1: Local authority areas of residence of the phase 2 matching group (n = 1,640)

Area	Area name	Local authority code	Local authority name	Number	% (within area)	Match specific area?
AC	Ashford and Canterbury	E07000106	Canterbury	71	43%	Yes
		E07000113	Swale	61	37%	Yes
		E07000105	Ashford	33	20%	Yes
		E07000112	Shepway	2	1%	No – as Ashford
BD	Blackburn with Darwen	E06000008	Blackburn with Darwen	243	91%	Yes
		E07000120	Hyndburn	18	7%	Yes (as East Lancashire)
		E07000124	Ribble Valley	7	3%	Yes (as East Lancashire)
EL	East Lancashire	E07000120	Hyndburn	90	33%	Yes
		E07000117	Burnley	85	31%	Yes
		E07000122	Pendle	41	15%	Yes
		E07000124	Ribble Valley	30	11%	Yes
		E07000125	Rossendale	25	9%	Yes
GW	Guildford and Waverley	E07000216	Waverley	66	56%	Yes
		E07000209	Guildford	47	40%	Yes
		E07000225	Chichester	3	3%	No – as Waverley
		E07000085	East Hampshire	1	1%	No – as Waverley
NT	North Tyneside	E08000022	North Tyneside	80	94%	Yes
		E06000048	Northumberland	5	6%	No – as North Tyneside
PO	Portsmouth	E06000044	Portsmouth	223	91%	Yes
		E07000090	Havant	20	8%	Yes
		E07000087	Fareham	3	1%	No – as Portsmouth
SH	Sheffield	E08000019	Sheffield	486	100%	Yes

Table C2: Matching local authority areas

Age UK areas				Matched areas		Comparison between Age UK and matched areas		
Area	Local authority code	Local authority name	Number of PICP clients	Local authority code	Local authority name	ONS SED†	ONS similarity‡	Relative odds ratio for emergency admission
AC	E07000106	Canterbury	71	E06000014	York	4.5	Similar	1.14
	E07000113	Swale	61	E07000067	Braintree	1.9	Very	1.06
	E07000105	Ashford	33+2	E07000110	Maidstone	1.6	Extremely	1.01
BD	E06000008	Blackburn with Darwen	243	E08000004	Oldham	2.3	Very	0.94
				E08000032	Bradford	2.4	Very	0.96
				E08000001	Bolton	3.4	Very	1.04
EL	E07000117	Burnley	85	E08000005	Rochdale	3.4	Very	1.04
	E07000122	Pendle	41	E08000034	Kirklees	3.5	Very	0.91
	E07000124	Ribble Valley	30+7(BD)♦	E07000163	Craven	3.2	Very	0.90
	E07000125	Rossendale	25	E07000118	Chorley	2.8	Very	1.14
	E07000120	Hyndburn	90+18(BD)	E08000033	Calderdale	3.4	Very	0.93
GW	E07000216	Waverley	66+4	E07000210	Mole Valley	2.8	Very	0.98
				E07000085	East Hampshire	2.8	Very	1.10
	E07000209	Guildford	47	E07000094	Winchester	4.4	Similar	1.06
				E07000222	Warwick	4.5	Similar	0.96
NT	E08000022	North Tyneside	80+5	E08000023	South Tyneside	2.6	Very	1.08
				E06000005	Darlington	2.9	Very	0.95
PO	E06000044	Portsmouth	223+3	E06000023	Bristol, City of	5.9	Similar	0.89
				E06000026	Plymouth	7.0	Similar	0.96
	E07000090	Havant	20	E07000223	Adur	2.7	Very	0.98
SH	E08000019	Sheffield	486	E08000021	Newcastle upon Tyne	3.5	Very	1.06
				E07000123	Preston	4.0	Very	0.96
				E06000015	Derby	5.3	Similar	0.92

† SED = 'squared Euclidean distance', a measure analogous to distance in 3D space, calculated by the Office for National Statistics (ONS).
‡ 'Extremely similar', 'very similar' or 'similar'.
♦ BD = PICP clients of Age UK Blackburn with Darwen living in Ribble Valley or Hyndburn.

