

Andrews, R. and Wankhade, P. (2015). Regional Variations in Emergency Service Performance: Does Social Capital Matter?, *Regional Studies*, Vol. 49, No. 12, pp. 2037-2052.

URL: <http://dx.doi.org/10.1080/00343404.2014.891009>

DOI:10.1080/00343404.2014.891009

### ABSTRACT

The relationship between social capital and the performance of public organizations is currently at the top of the UK policy agenda and elsewhere. This paper examines whether social capital is associated with improved regional emergency service performance by exploring its relationship with the achievements of ambulance trusts in England. Drawing on a six year panel data set, ambulance response times are modelled using an index of social capital, incorporating measures of community organizational life, political efficacy and social trust, in the regions served by NHS ambulance trusts. Theoretical and practical implications are discussed.

### KEYWORDS

Social capital; regional emergency services; organizational performance.

## INTRODUCTION

The concept of social capital is increasingly deployed in a host of important areas of public policy (see HALPERN, 2004). Structural, attitudinal and cognitive components of social capital, such as community organizational life, political efficacy and social trust, constitute resources that can potentially be mobilised for public purposes, including the delivery of public services. Whether by supplementing the efforts of public service providers, pushing them to be more responsive to citizens' needs and demands, or reducing the transaction costs associated with successful policy implementation, the different dimensions of social capital may be likely to have a positive influence on public service outcomes. Since the publication of Robert Putnam's *Bowling Alone* interest in the relationship between social capital and the performance of public services has grown rapidly. Most empirical studies of this relationship have focused on the achievements of regional and local governments or schools and school districts (see ANDREWS, 2012). Rather less attention has been paid to the connection between social capital and the performance of regionally-organized service providers often responsible for responding to emergencies. In particular, although researchers have devoted attention to role social capital may play in enabling emergency services to deal with natural disasters (MURPHY, 2007; YAMAMURA, 2010), few have theorised its connection with the performance of ambulance services, and fewer still have empirically analysed this relationship. This paper will build on the growing interest in these issues by theorising an empirical model of the social capital-emergency services performance relationship and applying it to the response times of regional ambulance services in England.

Institutionalist approaches to the geography of public policy suggest that spatial variations in social and human resources are likely to influence the behaviour of public organizations (SCOTT, 2001). Such variations have been observed to influence the achievements of regional service providers in

previous studies (BRASINGTON, 2002; THOMAS, 2001). In particular, the normative institutions associated with a civic culture, such as a politically engaged citizenry, are a potent source of path dependency for the public service operating within a region, which can potentially ‘support and empower activities and actors’ (SCOTT, 2001: 50). Where the civic norms of the population are positively orientated towards state involvement in the economy there is greater potential for developing effective public policy solutions. By contrast, if the normative expectations of local people are hostile or indifferent to the provision of services by public organizations, those organizations are likely to face considerable challenges in their attempts to distribute services effectively and equitably. For example, PUTNAM (1993: 120) famously argued that the relative ‘civicness’ of Italian regions was ‘the most important factor in explaining good government’ within their boundaries.

Although aspects of the institutionalist approach to geography are hotly contested (see CUMBERS et al., 2003), it is nonetheless widely accepted that ‘institutions constrain and regularize behaviour’ (SCOTT, 2001: 51; see also MACLEOD, 2001). To what extent might the achievements of regional emergency service providers be attributable to aspects of social capital such as community organizational life, political efficacy and social trust? This is a timely and extremely pertinent subject for investigation. A commitment to increasing citizen participation in public service provision is evident in countries across the globe. For example, voluntary contributions to the delivery of public services are at the heart of the UK coalition government’s attempt to build a ‘Big Society’ (JORDAN, 2010). At the same time, in the wake of the global financial crisis, the social capital found within local communities is regarded (rightly or wrongly) as a panacea for budget cutbacks (ASSOCIATION OF COUNTY CHIEF EXECUTIVES, 2009).

The analysis of the relationship between social capital and emergency service performance presented in this paper draws on the idea that the production of public services incorporates the efforts of the citizens who receive services as well as the organizations with formal responsibility for their provision (WHITAKER, 1980). A sharp distinction between the consumers and producers of services is especially difficult to maintain within the public sector because production outputs are in many respects beyond the control of the service provider. For example, students (and parents) actively contribute to the provision of schooling by completing homework and participating in extra-curricular activities, patients choose (not) to follow the advice of healthcare professionals, and citizens' willingness to report crimes and testify in court are integral to the criminal justice system (PARKS et al., 1981). To correctly specify the production function for public services it is therefore necessary to incorporate measures of co-productive activity or capacity within the estimation procedure (DE WITTE and GEYS, 2013; RUGGERIO, 1996).

