4th International Conference on
Public Policy (ICPP4)
June 26-28, 2019 – Montréal

**Panel T17-P02 Session 1**

*Health Policy and the Dynamics of Centralization and Decentralization*

**Title of the paper**

# *Comparative mixed methods analysis of decentralising health systems in the United Kingdom for 'integrated care'*

**Author(s)**

*Jonathan Stokes, Vishalie Shah, Leontine Goldzahl, Søren Rud Kristensen, Matt Sutton*

*Health Organisation, Policy, and Economics, Centre for Primary Care and Health Services Research, University of Manchester, Manchester, UK*

*jonathan.m.stokes@manchester.ac.uk*

**Date of presentation**

**June 28, 2019**

## Introduction

Health systems globally face rising demand, an ageing population with increasing multimorbidity, combined with economic uncertainty and restrained spending. This has spawned a policy movement towards 'integrated care' (Hughes, 2017). Integrated care aims to achieve a concurrent rise across the 'triple aim' of the health system (Berwick, Nolan, & Whittington, 2008): improving patient experience (e.g. via streamlined, person-centred provision of services), health (e.g. via decreased polypharmacy, increased communication between providers), and reducing costs of healthcare (particularly expensive hospital care, e.g. via more preventative care at the 'right place and time' and decreased duplication of effort).

Practically, integration can occur in various parts of the system, for example changing financial arrangements (e.g. through pooling of budgets), at the organisational level (e.g. by forming integrated provider bodies, Accountable Care Organisations, ACO), and/or, changing service delivery (e.g. multi-disciplinary case management of high-risk individuals) (Stokes et al., 2015). The majority of early integrated care models focused solely on single service delivery interventions, usually for a small group of individuals, those with a single disease or at high-risk of hospitalisation (Smith, Soubhi, Fortin, Hudon, & O'Dowd, 2016; Stokes, Checkland, & Kristensen, 2016). Therefore, the current evidence on integrated care tends to reflect these smaller-scale single interventions originally implemented under this banner. These models of integration typically succeed at increasing patient experience of care and might have some short-term benefits on self-reported health (Stokes et al., 2015), but fail to save on costs (Baxter et al., 2018), and frequently cost more for those directly targeted. This is likely due to increased access (Baxter et al., 2018), and also frequently hypothesised as identification of unmet need (Lloyd, Brine, Pearson, Caunt, & Steventon, 2018; Roland et al., 2012; Stokes, Kristensen, Checkland, & Bower, 2016).

More recent integrated care models, however, aim to change the whole (geographically defined) system, including organisational and payment changes (Stokes, Struckmann, et al., 2018), 'population health management models'. These more devolved, place-based models implement multiple interventions across the system simultaneously, aiming to improve outcomes for the entire local population (Ham, 2018). For example, in England, many of the 'Vanguard' (piloted) new care models have been implementing this approach since 2015 (NHS England, 2016). The recent NHS 'Long Term Plan' calls for further expansion of population health management models, 'Integrated Care Systems' (more similar to ACOs, in the US, with fully accountable 'place-based' organisational partnerships given more control over local funding and services in the hope that they can make better use of resources and improve the health and wellbeing of their populations), in all geographical footprints in England by 2021 (NHS England, 2019). There is some evidence from the current US literature which suggests more positive cost saving results might be possible with this broader population-level approach (Alderwick, Shortell, Briggs, & Fisher, 2018). The population health management approach, however, has not been rigorously evaluated in a national health system (already with universal health coverage and a stronger primary care base) to date, despite current piloting and planning.

Implementing these more devolved population health management models in a national health system might face increased challenges compared to earlier integration models aimed at specific groups of patients. In these systems, a desire for more local decision-making appears to lie in natural tension with a nationally funded system built on values of equality (Department of Health, 2009; Peckham, Exworthy, Powell, & Greener, 2005). Furthermore, previous research suggests that different contracting arrangements set nationally for each sector (e.g. primary/secondary/social care) can make local co-ordination and cross-boundary continuity of care difficult to achieve (Maniatopoulos, Le Couteur, Vale, & Colver, 2018). Engaging primary care has been an especially difficult task. With each primary care provider an independent contractor in the NHS, commissioners have described difficulties harnessing primary care towards a vision of whole system change, implementing

complex incentive structures to attempt to persuade them (Stokes, Riste, & Cheraghi-Sohi, 2018).

There are a number of reasons why we might expect the effects of multiple interventions at the population level to not be equal to the simple addition of the effects of the individual components. In essence, a system is more than the sum of its parts. An interrelated and interdependent set of interventions will each result in a complex (and unpredictable) set of intended and unintended effects (Atun, 2012). Moreover, these effects are not likely to be constrained to those patients directly targeted for each intervention. For example, having practitioners work in multidisciplinary teams (with social workers and other professions who they did not interact with previously) might create a learning effect and change referral practice for all patients subsequently treated. Changing, or aligning, incentives for different parts of the system might shift attention to preventative care beyond the traditional health system in attempts to reduce demand, for example by influencing lifestyle behaviours and environments for the wider (currently healthy) population.

This paper aims to inform the evidence base for the policy move towards these broader population health management models of integrated care. We examine effectiveness of these models as a bundle of interventions expected to act in synergy on 'triple aim' outcomes for the entire populations they serve. We use mixed methods policy analysis to compare two sites in England, UK and examine the effects of these increasingly diverging decentralised health systems, as well as interactions with national-level policy.