The local authority areas from which the controls were selected were themselves carefully chosen to achieve two main objectives:

1 Matched local authorities had to be defined by the Office for National Statistics (2015) as being extremely similar, very similar or similar to the phase 2 site local authorities. The Office for National Statistics' determination used 59 variables derived from the 2011 Census covering demographic factors, household composition, housing, socioeconomic factors and employment.

2 In addition, the matched local authority areas had to have indistinguishable rates of unplanned admissions given the same population profile. We determined this factor using a modification of the national risk model that we have developed at the Nuffield Trust (described in Appendix B).

Table C2 lists the 15 Age UK local authority areas alongside the local authority areas selected for matching. The 'squared Euclidean distance' (SED) is a measure of similarity that the Office for National Statistics calculates in its categorisation of local authorities (the smaller the number, the more similar to one another are the areas). The relative odds ratio represents the relative rate of emergency admissions between the two populations, having adjusted for numerous other factors. A ratio of 1 means that the rate is the same in both areas while a ratio greater than 1 means that the rate is higher in the Age UK area. None of the relative odds ratios were statistically significantly different from 1 at the 95% confidence level.

Appendix D: How closely matched was the control group?

We were able to summarise the success of the matched group in three main ways.

The first of these was to compare the history of hospital activity in both groups. Figure D1 shows the average number of contacts in each of the 24 months leading up to the guided conversation date (or equivalent date for the controls).

For the PICP group, the number of unplanned care events (A&E visits and emergency admissions) broadly trebled over the course of the two years, while the number of planned events (non-emergency admissions and outpatient attendances) also rose, but more modestly.

For the matched control group, meanwhile, hospital activity very closely matched that of the PICP group for A&E visits, emergency admissions and non-emergency admissions. Outpatient attendances were slightly less well matched – being consistently more common in the PICP group. However, it should be noted that in only one individual month (labelled '21') was there an apparently meaningful difference between the two groups, and the total number of outpatient attendances in the year before the guided conversation date was not meaningfully different in the two groups.

Figure D1: Average number of hospital contacts per person per month, in the two years before the guided conversation date