Much public service provision is already strongly characterised by the contribution of citizens to the production of the goods and services that they consume (BOYLE and HARRIS, 2009). And in recent times, there have been increasing calls for emergency service providers, in particular, to draw upon co-production as means for enhancing responsiveness and building community resilience (AMBULANCE SERVICE NETWORK, 2008). Citizen involvement in the decision-making process of ambulance service delivery can potentially lead to more contextually appropriate decisions towards the service users (NIMEGEER ET AL. (2011). For example, in areas where more people in the community volunteer to respond to emergency calls, the pressure on ambulance trusts may be reduced since locally-based call-handlers are likely to respond quicker and may also know the caller. This can also further help to improve community resilience, as volunteers bring local knowledge about the requirements for effective co-production of emergency services (JACKSON, 2011).

Social capital theories have long suggested that the mixing of the productive efforts of service providers and service users in education, healthcare and criminal justice may be more likely to succeed where there is a greater stock of social resources that can be brought to bear on co-production. By extension, emergency service providers too may benefit from greater public spiritedness as they seek to elicit citizens' support for their attempts to respond to emergencies as efficiently and effectively as possible. In fact, the notion of co-production in emergency services offers a useful remedy for the dominant command and control perspective found in the literature on emergency planning (LINDELL and PARRY, 1992). So to build on and extend the study of the social capital- performance relationship to a new policy area with some theoretically interesting characteristics, we present an exploratory examination of the relationship between social capital and the responsiveness of a set of important regional emergency service providers - English ambulance trusts - using a six-year panel data set.

In the first part of the paper, the concept of social capital will be introduced, and then its potential relationship with regional variations in ambulance performance explored. In the second part, the data and the empirical methods used to evaluate the influence of social capital on ambulance response times are described, before the empirical results of the statistical modelling are presented and interpreted in the third part of the paper. Finally, the implications of the findings are discussed.

## **SOCIAL CAPITAL AND EMERGENCY SERVICES PERFORMANCE**

The concept of social capital has been conceptualized and operationalized in myriad alternative ways (see PORTES, 1998). According to Robert Putnam (2000), it comprises “connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them”

(PUTNAM, 2000, p.19). This implies that social capital is a *structural* (networks) and *attitudinal* (norms) phenomenon that is the property of communities rather than individuals. While the concept of social capital is often highly contested and controversial (see NAVARRO, 2002; FINE, 2001), it remains a useful heuristic for exploring the salience of social relationships in the field of public policy because of its facility for bridging the worlds of academia and practice (WOOLCOCK, 2010). Hence, it offers a helpful way for thinking through how regional variations in emergency services performance might be, at least partly, attributable to the appetite for co-production within a region.

Generally speaking, social capital is conceptualised in the empirical literature as a latent construct that cannot be directly observed, but rather is composed of separate though inter-related dimensions that are susceptible to observation. Although each of these dimensions may have an independent life of their own, taken together they constitute a theoretically coherent representation of an underlying concept. On the basis of extensive longitudinal research, PUTNAM identified three key dimensions of social capital that have played a central role in maintaining the quality of government performance in both Italian regions (1993) and the US states (2000): community organizational life, engagement with public affairs and interpersonal trust. Taken together, these separate dimensions arguably capture the stock of social resources which can be mobilised for public purposes (good or bad) within a region.

Community organizational life reflects the formal organizational resources present within communities, such as sports clubs, arts societies and social support groups. In theory, such organizations build networks and shared values and norms amongst citizens (VAN DETH, 1997). While the social capital created by associational activity may result in greater competition between social groups (BERMAN, 1997), it is also a potentially rich source of co-productive capacity.

ANDREWS (2012) identifies several studies that report a positive connection between community groups and neighbourhood level outcomes. NEUGELSDIJK and SMULDERS (2003) find a connection between associational activity and economic growth in the European regions. That said, at a higher spatial scale, BJØRNSKOV (2006) fails to uncover a connection between community organizational life and good governance internationally.