## The models of care

As the name suggests, population health management models are designed around a geographically defined population. In England, nine of these areas were awarded Primary and Acute Care Systems (PACS) Vanguard status in 2015 with the general aim "to improve the physical, mental, social health and wellbeing of its local population. It achieves this by

bringing together health and care providers with shared goals and incentives so they can focus on what is best for the local population" (NHS England, 2018a). As part of a large Horizon2020 project looking for sustainable integrated care models for multimorbidity in Europe we selected two of these sites, Salford and South Somerset, to evaluate in detail using qualitative and quantitative methods (SELFIE consortium, 2017). Each site's system changes are described below (Table 1), according to the SELFIE framework (Leijten et al., 2017). Both sites were awarded additional Vanguard funding in April 2015 to enact these changes, and the Vanguard programme finished funding in March 2018 (NHS England, 2018b).

**Table 1: Key Salford and South Somerset system changes**

| Domain | Salford | South Somerset |
|---|---|---|
| Service delivery | • Integrated contact centre for patient navigation (including health coaching)<br>• Multidisciplinary group case management<br>• Supporting 'community assets' (neighbourhood groups and activities) | • Complex care hub (Yeovil hospital – case management of high-risk patients)<br>• Enhanced primary care (17/19 GP practices – health coaching for self-management of chronic conditions) |
| Leadership & governance | • Salford Together is a partnership between Salford City Council, NHS Salford Clinical Commissioning Group, Salford Royal NHS Foundation Trust (leading role), Salford Primary Care Together and Greater Manchester Mental Health NHS Foundation Trust.<br>• Originally partnership functioned through an Alliance Contract, but the creation of an Integrated Care Organisation (ICO) in 2016 saw community (minus general practice), social care and mental health services merge together to create a single organisational unit (based at the hospital) | • Leadership by Symphony Programme Board, co-located in Yeovil hospital.<br>• Formation of accountable care provider organisation, Symphony Healthcare Services Ltd, from acquisition of a small number of GP practices (initially 4) |
| Workforce | • New ways of working, incorporating multiple specialties (health and social care) into multidisciplinary neighbourhood groups delivering case manage to high-risk patients | • Co-location of GPs in hospital as part of an 'extensivist' complex care hub model<br>• Introduction of new health coach roles in primary care. |
| Information & research | • Data-driven risk stratification approach to initially select high-risk patients (gradually moved away from this approach with experience gained, as general consensus that this was not targeting the 'right' patients) | • Data-driven risk stratification approach to initially select high-risk patients (gradually moved away from this approach with experience gained, as general consensus that this was not targeting the 'right' patients)<br>• Plans to try and join up electronic records, but encountered difficulties in implementing |
| Technologies & medical products | • Some joining of health and social care records through the Salford Integrated Record (but, with access, data-quality, and governance issues which have caused teething-problems for usability) | • 'Patient Knows Best' online care plan tool to enable self-management (teething problems in implementation meant poor uptake, however)<br>• Telehealth management used on a subset of patients by the complex care hub to keep track of vital signs and alert staff to any changes that might require escalation/ follow-up |
| Financing | • Pump-prime funding by NHS England through Vanguard programme (£5.33m in 2015/16) [#]<br>• Pooling of health and social care budgets (originally for over 65s) | • Pump-prime funding by NHS England through Vanguard programme (£5.27m in 2015/16) [*]<br>• Changed funding for practices incorporated into Symphony |

| | | |
|---|---|---|
| | extending to all adult health and social care services (minus specialised services) | Healthcare Services Ltd – PMS/GMS funding flows direct to practices as before, but other financing is pooled and spending decided on locally<br>• Aims to move towards 'outcome-based financing', but still in early planning stages |

# Integrated care organisation full business case 2016 http://www.salfordccg.nhs.uk/download.cfm?doc=docm93jijm4n5315.pdf&ver=5652; * Estimate given by programme director

## Methods

We evaluate each site separately and compare findings together with our contextual qualitative findings.

### Quantitative Data

We use two nationally representative sources of data. For measuring patient experience and health-related quality of life we use data from the GP Patient Survey (GPPS), administered by post to samples of patients from all GP practices in England annually (biannually until 2016). For costs we use data from Hospital Episode Statistics (HES), administrative data recording all patient contacts with NHS hospitals.

For both datasets, we have data at the individual-level which we collapse by GP practice, multimorbidity status (see details below), over 65 status, gender and time. The time dimension is yearly for HES and survey wave for GPPS). For the GPPS data, we use the survey weights to adjust the mean values for the survey composition. For the HES data, we assigned tariffs to each of the different types of contact (inpatient, outpatient and emergency department) and divided the sum of costs by the number of registered patients in that stratum.

We measure effectiveness on three outcomes:

1) Experience: 'In the last 6 months, have you had enough support from local services or organisations to help you to manage your long-term health condition(s)? – Please think about all services and organisations, not just health services' (only asked to those answering positively that they have a long-term condition – analysed as a proportion of those in the practice that answered, "Yes, definitely") (GPPS – data analysed up to end of March 2018)
2) Health: health-related quality of life, measured by the EQ-5D 5L index (GPPS – 5L version only available from June 2012 onwards & excluded from the survey from 2018, so follow-up period only to end of March 2017)

3) Costs: total costs of secondary care (HES – we are waiting for updated data, so currently only one year of follow-up for this outcome, to end of March 2016)

We were supplied with the list of GP practices involved in all of the Vanguard sites directly by NHS England and we use these to identify our treated practices and to remove other Vanguard practices from the control pool.