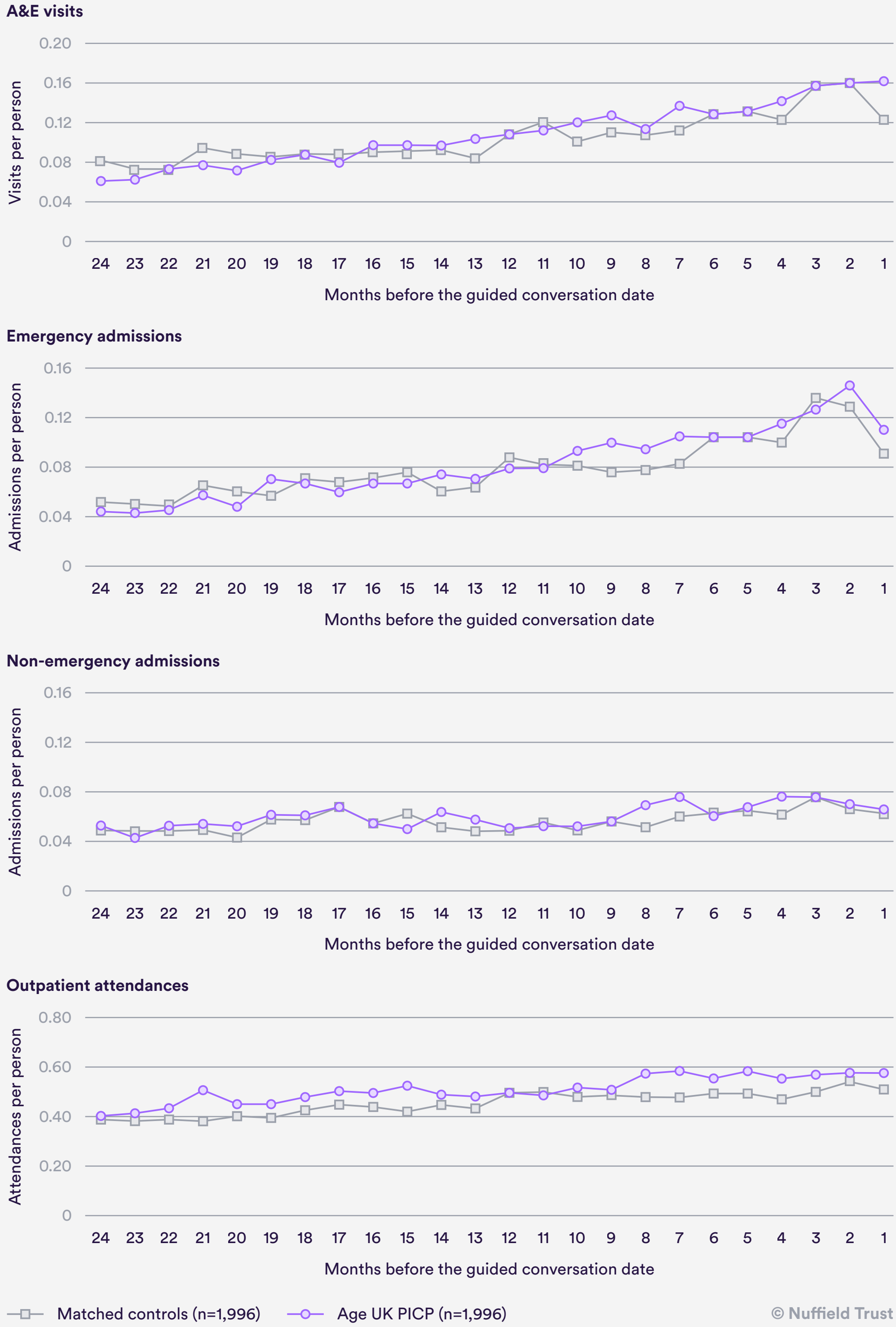


Table D1: Selected characteristics of PICP and control groups (means in the PICP and matched control groups, and standardised differences in the means†)

		Control group (n = 1,996)	PICP group (n = 1,996)	Standardised difference
Age and sex				
FEMALE	Sex = female	61.4%	61.4%	0.0%
age	Age (year)	78.8	78.9	1.2%
AGEband50	Aged 50–64	7.9%	7.9%	0.0%
AGEband65	Aged 65–69	9.8%	9.8%	0.0%
AGEband70	Aged 70–74	12.6%	12.6%	0.0%
AGEband75	Aged 75–79	16.8%	16.8%	0.0%
AGEband80	Aged 80–84	21.0%	21.0%	0.0%
AGEband85	Aged 85–89	19.7%	19.7%	0.0%
AGEband90	Aged 90+	12.3%	12.3%	0.0%
Deciles of deprivation (area of residence)				
IMD1	Most deprived decile	17.4%	20.5%	7.9%
IMD2	Deprivation decile 2	11.8%	13.0%	3.8%
IMD3	Deprivation decile 3	13.1%	12.3%	2.4%
IMD4	Deprivation decile 4	11.2%	11.8%	1.7%
IMD5	Deprivation decile 5	11.0%	7.9%	10.5%
IMD6	Deprivation decile 6	8.1%	9.0%	3.2%
IMD7	Deprivation decile 7	7.1%	8.4%	5.1%
IMD8	Deprivation decile 8	7.3%	6.4%	3.6%
IMD9	Deprivation decile 9	6.4%	5.3%	4.7%
IMD10	Least deprived decile	6.7%	5.4%	5.5%
Risk of future emergency admission				
RISK_DEC_NOLA_10HI	Highest risk 10%	68.7%	69.3%	1.3%
RISK_DEC_NOLA_09	Risk decile 9	16.3%	15.7%	1.6%
RISK_DEC_NOLA_08	Risk decile 8	7.2%	6.7%	2.0%
RISK_DEC_NOLA_07	Risk decile 7	2.3%	2.9%	3.8%
RISK_DEC_NOLA_06	Risk decile 6	2.6%	2.6%	0.3%
RISK_LO50	Lowest risk 50%	3.0%	2.8%	0.9%