Engagement in public affairs is constituted by participation in democratic politics, especially through voting in elections and attendance at public meetings. Evidence suggests that there are important links between political participation and a pro-social attitude (SULLIVAN and TRANSUE, 1999), which may thereby underpin positive contributions to the production of public services. Although public organizations operating in politically active areas sometimes have to overcome greater resistance to unwanted policy change (ALDRICH and CROOK, 2008), empirical studies do suggest that a more engaged citizenry can prompt improvements in public service production (see ANDREWS, 2012).

Social trust refers to the generalized reciprocity that guides exchanges between community members. Trust can foster collaborative action in the absence of formal mechanisms for that purpose (COLEMAN, 1994). Trust can be an indicator of insularity and closed-mindedness within some communities (SUTTLES, 1972), but can also underpin the sense of obligation and reciprocity characteristic of a positive attitude towards service co-production. Several studies identify the benefits of trust for public service outcomes. For example, at the national level, LA PORTA et al. (1997) find that social trust is linked to the efficiency of the judiciary, bureaucratic quality in government, school performance and lower levels of government corruption in economically advanced nations – findings mirrored in BJØRNSKOV's (2010) updated replication study.

Each of these key dimensions of social capital may have important effects on the structural and attitudinal resources available within communities for emergency services to harness in the pursuit of better performance. Community organisational life may build shared values about public life, enabling citizens to prompt emergency service providers to meet their needs more effectively. A more active and empowered citizenry too may dictate agenda-setting to policy-makers (ELKINS and SIMEON, 1979; HIRSCHMAN, 1970), which, in turn, forces emergency services to perform at a higher level. At the same time, participation in community organizational life and public affairs is also arguably an educative experience, which may therefore lead citizens to have more realistic expectations about public service performance, and to potentially become less likely to misuse the ready availability of costly emergency services.

Similar arguments can be applied to areas with higher levels of social trust. In addition, it is also possible that public-spiritedness in areas with high social capital is reflected in various forms of “protective neighbouring” that assist emergency service providers in their work (SCHNEIDER, 1987). For example, in areas with vibrant community organizational life, more electoral participation and greater propensity toward social trust, ambulance crews may be especially likely to benefit from the work of Community First Responders (CFRs) – local volunteers trained to receive emergency calls and provide care to patients until an ambulance arrives (TIMMONS AND VERNON-EVANS, 2013). At the same time, it is possible that vehicle drivers in areas of higher social capital may be more disposed to move aside for emergency rescue vehicles, and pedestrians more inclined to assist first responders and ambulance crews by providing them with local knowledge that can help them to reach incidents more quickly.



The plausibility of these arguments notwithstanding, it is also conceivable that the potentially positive effects of social capital for public organizations will not emerge for emergency service providers due to the very distinctive characteristics of the service. In particular, it would seem likely that social capital might matter more for distributive public services, such as education and social care, which rely to a greater extent on close relational exchanges between service providers and users, than for emergency services, such as ambulance and fire and rescue, which, on the face of it, may be less reliant on such exchanges (HORNE and SHIRLEY, 2009). The highly technical challenge of providing first response services might simply be much less dependent upon the co-productive capabilities of citizens than most other public services. The CFRs who volunteer with the ambulance service, for example, require considerable training and support to be able to carry out their role effectively (TIMMONS AND VERNON-EVANS, 2013).

Despite these complexities, emergency services are an interesting test case for examining the potential for social capital to influence regional performance variations because the degree of openness to co-production varies considerably by task. In responding to and dealing with life-threatening emergencies, ambulance trusts may have little discretion over how much they seek to involve citizens in the production process; and any discretion that exists in this area would be unlikely to vary much from one trust to another. In contrast, trusts will have considerably more discretion in their efforts to respond to less urgent incidents and to enlist citizens in their efforts to address these emergencies. In these circumstances, ambulance trusts will be better able to determine which groups to interact with, for what types of response services and in what circumstances they will draw upon the social resources extant within their jurisdiction. Thus, the less critical emergencies are where one would expect to see trusts operating in areas with high social capital to perform better.

## DATA AND METHODS

The data set for our study draws upon measures that were collected annually between 2004 and 2009. The unit of analysis is the area served by the 12 NHS ambulance trusts in England that were operational in 2009. These organizations were created on a regional basis through the merger of 31 ambulance trusts in 2006 (DEPARTMENT OF HEALTH, DH, 2005, p.10). To develop a set of measures that correspond to the boundaries of the regional trusts in the period preceding the consolidations that took place in 2006, the statistics for the reformed trusts were therefore aggregated to the new regional level for the years 2004 to 2006. For our study period (2004-09), this provides a total of 72 units of analysis for the investigation of the effects of social capital and emergency services performance.