We create a dummy for multimorbidity (two or more long-term conditions) for each patient from each data source prior to collapsing. For HES, we use a count of 30 long-term conditions (Tonelli et al., 2015) from icd-10 codes recorded in inpatient data (multimorbidity status is carried forward from the first available inpatient admission contact to any years where there is no inpatient admission for that patient to minimise false zeros). For GPPS, we count from self-report data on 15 specified long-term conditions plus option of selecting 'another long-term condition'.

## Quantitative Analysis

We analyse the data using a quasi-experimental design, difference-in-differences (Imbens & Wooldridge, 2009). We compare intervention practices to control ('usual care') practices from the rest of England, taking the difference in outcomes between the groups in both the pre- and post-intervention periods and assigning this difference-in-differences as the intervention's causal effect. We are assuming parallel trends in outcomes if nothing had happened to the intervention site, and because this is unobservable in the post-period we use the parallel trends test in the pre-intervention period (which we test for statistically by testing the joint significance of differences in the pre-period) as an indication of whether our assumption is likely to be valid or not. The method controls for time-invariant unobserved differences between the two groups, as well as any common shocks (i.e. other events occurring during the period of the analysis that might affect the outcome of interest that has an equal effect on both groups).

We define the intervention post-period based on the date each site received their first set of Vanguard funding, April 2015. Our pre-intervention period (used to test our assumption of parallel pre-intervention trends, as above) is from the start of financial year 2012/13 to end of financial year 2014/15 (i.e. three years). The intervention effect is therefore the average intervention effect at each site over the post period, currently over three years for experience; two years for health; and, one year for cost.

We run analysis for each site individually (the sites are not included in each other's analysis in the control group), comparing each to 1) all other GP practices in the rest of England (minus other Vanguard practices); 2) the site's NHS Rightcare peers (an NHS tool which matches each local health geography - Clinical Commissioning Group, CCG - in England to the 10 closest, based on 12 demographic variables) (NHS England, 2017). All models are ordinary least squares linear regressions adjusted for multimorbidity status, over 65 status, gender, and time and GP practice fixed effects. We cluster standard errors at the CCG level, generally the level of decision-making for integrated care initiatives and healthcare purchasing.

We expect multimorbid patients to be those most affected in the short-term by efforts to integrate care. We therefore analyse subgroup effects only on those patients with multimorbidity as a secondary analysis.

## Qualitative Data and Analysis

We report detailed qualitative analysis and findings elsewhere for each site (Stokes, Cheraghi-Sohi, Kristensen, & Sutton, 2016). Briefly, across both sites we conducted a combination of document analyses and a total of 22 semi-structured interviews with stakeholders (including patients, informal caregivers, healthcare professionals, payers and policymakers). The interview questions concerned, for example, the stakeholders'

perceptions of the care process, their roles and relationships within the programme, their specific problems and applied solutions, and their personal views on the programme. Here, we draw on cross-cutting themes from this evidence to attempt to contextualise our quantitative results, particularly drawing on themes related to national versus local decision-making tensions.

# Results

## Quantitative Analysis

Table 2 compares the outcome measures in both treated sites compared to the rest of England average in the period before the introduction of the Vanguards. Patient experience of care is higher in both Salford and (particularly) South Somerset, compared to the rest of England control group. Health related quality of life (measured by the EQ5D-5L) is lower in Salford than the rest of England average, but higher in South Somerset. Total cost of secondary care is significantly higher per person in Salford compared to the control group, but slightly lower (although not significantly so) in South Somerset.

Out of the six parallel trend tests, one for each outcome for each of (i) whole-population and (ii) multimorbidity analyses, only one fails. For the multimorbidity subgroup for the Salford analysis, the measure of health (EQ5D-5L) shows a decreasing trend in the intervention group prior to the intervention, so biased towards finding the intended intervention effect. The same conclusions were drawn from the pre-trend tests where the NHS Rightcare controls were used.