Age UK targeting conditions				
NLTC_ageUK_2pl	2+ long-term conditions	61.3%	60.8%	1.0%
EMADM_N_18M_2pl	2+ prior emergency admissions (18 months)	39.4%	40.6%	2.5%
Two_plus_two	Both above: '2+2'	34.3%	34.9%	1.3%
History of disease diagnoses (prior two years)				
DX_Hyperten	Hypertension	53.5%	53.7%	0.3%
DX_MentalIH	Mental ill-health	31.1%	32.8%	3.7%
DX_IschamicHD	Ischaemic heart disease	29.3%	28.7%	1.2%
DX_PVD	Peripheral vascular disease	29.1%	29.3%	0.3%
DX_Diabetes	Diabetes	23.5%	25.4%	4.3%
DX_COPD	COPD	21.7%	24.1%	5.6%
DX_AtrlFib	Atrial fibrillation	24.4%	24.4%	0.0%
DX_RenalFail	Renal failure	18.8%	19.8%	2.7%
DX_Angina	Angina	16.1%	18.6%	6.6%
DX_CHF	Congestive heart failure	16.9%	17.8%	2.5%
DX_Fall	Falls	17.2%	19.0%	4.6%
DX_UTI	Urinary tract infection	16.9%	16.8%	0.4%
DX_CVD	Cerebrovascular disease	11.4%	15.4%	11.6%
ICDMB_Pne	Pneumonia	14.0%	14.7%	2.1%
ICDMB_Mhsubst	Mental disorders – psychoactive substance	13.7%	14.2%	1.6%
DX_Asthma	Asthma	11.6%	13.7%	6.3%
DX_Anem	Anaemia	15.0%	13.6%	4.2%
DX_RespInf	Respiratory infection	11.2%	11.6%	1.1%
ICDMB_Bipl	Bipolar disorder	9.6%	12.1%	8.1%
ICDMB_Oste	Osteoarthritis	11.2%	11.0%	0.8%
DX_Cancer	Cancer	12.7%	10.6%	6.6%
DX_Stroke	Stroke	3.0%	4.9%	9.8%
CH_Dem	Dementia	7.8%	6.1%	6.7%
ICDMB_Park	Parkinson's disease	1.5%	2.2%	5.2%
NLTC_ageUK	Number of long-term conditions	1.89	1.94	3.2%
NumCancers	Number of cancers	0.13	0.10	7.3%
CH_INDEX	Charlson index (risk of admission)	2.91	2.92	0.4%

Hospital activity in prior three months				
Z_ALLAE_N_000090	A&E visits	0.44	0.47	4.4%
Z_EMADM_N_000090	Emergency admissions	0.35	0.38	4.4%
ACSADM_N_3m	Emergency avoidable (ACS) admissions	0.11	0.13	4.1%
Z_NEMADM_N_000090	Non-emergency admissions	0.20	0.20	0.9%
Z_ALLOP_N_000090	Outpatient attendances	1.54	1.71	6.3%
Z_ALLADM_BD_000090	Inpatient bed days	2.96	4.13	13.0%
Hospital activity in past 12 months				
AEvis_000360	A&E visits	1.47	1.58	6.6%
EMADM_N_000360	Emergency admissions	1.13	1.23	7.2%
ACSADM_N_12m	Emergency avoidable (ACS) admissions	0.35	0.40	7.3%
NEMADM_N_000360	Non-emergency admissions	0.56	0.55	0.6%
OP_ALL_000360	Outpatient attendances	5.86	6.54	7.9%
ALLADM_BD_000360	Inpatient bed days	7.58	7.65	0.4%

† More than 10% signifies a meaningful difference.

The groups were very well matched on age, sex, deprivation and risk of future emergency admission. The prevalence of most diseases was very similar in each group, with the exception of cardiovascular disease (more common in the PICP group). The average number of long-term conditions was similar in each group (just under two per person).

In terms of prior hospital activity – in the three months before referral and in the year before referral – the rates of most types of hospital activity were effectively equivalent in both groups. The one exception was total inpatient bed days in the three months before referral, which was higher in the PICP group.

The control group and the PICP group were well matched in terms of the large majority of relevant factors. It is important to appreciate how unlikely it is that any match will be perfect over all important characteristics measurable in the hospital data, and for this reason, we adjusted all results using multivariate regression methods to account for some of the relatively small remaining differences between the two groups.

The third and final test of the matched control group came from the first analysis of the period after the guided conversation date. In the nine months following this date, we checked for differences between the groups in in-hospital deaths. We would not have expected a community-based intervention such as PICP to affect life expectancy in the short term, and so expected to see similar numbers in both groups. While there were more in-hospital deaths in the PICP group than in the control group (94 versus 76), this difference did not prove to be statistically significant at the 5% confidence level.