Our evaluation of social capital and the performance of English regional ambulance trusts examines the average emergency attendance times of these organizations. The ambulance service is the first point of access in the NHS for a wide variety of health problems, and ambulance trusts provide both emergency and non-emergency services. Emergency transport is provided by individual ambulance trusts in response to 999 calls and urgent requests from general practitioners and clinicians including inter-hospital transfers using an emergency vehicle. The Patient Transport Service (PTS) provides transport from/to hospitals for outpatient appointments and to day care centres. During the study period, individual ambulance trusts were responsible for setting the budgets in consultation with the Primary Care Trusts (PCTs) in commissioning their services – a role now undertaken by Clinical Commissioning Groups.

Until very recently, response time targets based on 999 call prioritisation have been used as the main indicator of ambulance trust performance in England by the UK central government. Two response time standards were in use in England during the study period. First, the stipulation that category A calls should be attended within 8 minutes for conditions which may be urgent and immediately life threatening. These calls are attended first by rapid response vehicles manned by paramedics who administer emergency medical assistance and decide on the most appropriate course of action at the scene of an emergency. During the study period, the national target was to respond to such calls within the target time irrespective of location in 75% of cases. The second standard was the stipulation that category B calls should be attended within 19 minute in cases which are serious but not immediately life threatening. These calls are attended by full-size ambulances, which are able to provide initial acute care when in transit from the scene of the emergency call to hospital admission. The national target is to respond to 95% of all such cases. Data on the response times of ambulance trusts is made publicly available on an annual basis. Table 1 shows the average response times for each ambulance trust during the study period.

[INSERT TABLE 1 HERE]

Typically, emergency ambulance response to 999 calls is necessitated by both clinical emergencies such as cardiac arrest, stroke, road traffic collision or social causes such as domestic violence, urgent care for older people who have fallen in their homes and patients with long-term conditions, such as diabetes and heart problems. During the 2000s, ambulance service demand rose by around 6-7% annually equating to around 250,000 more responses per year in England (DH, 2005a). Statistics further reveal that only 10% of the callers who call 999 have life threatening conditions and many callers suffer from mental health problems or have social care needs. About 77% of emergency calls

which result in an ambulance journey to hospital lead to admissions in 40% of cases whilst 50% of these could be treated at the scene or in the community (IBID, 13). The increasing demand placed on ambulance trusts in recent times requires a fresh perspective to look at more innovative ways in which trusts can organise and commission their resources to maximise the efficiency and effectiveness of the front line service delivery. By using quantitative research techniques to explore whether social capital offers a potential solution to some of these issues, this paper therefore seeks to illustrate the role that co-production may play in improving regional emergency service provision.

## **Independent Variables**

### *Social capital*

A measure gauging the stock of social capital within the areas served by English ambulance trusts was created by aggregating separate measures of community organizational life, political engagement and social trust. By aggregating the measures it is possible to create an index which represents a latent construct gauging the social resources within a region. This index is the equivalent of that used by Coffe and Geys (2005) and Andrews (2011) in their studies of social capital and local government performance.

Community organizational life in local government areas was measured as the number of community, social and personal services organizations (such as voluntary associations, film societies or sports clubs) per 1000 capita registering for value added (or goods and services) tax (DEPARTMENT OF BUSINESS, INNOVATION AND SKILLS, 2008). Due to their legal status, these organizations are likely persistent features of community life. This measure has been used in several influential quantitative studies of social capital and public services outcomes (e.g. COFFE and GEYS, 2005; PUTNAM, 2000).

Following PUTNAM (2000) and others (e.g. CASEY, 2004), the relative influence of political participation on social capital was measured as the average turnout in local government elections in the areas served by ambulance trusts. High turnout implies greater concern with public affairs and active engagement with the “common good” (SMITH, 2002). The measure is therefore a useful proxy for political participation in the absence of detailed annual data on public attitudes towards engagement with the work of ambulance trusts.

A proxy for social trust was measured by taking the average crime rate recorded per 1000 capita within the areas served by each ambulance trust. Crime rates have been used in several previous studies as proxies for the level of trust within communities (e.g COFFE and GEYS, 2005; RICE and SUMBERG, 1997). The relative prevalence of criminal activity will likely reflect informal expectations about appropriate conduct towards fellow citizens within an area (GIBBS, 1977).