**Table 2: Pre-intervention descriptive statistics.**

| | | Salford (1) | | | South Somerset (2) | | | Rest of England (3) | | | (3)-(1) | (3)- (2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Obs | Mean | Std. Dev. | Obs | Mean | Std. Dev. | Obs | Mean | Std. Dev. | | |
| Experience (support for LTCs) | | 2,359 | .559 | .344 | 1,002 | .616 | .333 | 358,159 | .547 | .352 | -.013* | -.069*** |
| | Over 65 | 1,138 | .633 | .330 | 509 | .688 | .290 | 174,362 | .625 | .338 | -.009 | -.063*** |
| | Under 65 | 1,221 | .491 | .342 | 493 | .541 | .358 | 183,797 | .473 | .348 | -.018* | -.068*** |
| | Multimorbid | 1,216 | .518 | .326 | 499 | .583 | .329 | 181,997 | .511 | .345 | -.007 | -.072*** |
| | Non-multimorbid | 1,143 | .604 | .357 | 503 | .648 | .335 | 176,162 | .584 | .355 | -.020* | -.064*** |
| | Male | 1,185 | .574 | .347 | 494 | .659 | .340 | 178,157 | .566 | .358 | -.007 | -.093*** |
| | Female | 1,174 | .545 | .340 | 508 | .574 | .321 | 180,002 | .528 | .344 | -.017* | -.046** |
| Health (EQ5D) | | 2,147 | .693 | .218 | 895 | .769 | .170 | 324,095 | .736 | .191 | .043*** | -.033*** |
| | Over 65 | 1,072 | .685 | .192 | 455 | .758 | .137 | 161,798 | .718 | .171 | .034*** | -.040*** |
| | Under 65 | 1,075 | .702 | .240 | 440 | .779 | .199 | 162,297 | .753 | .207 | .052*** | -.026** |
| | Multimorbid | 1,057 | .550 | .201 | 439 | .662 | .179 | 159,218 | .616 | .190 | .066*** | -.046*** |
| | Non-multimorbid | 1,090 | .832 | .121 | 456 | .871 | .070 | 164,877 | .852 | .097 | .019*** | -.020*** |
| | Male | 1,076 | .704 | .209 | 445 | .786 | .166 | 161,331 | .747 | .190 | .044*** | -.039*** |
| | Female | 1,071 | .683 | .226 | 450 | .751 | .173 | 162,764 | .724 | .191 | .041*** | -.027** |
| Cost (secondary care / person) | | 1,127 | 522.462 | 18.894 | 456 | 409.918 | 286.414 | 169,770 | 417.284 | 357.874 | -105.178*** | 7.366 |
| | Over 65 | 563 | 776.135 | 463.896 | 228 | 641.693 | 208.727 | 84,803 | 664.762 | 344.655 | -111.373*** | 23.069 |
| | Under 65 | 564 | 269.239 | 679.143 | 228 | 178.143 | 113.789 | 84,967 | 170.284 | 123.317 | -98.955*** | -7.859 |
| | Multimorbid | 563 | 643.118 | 739.920 | 228 | 419.952 | 378.432 | 84,817 | 479.469 | 474.896 | -163.650*** | 59.516* |
| | Non-multimorbid | 564 | 402.020 | 478.582 | 228 | 399.884 | 144.963 | 84,953 | 355.199 | 151.869 | -46.821*** | -44.684*** |
| | Male | 563 | 532.917 | 738.247 | 228 | 416.510 | 316.386 | 84,926 | 423.373 | 384.634 | -109.544*** | 6.864 |
| | Female | 564 | 512.026 | 510.274 | 228 | 403.326 | 253.457 | 84,844 | 411.189 | 328.805 | -100.837*** | 7.863 |

*** = $p < 0.001$; ** = $p < 0.05$; * = $p < 0.1$; For experience and health, a higher score indicates better performance (where 1 indicates perfect health/ "Yes, definitely" enough support to manage long-term conditions, LTCs). Reduced cost is an aim of both programmes, so a lower cost indicates better performance.

*Primary analysis*

Table 3 shows the results from the whole population-level analysis.

**Table 3: Regression results at the whole population-level**

| | (1) Rest of England controls | | (2) NHS Rightcare controls | |
|---|---|---|---|---|
| | **Salford** | | | |
| | n | Adjusted# intervention effect (95% CI) | n | Adjusted# intervention effect (95% CI) |
| Experience (support for LTCs) | 559,367 | -0.003** (-0.006 to -0.001) | 34,927 | 0.008** (0.002 to 0.015) |
| Health (EQ5D) | 483,074 | 0.0005 (-0.0004 to 0.001) | 30,198 | 0.001 (-0.004 to 0.006) |
| Cost (secondary care, £ / person) | 225,552 | -39.246*** (-43.202 to -35.290) | 14,010 | -25.606** (-45.193 to -6.019) |
| | **South Somerset** | | | |
| Experience (support for LTCs) | 557,214 | -0.022*** (-0.024 to -0.019) | 41,918 | -0.027*** (-0.033 to -0.021) |
| Health (EQ5D) | 481,199 | -0.010*** (-0.011 to -0.009) | 41,480 | -0.010*** (-0.013 to -0.008) |
| Cost (secondary care, £ / person) | 224,657 | 13.246*** (9.289 to 17.202) | 19,144 | 16.174** (2.279 to 30.069) |

*** = p < 0.001; ** = p < 0.05; * = p < 0.1; # = models adjusted for multimorbidity status, over 65 status, gender, and time and GP practice fixed effects. Standard errors clustered at the Clinical Commissioning Group level. CI = confidence interval. The intervention effect is the average intervention effect at each site over the post period, currently over three years for experience; two years for health; and, one year for cost.

In Salford, model 1 shows a small decrease in experience of care (-0.3%, 95% confidence interval -0.6% to -0.1%), no effect on health, but also a decrease in total cost of secondary care per registered patient (-£39, -£43 to -£35). Model 2, using the NHS Rightcare control group, likewise shows this decrease in total cost of secondary care per registered patient (-£26, -£45 to -£6), no effect on health, but contrary to model 1 shows a small increase in experience of care (+0.8%, +0.2% to +1.5%).

In South Somerset, model 1 shows a small decrease in experience of care (-2.2%, -2.4% to -1.9%), a decrease in health related quality of life (-1%, -1.1% to 0.9%), and an increase in total cost of secondary care per registered patient (+£13, +£9 to +£17). Model 2 results are very consistent, but with a larger confidence interval as expected with the decreased sample size.