Appendix E: Subgroup analyses, phase 2 areas, 16-month follow-up

Table E1 presents the results of subgroup analyses of costs for the seven phase 2 areas with 16-month follow-up.

Table E1: Total hospital costs during the 16 months after the guided conversation date by various subgroups, phase 2 areas

Subgroup (number in PICP group, and matched in controls)	Mean cost, £ per person (standard deviation)		Difference in mean costs, £ per person† (95% confidence intervals)		Higher or lower compared with controls? (adjusted difference, at 95% statistical significance)
	Control group	PICP group	Unadjusted	Adjusted	
'Two plus two' group?					
No (n = 968)	3,949 (5,572)	5,002 (6,511)	**1,053**** (529 to 1,578)	**885**** (365 to 1,404)	**Higher cost** (by 22%)
Yes (n = 633)	6,173 (7,315)	8,249 (8,424)	**2,076**** (1,265 to 2,887)	**1,674**** (842 to 2,507)	**Higher cost** (by 27%)
Age band					
50–74 (n = 514)	4,904 (7,229)	6,064 (7,420)	**1,160*** (351 to 1,969)	**895*** (86 to 1,704)	**Higher cost** (by 18%)
75–84 (n = 597)	5,030 (6,141)	6,524 (8,331)	**1,493**** (707 to 2,280)	**1,129*** (343 to 1,914)	**Higher cost** (by 22%)
85+ (n = 490)	4,503 (5,786)	6,230 (6,427)	**1,727**** (991 to 2,462)	**1,437**** (704 to 2,170)	**Higher cost** (by 32%)
Area					
Ashford and Canterbury (n = 164)	4,461 (5,848)	5,703 (7,065)	1,242 (-99 to 2,582)	980 (-409 to 2,369)	No difference

Blackburn with Darwen (n = 265)	4,454 (5,630)	7,110 (8,099)	**2,656**** (1,529 to 3,783)	**2,410**** (1,302 to 3,518)	**Higher cost** (by 54%)
East Lancashire (n = 265)	5,648 (6,769)	6,309 (6,834)	661 (-406 to 1,727)	218 (-869 to 1,304)	No difference
Guildford and Waverley (n = 113)	4,152 (4,801)	5,659 (6,301)	**1,507*** (94 to 2,920)	1,433 (-58 to 2,924)	No difference
North Tyneside (n = 75)	5,465 (6,082)	8,234 (8,056)	**2,769*** (548 to 4,990)	2,092 (-389 to 4,572)	No difference
Portsmouth (n = 243)	3,611 (4,787)	5,136 (7,433)	**1,525*** (455 to 2,596)	**1,408*** (358 to 2,458)	**Higher cost** (by 39%)
Sheffield (n = 476)	5,389 (7,678)	6,444 (7,755)	**1,056*** (149 to 1,962)	702 (-211 to 1,614)	No difference
Risk band (risk of future emergency admission)					
Low (n = 471)	2,635 (3,979)	3,563 (5,148)	**931*** (351 to 1,511)	**1,058**** (478 to 1,638)	**Higher cost** (by 40%)
Medium (n = 567)	4,520 (6,015)	5,864 (6,838)	**1,341**** (594 to 2,088)	**1,236*** (482 to 1,990)	**Higher cost** (by 27%)
High (n = 563)	7,021 (7,668)	8,990 (8,772)	**1,975**** (1,053 to 2,896)	**1,586**** (657 to 2,515)	**Higher cost** (by 23%)
Period of start of intervention					
Early (n = 529)	4,916 (6,400)	6,616 (8,525)	**1,701**** (846 to 2,555)	**1,425*** (564 to 2,286)	**Higher cost** (by 29%)
Middle (n = 523)	4,466 (5,886)	6,248 (6,998)	**1,781**** (1,041 to 2,522)	**1,652**** (910 to 2,393)	**Higher cost** (by 37%)
Late (n = 549)	5,089 (6,876)	6,004 (6,866)	**915*** (167 to 1,663)	525 (-221 to 1,272)	No difference

† > 0 means that the PICP group had higher costs.
* $p < 0.05$ (statistically significant at the 95% confidence level).
** $p < 0.001$ (statistically significant at the 99.9% confidence level).

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