[INSERT TABLE 2 HERE]

The literature suggests that social capital changes at a very slow pace (BASILE ET AL., 2011; PUTNAM, 2000), which can make it difficult to draw causal inferences from small-*t* panel data analysis. To assess the extent to which this potential limitation might bias our statistical results we present annual means for the social capital variables in Table 2. The annual statistics indicate that two of our social capital variables (community organizational life and electoral turnout) are pretty stable, but that the crime rate fell dramatically during the study period.

To create an aggregate social capital measure we carried out principal components analysis of our social capital variables, with the three separate measures loading on to the first factor, which accounted for over fifty-five per cent of the variance in the data.

### *Control Variables*

Four measures were selected to control for the potential influence of other relevant variables on ambulance performance. First, a measure is included gauging the quantity of emergency calls made to each ambulance. To ensure that this measure was not biased by greater number of calls received by trusts serving larger populations, it was calculated as the number of emergency calls per 1,000 capita. It is anticipated that greater demand upon emergency ambulance services is likely to have a detrimental effect on their ability to meet response time targets. During the last decade, 999 emergency calls to ambulance trusts in England have increased by between 5 and 7 per cent each (NHS INFORMATION CENTRE, 2008) resulting in an extra 250,000 emergency and urgent patient journeys (DH, 2005). It costs around £200 to send an ambulance for an emergency 999 call and the total cost to the NHS is much higher if the patients are taken to hospital A&Es for overnight admissions or for longer (AMBULANCE SERVICE NETWORK, 2008). Increased demand directly influences the operational resources available to ambulance trusts in meeting targets.

Next, a measure of the population density in the area served by ambulance trusts is added. It has long been assumed that emergency services face greater challenges of coordination in areas, which are more sparsely populated. The sheer size of the region covered by many ambulance trusts in England is inevitably thought to have a bearing on the response times. A cardiac arrest in London should be met within the same time limit as a cardiac arrest in a remote village in Cumbria.

Moreover, it is possible that the types of urban models of emergency service provision advocated by central government during the study period do not necessarily work in rural areas (see MOY *et al.*, 2011).

Third, the Average Ward Score on the Index of Multiple Deprivation (OFFICE OF THE DEPUTY PRIME MINISTER, 2004) for each region served by ambulance trusts is included in the model to control for the relative effects of socio-economic disadvantage on the provision of emergency services. This deprivation score is the standard population-weighted measure of deprivation used by UK central government. It is based on multiple indicators of poverty and hardship within an area ranging from the proportion of the adult population receiving welfare benefits and the accessibility of local public services to housing quality and morbidity rates. In economically disadvantaged areas, the emergency response system frequently becomes the default provider of health care, with the ambulance service the first point of call (COOKE, 2011, p.39). The NHS Next Stage Review- Darzi Report (DH, 2008) highlighted that there is increased demand on ambulance services within deprived areas, which could, in turn, make it harder for them to hit performance targets. Soo *et al.*, (2001), for example, show that deprivation is associated with a higher incidence of out-of-hospital cardiac arrests. In addition, research suggests sickness absence rates in the NHS are higher among ambulance staff than other frontline NHS staff, such as nurses, midwives, health visitors and healthcare assistants and that it is higher still in economically deprived areas served by the NHS trusts (AUDIT COMMISSION, 2011, pp. 7-9).

Finally, a measure gauging the average percentage of principal roads requiring maintenance by the local authorities across the areas served by ambulance trusts was included to control for the possibility that road conditions affect response times. This data was collected annually by all major

local authorities in England during the study period. The descriptive statistics for all the variables used in the statistical analysis can be found in Table 3.

[INSERT TABLE 3 HERE]

Correlations between the variables entered in the main statistical model are shown in Table 4. The bivariate correlations illustrate that there is a positive correlation between the two indicators of emergency responsiveness, and that our measure of social capital is positively correlated with only the first of these indicators (responsiveness to Category A calls). As well as being negatively correlated with population density and deprivation, social capital is also negatively correlated with the volume of emergency calls. This raises the intriguing possibility that the putative benefits of social capital for health (D’HOMBRES ET AL. 2010) or a lower propensity to make prank calls may be associated with reduced demand for emergency services in areas with high social capital. It also implies that it is important to include the measure of call volume in the regression models to control for its potential influence on the social capital-performance relationship; as do the other statistically significant correlations between the other explanatory variables. All of the variables subsequently entered in the statistical models were log-transformed to ensure that the variance underlying the estimated parameters for each variable is comparable.