*Secondary analysis – multimorbid patients*

Table 4 shows the results from the multimorbid population-level analysis

**Table 4: Regression results at the multimorbid population-level**

| | (1) Rest of England controls | | (2) NHS Rightcare controls | |
|---|---|---|---|---|
| | **Salford** | | | |
| | n | Adjusted# intervention effect (95% CI) | n | Adjusted# intervention effect (95% CI) |
| Experience (support for LTCs) | 283,977 | 0.012*** | 17,976 | 0.024*** |
| | | (0.009 to 0.015) | | (0.017 to 0.032) |
| Health (EQ5D) | 237,492 | -0.008*** | 14,998 | -0.007 |
| | | (-0.009 to -0.006) | | (-0.016 to 0.002) |
| Cost (secondary care, £ / person) | 112,688 | -58.847*** | 7,001 | -46.960** |
| | | (-65.316 to -52.379) | | (-75.976 to -17.944) |
| | **South Somerset** | | | |
| Experience (support for LTCs) | 282,842 | -0.045*** | 24,356 | -0.052*** |
| | | (-0.048 to -0.042) | | (-0.062 to -0.042) |
| Health (EQ5D) | 236,562 | -0.014*** | 20,338 | -0.016*** |
| | | (-0.015 to -0.012) | | (-0.021 to -0.010) |
| Cost (secondary care, £ / person) | 112,241 | 18.173*** | 9,568 | 21.705* |
| | | (11.703 to 24.643) | | (-0.416 to 43.825) |

*** = p < 0.001; ** = p < 0.05; * = p < 0.1; # = models adjusted for over 65 status, gender, and time and GP practice fixed effects. Standard errors clustered at the Clinical Commissioning Group level. CI = confidence interval. The intervention effect is the average intervention effect at each site over the post period, currently over three years for experience; two years for health; and, one year for cost.

In Salford, model 1 shows that multimorbid patients gain a small increase in experience of care (+1.2%, +0.9% to +1.5%), but a small decrease in health (-0.8%, -0.9% to -0.6%; however, be aware that trends were not parallel for this grouping in the pre-period, so reliability of this estimate is questionable, it may be an underestimate since there was already a decrease in the pre-period which we would expect to favour a positive result), and a larger decrease in total cost of secondary care (-£59, -£65 to -£52) compared to the whole population. Model 2 results are fairly consistent, although the decrease in health is no longer significant (but with a similar point estimate).

In South Somerset, model 1 shows a decrease in experience of care (-4.5%, -4.8% to -4.2%) a decrease in health (-1.4%, -1.5% to -1.2%) and an increase in total cost of secondary care per registered patient (+£18, +£12 to +£25). As above, model 2 results are very consistent, but with a larger confidence interval.

## Qualitative Analysis

Our previous qualitative findings (detailed here: (J Stokes et al., 2016)) highlighted a number of factors which may help explain our findings.

A decrease in patient experience, particularly, and potentially health, fits with stakeholder feedback regarding the shift in mindset required by patients in South Somerset. In general, patients with chronic conditions interacted increasingly with those with a lower perceived professional status, e.g. with a health coach without any formal medical training, where before it was with a general practitioner. In contrast, in Salford the MDG meetings were often in the background, conducted by multiple professionals but not directly involving the patient and so unlikely to affect patient experience to the same extent. This could be perceived as less 'person-centred', which upset some interviewees, but generally might

avoid as much disruption to usual care practice that might be perceived negatively by patients, particularly in the short-term:

> "*…patients decide, you know, they might decide, actually, I don't like this coaching approach, I'd rather go back to conventional GP, so they would opt back out of the service.*" (South Somerset interviewee)

> "*I mean some patients love it, some patients, you know, are used to their GP and, you know, does my GP not want me anymore… you know, when you always thought you'd have a doctor and it was your right to see the doctor all the time, when you are not seeing your doctor all the time and you are seeing other clinicians it feels like a change, but then they are having much more contact anyway, because we are proactively contacting them. That has been a shift that patients have had to get used to.*" (South Somerset interviewee)

> "*…you know, there's so much stuff we can be doing and that's involving the bloody patients, you know, the whole idea is to be coordinating care around the patient, but the patient isn't party to any of it, it's bonkers.*" (Salford interviewee)

> "*You might also have picked up that the week before last they changed the care plan without discussing it with me. I really was annoyed with them about that. You've no right to do that, I said to them. That has to be discussed with my mum or her advocate, which is me.*" (Salford interviewee)

There was also evidence that might account for the more positive results, particularly for costs of secondary care, in Salford as opposed to South Somerset. In Salford, there was a long history of inter-organisational planning and working, whereas this was a relatively new

innovation in South Somerset; the multiple organisations involved in delivering the programme were also coterminous in Salford, whereas in South Somerset it was also primarily based around one hospital, but only half a CCG which made it more difficult to implement radical change. The combination of these factors may have led to quicker/easier gains and cost-saving opportunities in Salford versus South Somerset.

Additionally, there was a much larger involvement of social work in the Salford programme, which might have helped change preventative behaviour/ hospital discharge practice; there was a wider focus on early prevention activity in Salford, funding a variety of community assets (e.g. charity, voluntary or community groups – previously evaluated alone with positive impacts identified for health related quality of life (Munford, Sidaway, Blakemore, Sutton, & Bower, 2017)), whereas South Somerset's prevention activity was primarily health service-based (delivered by health coaches at GP practices), so presumably able to reach less people and perhaps less effective if targeting those already at relatively higher risk of exacerbations; finally, in Salford, there was more emphasis on organisational changes (formation of a single ACO-like provider encompassing secondary and social care from mid-2016) and pooling budgets than in South Somerset (which implemented a much smaller-scale version where the hospital incorporated a few failing GP practices in the local area to pool risk). These organisational changes and focus on prevention were highlighted by interviewees at both sites as the key to any potential efficiency savings resulting from integrated care:

> "*I think the model that we're putting in will help because it's facilitating the services to work differently in specific areas. But the real efficiencies…so that's a different way of working, but the efficiencies have to come through the integrated care organisation [ACO-type organisation], I believe*" (Salford interviewee)

> *"…it's about developing new ways of working within primary care. It's about making it sustainable and it's about the fact that we want to provide a back office function. So things like HR and IT, because we can do that with economies of scale, rather than them all dabbling and doing a little bit. And some of these practices are singlehanded GPs with four other members of staff. Well, you can't expect them to have that level of expertise. Especially around governance and all of those kinds of things."* (South Somerset interviewee)

However, there appeared to be tensions with national policy and practice when it came to implementing and scaling up these wider organisational changes. Particularly, despite their vital importance to deliver more preventative care, involving primary care participants appeared to be difficult because of their nationally-agreed independent contracting arrangement, national incentives and priorities:

> "*it has to be voluntary because you can't make [GP] practices do anything. So it's still voluntary but we're incentivising them to do it, by not only saying we'll reimburse your time, but we've agreed a local commissioned service. It's basically an additional contract […] which are optional. Which when you're trying to implement a radical big thing across…you can't have it because you wouldn't get 100 per cent coverage across Salford.*" (Salford interviewee)

> "*In amongst all of that you've got the other difficult issues with primary care, which primary care is individual private practice. We've got some integrated practices now within the NHS that they belong as part of our organisation. And that's making things easier. But there are huge amounts of different organisations and different trusts and the commissioners for Dorset and Somerset, and then all the individual private practices for primary care that make it trickier. We're desperately working very hard*

*to build up those trust and relationships so that we can start to work much closer with them.*" (South Somerset interviewee)

## Discussion

*Summary of results*

We use quasi-experimental, difference-in-differences, analysis to evaluate the population-level effects of two increasingly devolved population health management models implemented in England. Results differ according to site: (i) in Salford, costs of secondary care per person are reduced, considering an average GP practice size of 8000 registered patients, a potential saving of £314,000 per year (confidence interval £345,616 to £282,320). However, there are no effects on health, and effects on experience of care are indeterminate but small in either direction. For multimorbid patients, those most likely to be directly affected by integrated care interventions, potential secondary care cost savings are amplified, there is a small increase in experience of care, but there may be a small decrease in health. (ii) in South Somerset, costs of secondary care are increased, considering an average GP practice size of 8000 registered patients, a potential increase of £106,000 per year (£74,312 to £137,616). There is also a small negative effect on health related quality of life and experience of care. For multimorbid patients, these effects are amplified. For both sites, we see measures head towards the rest of England average post-intervention.

Our qualitative results provide contextual enabling factors, which might explain some of these differences in effects. Alternatively, as might be suggested by our descriptive statistics comparing to the rest of England mean, there could have been pre-intervention under-/ over-utilisation of services at each site which have been addressed by the health system changes. Both sites, however, struggled to fully implement their organisational integration plans, due to national-level contracting and incentive tensions.

*Limitations*

Across both sites, multiple interventions were implemented directly targeting specific groups (elsewhere, we attempt to isolate individual intervention effects for the MDGs in Salford and the enhanced primary care intervention in South Somerset (manuscripts currently in preparation)). In this analysis, we are not able to, and do not attempt to isolate the direct effects of the interventions. Instead, we are interested in estimating effects on the whole population, as the combination of interventions at each site aims to change the health system as a whole, and ultimately, population-level outcomes.

Additionally, we assume that effects in both sites started when they received their Vanguard funding, whereas in reality individual interventions were rolled out gradually starting from this time point (timeline detailed here: (Stokes et al., 2016)) which may dilute any estimated effect. We have a limited follow-up period across both sites, again reflecting the period of the Vanguard funding as closely as possible where data allowed. During this time period, there may have been impact of other health system and wider governmental reforms at each site which influenced the results, also (GMCA, 2015).

We chose three outcome measures based on data available and attempting to represent the health system 'triple aim' (Berwick et al., 2008) which integrated care tries to improve. There is the possibility that different results could be raised based on a different choice of outcomes. For instance, for costs we have not been able to include data on primary care or social care costs (which we might expect to rise in both sites, at least in the short-term), and we do not have a breakdown of running versus start-up costs to determine the significance of the additional Vanguard funding received and relative sustainability of the programmes. However, the outcomes we chose are frequently used in the literature (particularly cost of secondary care and health related quality of life), align with the specific aims across both sites, and could plausibly be influenced by the set of interventions rolled out.

Our definition of multimorbidity necessarily differs between our two datasets based on available data. We are particularly limited in the hospital data where we can only record multiple conditions based on an inpatient visit. For this dataset, we attempt to carry forward and fill missing data for the same person in future years.

We are only able to compare two selected case studies of population health management models in this analysis. Therefore, we are unable to quantitatively explore possible mechanisms for the divergent results across the two sites. However, we draw on our qualitative analysis at each site, so are able to draw some hypotheses from these results to attempt to explain these differences.

For our qualitative analysis, the interviews were not conducted for the specific purpose of comparing outcome analyses. We conduct a secondary analysis of comparative themes to try and contextualise our results, but there may be other factors that lead to these.

*Results in context*

The literature on population health management programmes comes primarily from the US, particularly from evaluation of ACOs. Early evidence is mixed, particularly for cost-savings, with a small majority (53% saving versus 43% overspending) of ACOs achieving either relatively small (0-2.5%) savings or losses (McClellan, Kocot, & White, 2015), but with an average saving of 1.4% overall (McWilliams, Hatfield, Chernew, Landon, & Schwartz, 2016). Where these modest cost-savings have occurred, these have largely been attributed to reducing waste/ obvious sources of over-use rather than to improved coordination of care (McWilliams, 2016). This literature does suggest that a wider focus on prevention might aid savings, highlighting that “more efficient organisations have achieved lower spending by influencing the entire distribution of spending rather than just shortening its tail (as would be expected from a focus on high-cost patients)” (McWilliams & Schwartz, 2017). It is not clear how comparable the average effect across multiple sites would be in the vastly

different health system context of the UK (arguably with less spending waste, comparing the GDP healthcare spending of 16.8% in the US versus 9.9% in the UK, with fairly equivalent health outcomes (The World Bank, 2019)), but our current results appear to chime with these.

*Implication for policy*

The NHS Long Term Plan places much emphasis on widespread adoption of organisational integration (more devolved, Integrated Care Systems), population health management models for delivering a sustainable NHS going forward. Our findings suggest there might be limited (small changes at the population-level) and mixed results of these changes in the short-to-medium term. Together with our qualitative analysis and literature from the US, they also imply the need to focus beyond NHS-led prevention efforts alone and on the wider important role of individuals, communities, government and businesses in defining lifestyle and health.

It is also unclear how important the Vanguard pump-prime funding has been for these organisational units to get off the ground, so implementation in future areas without this additional funding may take longer alongside any impacts these changes bring.

While these integrated care programmes aim to bring positive impacts across the 'triple aim', our findings show that this might not occur as mutual benefits across all three, and there may be some trade-offs between aims. Neither site managed to improve health for the entire population, and for multimorbid patients there appears to have been a slight decrease in health in both sites. Policymakers might have to prioritise what they wish to achieve and plan tailored interventions within local health system contexts and constraints.

*Future research*

With wider roll-out of population health management models forthcoming, there is the potential to implement categorisation of interventions with a suitable framework and subgroup analyses to try and identify key ingredients and optimal mix of interventions (Stokes et al., 2017).

As the organisational ACO, financial, governance and regulatory system changes in the UK are scaled up with implementation of the Long Term Plan, there is the opportunity to analyse any added benefit of these changes beyond what is implemented at the service delivery level alone. Additionally, as sites such as Devolution in Greater Manchester expand what is offered beyond the health system alone (e.g. to transport and housing), there is the opportunity to examine any modifying effect of inter-sectoral work and to trial at what level of population size decentralised decisions are best taken.

We additionally plan to extend the timeline of our analysis for our hospital costs outcome when newly received data is prepared.

## Conclusions

Population health management intervention effects are likely to vary in effect across devolved health system geographies and the 'triple aim'. Any population-level effects are likely to be reserved in the short-to-medium term, but may be improved if baseline efficiency is low, social care and other sectors beyond healthcare alone are involved, and there are other beneficial enablers for implementing integrated care, such as historical working relationships and organisational changes. There might be a need to examine any additional nationally-set barriers to implementation for organisational integration.

## References

Alderwick, H., Shortell, S. M., Briggs, A. D. M., & Fisher, E. S. (2018). Can accountable care organisations really improve the English NHS? Lessons from the United States. *BMJ, 360*. doi:10.1136/bmj.k921

Atun, R. (2012). Health systems, systems thinking and innovation. *Health Policy and Planning, 27*(suppl 4), iv4-iv8. doi:10.1093/heapol/czs088

Baxter, S., Johnson, M., Chambers, D., Sutton, A., Goyder, E., & Booth, A. (2018). The effects of integrated care: a systematic review of UK and international evidence. *BMC Health Services Research, 18*(1), 350. doi:10.1186/s12913-018-3161-3

Berwick, D. M., Nolan, T. W., & Whittington, J. (2008). The triple aim: care, health, and cost. *Health Aff (Millwood), 27*(3), 759-769. doi:10.1377/hlthaff.27.3.759

Department of Health. (2009). NHS Constitution. London, UK: Department of Health.

GMCA. (2015). *Taking charge of our Health and Social Care in Greater Manchester: The Plan*. Retrieved from http://www.gmhealthandsocialcaredevo.org.uk/assets/GM-Strategic-Plan-Final.pdf

Ham, C. (2018). Making sense of integrated care systems, integrated care partnerships and accountable care organisations in the NHS in England. Retrieved from https://www.kingsfund.org.uk/publications/making-sense-integrated-care-systems

Hughes, G. (2017). New models of care: the policy discourse of integrated care. *People Place and Policy, 11*(2), 72-89.

Imbens, G. W., & Wooldridge, J. M. (2009). Recent developments in the econometrics of program evaluation. *Journal of economic literature, 47*(1), 5-86.