[INSERT TABLE 4 HERE]

#### *Statistical model*

To explore the relationship between social capital and emergency responsiveness, a three-stage multivariate analysis is undertaken. First, the relationship between the social capital index and the



response times of regional ambulance trusts across England is modeled. The fully specified Ordinary Least Squares (OLS) version of this model of emergency responsiveness can be represented through notation as equation [1], in which response times (ER) in trust  $i$  in year  $t$  is a function of the trust's fixed characteristics ( $\alpha_{it}$ ), dummy variables for each year of the analysis (minus one) ( $\pi$ ), social capital (SC), quantity of demand (QD), population density (PD), socio-economic disadvantage (SD), and road quality (RQ):

$$ER_{it} = \alpha_{it} + \beta_1 SC_{it} + \beta_2 QD_{it} + \beta_3 PD_{it} + \beta_4 SD_{it} + \beta_5 RQ_{it} + \pi + \epsilon \quad [1], \text{ where } \epsilon \text{ is an error term.}$$

For the second stage of our analysis, the social capital index is broken up into its component parts (community organizational life (CO); local election turnout (ET); and crime rate (CR)) to estimate the potential influence of each dimension of social capital on the response times of regional ambulance trusts. Equation [2] takes the following form:

$$ER_{it} = \alpha_{it} + \beta_1 CO_{it} + \beta_2 ET_{it} + \beta_3 CR_{it} + \beta_4 QD_{it} + \beta_5 PD_{it} + \beta_6 SD_{it} + \beta_7 RQ_{it} + \pi + \epsilon \quad [2]$$

In estimating these equations, we also carried out supplementary tests to explore whether the idea that one can have too much social capital has any empirical traction. By including a quadratic term for the social capital variable within the equation we can assess whether very high levels of social capital are harmful for emergency service production. Although we identified several nonlinear relationships between our social capital measures and emergency response time, the turning point for each of the relationships that we identified was far beyond the range of the data, so we remain confident that our specification of linear estimates is the correct one.

### *Instrumental Variable Estimator*

For our OLS estimates to be unbiased it is important that the coefficient for social capital is orthogonal to the error term for the statistical model. There are at least two reasons why this condition may be unlikely to hold (see DURLAUF 2002 for a full account). First, social capital is correlated with other relevant spatial characteristics of the regions served by ambulance trusts. Second, it is possible that an omitted variable may be responsible for identification of a relationship between social capital and emergency responsiveness. Third, the performance of emergency service providers may contribute towards the growth of social capital. In fact, the potential for endogeneity and reverse causality to bias the social capital-performance relationship is well documented (see, for example, ROTHSTEIN and STOLLE, 2005). To address these potential problems we therefore employ an instrumental variable (IV) estimator, incorporating instrumental variables which are correlated with our social capital index, but that are also orthogonal to the dependent variable.

For our instruments we draw upon indicators of the average education (percentage of working age residents educated to degree level) and income levels (median level of income in £'s) to capture variations in the populations served by ambulance trusts that might be anticipated to influence social capital (BREHM and RAHN, 1997), yet be independent of performance. Of course, many of the population characteristics likely to be associated with social capital might still also (at least) partly determine public service outcomes (ANDREWS, 2010). Hence, the validity of our instruments was tested in three ways: first, we tested for endogeneity using the Durbin-Wu-Hausman test, which did not reject the null hypothesis that income and education are exogenous; second, we tested for overidentifying restrictions using Sargan's test, which also failed to reject the null hypothesis; and, third, we tested the strength of the instruments by examining the F-statistic from the first stage regressions, which in each case was greater than the 10 typically recommended by econometricians (see STAIGER and STOCK, 1997). The results of these tests therefore give us

some confidence that our instruments are exogenous, well-specified and of sufficient strength. Nevertheless, we did experiment with a range of other instruments (e.g. religious adherence, immigration rates), in a bid to broaden the range of the IV estimator. However, we found evidence of overidentification whenever three or more instruments were included, due to the small sample size. Thus, since we were unable to incorporate more than two instruments within the IV estimator, we do not apply an IV estimator to the models incorporating the separate dimensions of social capital on this occasion.

## **EMPIRICAL RESULTS**

Results for statistical tests of the relationships between social capital and ambulance performance are shown in Tables 5 to 7. We present the results of our OLS estimates in the following sequence. Eight models are presented in Table 5: in model 1 the measure of Category A call responsiveness is regressed on to the control variables; model 2 introduces our social capital measure; in model 3, year dummies coded 1 for each year of the study period and 0 for all the other years (minus one) are added to control for idiosyncratic events within individual years; before model 4 displays the results of our instrumental variable (IV) estimation. The estimates shown in models 1-4 enable us to identify the determinants of variations in the response times across different ambulance trusts. In models 5 to 8, we repeat the model-building pattern of models 1 to 4, but include ambulance trust fixed effects. By including fixed effects in the model, we can identify the determinants of changes in the response times within ambulance trusts and control for unobserved unique trust-specific (fixed) effects that are very difficult to measure quantitatively (GREENE, 2003), such as the quality of the management or the occupational culture within each ambulance trust. Since the boundaries of the trusts are largely coterminous with those for English regions, this also enables us to control for additional unobserved spatially-varying regional effects, such as institutional structures for economic

growth and social attitudes broadly understood. Nonetheless, to explore this matter in more depth, we also tested for, and found, some evidence of spatial auto-correlation in the residuals from our statistical models. Further examination of LISA maps revealed that this was restricted to two of the twelve ambulance trusts included within the analysis, South Western and South Central, which gives us some confidence that the estimates are not unduly biased by spatial auto-correlation.

In Table 6, the sequence in which the estimates are presented in Table 5 is repeated for our models of the relationship between social capital and Category B responsiveness. Table 7 then presents estimates of the relationship between social capital and ambulance response times with and without trust fixed effects. The findings for all of the estimations shown are not distorted by multicollinearity as the average Variance Inflation Factor score for the independent variables in the models is about 4.1, with only one variable exceeding 10 (BOWERMAN & O'CONNELL, 1990). Tests for heteroscedasticity revealed the presence of nonconstant error variance, so robust estimation of the standard errors was carried out.

[INSERT TABLE 5 HERE]

The basic specification represented in models 1 and 5 highlight that when entered in the equation on their own, the control variables make no statistically significant contribution to the explanation of variations in Category A response times between or within ambulance trusts. The inclusion of the social capital index, however, elicits statistically significant contributions from population density and deprivation in the between variations. Furthermore, the coefficient for social capital itself is positive and statistically significant for model 2, but is actually negative and significant for model 6. The  $R^2$  for our fully-specified models 3 and 7 is over 40% and the joint F statistic is significant. The

fully-specified between and within models therefore provide a reasonable level of statistical explanation of variations in the rate of emergency response times within ambulance trusts. Whilst the inclusion of time-effects in these models does not alter the positive connection between social capital and Category A response times for the cross-sectional model, it does eradicate the negative relationship observed for the within-effects model. The instrumental variables estimates largely confirm the results observed in models 3 and 7.

Before discussing the substantive effects of social capital, we briefly turn our attention to our control variables. Interestingly, none of those variables is consistently statistically significant in the models predicting variations in category A response times. There are a few possible explanations why this might be the case. Meeting the eight minute response target has been the key indicator of ambulance performance and a top management and operational priority for the ambulance trusts (HEATH and RADCLIFFE, 2010; SNOOKS *et al.*, 2009; WANKHADE, 2011). The funding model required each trust to meet its eight minute target and failure to meet the target is seen as a ‘stigma’ for the ambulance chiefs’ often inviting financial penalties. [The North West Ambulance Service NHS Trust, for example, e was threatened with a fine of £3.8m fine \(WILLIAMS, 2011\) from the Primary Care Trust \(which commissioned its services at the time\) in case it failed to meet its s Category A response target.](#) It is also conceivable that ambulance crews are so well trained and equipped to deal with category A emergencies, that only large or unexpected environmental jolts (such as terrorist attacks, natural disasters, or large-scale organizational restructuring) influence their ability to respond effectively to the most serious calls. Further research (see WANKHADE, 2012) is required to explore these possible explanations in more depth.