Leijten, F. R. M., Struckmann, V., van Ginneken, E., Czypionka, T., Kraus, M., Reiss, M., . . . Mölken, M. R.-v. (2017). The SELFIE framework for integrated care for multi-morbidity: Development and description. *Health Policy, 122*(1), 12-22. doi:10.1016/j.healthpol.2017.06.002

Lloyd, T., Brine, R., Pearson, R., Caunt, M., & Steventon, A. (2018). *Briefing: The impact of integrated care teams on hospital use in North East Hampshire and Farnham*. Retrieved from https://www.health.org.uk/sites/health/files/Briefing_North_East_Hampshire_IAU.pdf

Maniatopoulos, G., Le Couteur, A., Vale, L., & Colver, A. (2018). Falling through the gaps: exploring the role of integrated commissioning in improving transition from children's to adults' services for young people with long-term health conditions in England. *J Health Serv Res Policy, 23*(2), 107-115. doi:10.1177/1355819617752744

McClellan, M., Kocot, S., & White, R. (2015). Early evidence on medicare acos and next steps for the medicare aco program (updated). *Health Affairs Blog*.

McWilliams, J. M. (2016). Cost Containment and the Tale of Care Coordination. *New England Journal of Medicine, 375*(23), 2218-2220. doi:10.1056/NEJMp1610821

McWilliams, J. M., Hatfield, L. A., Chernew, M. E., Landon, B. E., & Schwartz, A. L. (2016). Early Performance of Accountable Care Organizations in Medicare. *New England Journal of Medicine, 374*(24), 2357-2366. doi:doi:10.1056/NEJMsa1600142

McWilliams, J. M., & Schwartz, A. L. (2017). Focusing on High-Cost Patients — The Key to Addressing High Costs? *New England Journal of Medicine, 376*(9), 807-809. doi:doi:10.1056/NEJMp1612779

Munford, L. A., Sidaway, M., Blakemore, A., Sutton, M., & Bower, P. (2017). Associations of participation in community assets with health-related quality of life and healthcare usage: a cross-sectional study of older people in the community. *BMJ Open, 7*(2). doi:10.1136/bmjopen-2016-012374

NHS England. (2016). New care models - vanguard sites*2016*. Retrieved from https://www.england.nhs.uk/ourwork/futurenhs/new-care-models/

NHS England. (2017). NHS RightCare. Retrieved from https://www.england.nhs.uk/rightcare/

NHS England. (2018a). Integrated primary and acute care systems vanguards. Retrieved from https://www.england.nhs.uk/new-care-models/about/primary-acute-sites/

NHS England. (2018b). Models of care. Retrieved from https://www.england.nhs.uk/new-care-models/about/

NHS England. (2019). *The NHS Long Term Plan*. Retrieved from https://www.longtermplan.nhs.uk/publication/nhs-long-term-plan/

Peckham, S., Exworthy, M., Powell, M., & Greener, I. (2005). Decentralisation, centralisation and devolution in publicly funded health services: decentralisation as an organisational model for health-care in England.

Roland, M., Lewis, R., Steventon, A., Abel, G., Adams, J., Bardsley, M., . . . Ling, T. (2012). Case management for at-risk elderly patients in the English integrated care pilots: observational study of staff and patient experience and secondary care utilisation. *Int J Integr Care, 12*, e130.

SELFIE consortium. (2017). Publications. Retrieved from http://www.selfie2020.eu/publications/

Smith, S. M., Soubhi, H., Fortin, M., Hudon, C., & O'Dowd, T. (2016). Interventions for improving outcomes in patients with multimorbidity in primary care and community settings. *Cochrane Database Syst Rev, 4*.

Stokes, J., Checkland, K., & Kristensen, S. R. (2016). Integrated care: theory to practice. *J Health Serv Res Policy, 21*(4), 282-285. doi:10.1177/1355819616660581

Stokes, J., Cheraghi-Sohi, S., Kristensen, S. R., & Sutton, M. (2016, 08/02/2017). SELFIE Work Package 2 Report: United Kingdom. Retrieved from http://www.selfie2020.eu/wp-content/uploads/2016/12/SELFIE_WP2_UK_Final-thick-descriptions.pdf

Stokes, J., Kristensen, S. R., Checkland, K., & Bower, P. (2016). Effectiveness of multidisciplinary team case management: difference-in-differences analysis. *BMJ Open, 6*(4), e010468.

Stokes, J., Man, M.-S., Guthrie, B., Mercer, S. W., Salisbury, C., & Bower, P. (2017). The Foundations Framework for Developing and Reporting New Models of Care for Multimorbidity. *The Annals of Family Medicine, 15*(6), 570-577. doi:10.1370/afm.2150

Stokes, J., Panagioti, M., Alam, R., Checkland, K., Cheraghi-Sohi, S., & Bower, P. (2015). Effectiveness of Case Management for 'At Risk' Patients in Primary Care: A Systematic Review and Meta-Analysis. *PLoS ONE, 10*(7), e0132340. doi:10.1371/journal.pone.0132340

Stokes, J., Riste, L., & Cheraghi-Sohi, S. (2018). Targeting the 'right' patients for integrated care: stakeholder perspectives from a qualitative study. *J Health Serv Res Policy, 23*(4), 243-251. doi:10.1177/1355819618788100

Stokes, J., Struckmann, V., Kristensen, S. R., Fuchs, S., van Ginneken, E., Tsiachristas, A., . . . Sutton, M. (2018). Towards incentivising integration: A typology of payments for integrated care. *Health Policy, 122*(9), 963-969. doi:https://doi.org/10.1016/j.healthpol.2018.07.003

The World Bank. (2019). Current health expenditure (% of GDP). Retrieved from https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS

Tonelli, M., Wiebe, N., Fortin, M., Guthrie, B., Hemmelgarn, B., James, M., . . . Network, F. t. A. K. D. (2015). Methods for identifying 30 chronic conditions: application to administrative data. *BMC Medical Informatics and Decision Making, 15*(1), 31.