The year dummy for 2007 is indicative of a statistically significant improvement in category A response times in that year. To explore whether this finding points towards a positive impact from the reorganization carried out in 2006, we expanded the statistical model by including a dummy variable coded 1 for the post-reform period (i.e. 2007-09) and 0 for the years prior to the reform (i.e. 2004-06). However, the coefficient for this structural change measure was not statistically significant and its inclusion in the model did not add any explanatory power. Further qualitative and quantitative research is required to unravel whether something other than reorganization may have exerted such a powerful influence on the performance of ambulance trusts during 2007.

Having discussed the control variables included in our estimates of variations in Category A response times, we turn now to examine the social capital variable in more depth. The coefficients for social capital suggest that it may be responsible for differences in Category A response times between ambulance trusts but not within them during the study period; something that is confirmed by our instrumental variable estimates. Substantively, the coefficient for social capital in model 3 implies that a ten percent increase in social capital within any given ambulance trust during the study period is likely to result in it having a Category A response time performance that is about twenty percent better than its peers. The absence of a relationship between social capital and responsiveness to the most urgent emergencies within ambulance trusts may reflect the absence of discretion around the organizational effort ambulance trusts must devote to the most pressing of cases. That social capital appears to be unrelated to changes in Category A response times within ambulance trusts may therefore point towards the technical challenge of improving on this most demanding response target, but could also be indicative of the difficulty of identifying social capital effects within such a short study period. Nevertheless, it is intriguing that neither of these accounts of the

problems associated with improving Category A performance seem to apply to variations in Category B response times.

[INSERT TABLE 6 HERE]

The results for models 1 and 5 shown in Table 6 indicate that, when entered on their own, the control variables explain very little of the variations in Category B response times between or within ambulance trusts. Inclusion of the social capital index adds considerable explanatory power to the between model, but makes no difference to the within model. Entering the year dummies strengthens the positive social capital-performance relationship identified in model 2, and elicits a similar relationship for the within estimates. The instrumental variable estimates for both the between and within estimates are similar to those for the fully-specified models (i.e models 3 and 7).

In stark contrast to the Category A estimates, two out of the four control variables make statistical significant contributions to the explanatory power of the fully-specified models predicting category B response times. In particular, there is evidence of a positive relationship between growing population density and category B response times, which corroborates much of the literature on emergency service provision. At the same time, the level of deprivation makes a difference. However, the direction of deprivation's influence on Category B response times varies across the between and within estimates, suggesting that ambulance trusts in more deprived areas perform better than those in less deprived areas, but that their performance worsened if they were becoming more deprived.

In terms of the relationship between the social capital index and emergency responsiveness, it appears to have a strong positive relationship with category B response times across and within ambulance trusts. Substantive interpretation of the coefficient for social capital in models 3 and 7 suggests that for a given trust, a ten percent increase in social capital during the study period would result in a Category B response time that is about 14% better than its peers, as well as an 18% improvement in its own response time performance. The positive and substantive relationship between social capital and category B responsiveness therefore provides support for the arguments we developed with regard to “protective neighbouring” and the benefits of a more civically engaged population for emergency service outcomes that seem to offer more opportunity for co-production. The IV estimates confirm the positive connection of social capital with cross-sectional variations in ambulance service performance. However, although the  $R^2$  for the IV model estimating within variations in Category B responsiveness is similar to the basic estimation, the coefficient for social capital is not statistically significant. Likewise, the IV estimation of within variations in Category A responsiveness does not identify a connection between social capital and performance. It is possible the use of instruments that do not vary greatly during the study period, problematizes identification of the social capital-performance relationship through time, which would confirm the long-standing arguments about the static nature of social capital that we discussed earlier. Our instrumental variables are simply not precise enough to capture a temporal causal effect on this occasion. Still, to explore whether the identification problem might also be the product of reverse causality from performance to social capital we carried out the Granger causality tests recommended by Meier, Polinard and Wrinkle (2000). The results of these tests suggest that the lagged values of category A responsiveness are positively related to social capital whereas the lagged values of category B responsiveness are not. Although these tests therefore identify a possible source of endogeneity bias within our estimation of within variations in Category A responsiveness, they do at least add some



confidence in the validity of the basic estimates of the relationship between social capital and category B responsiveness.

### *Dimensions of Social Capital*

Knack (2002) and Bjornskov (2006) emphasise that social capital should be understood as a multidimensional rather than a unitary concept. Thus, to explore whether the benefits of our social capital index accrued primarily from community organizational life, engagement with public affairs or social trust, regression models were constructed predicting emergency responsiveness, which incorporate each of these separate elements of the index (see Table 4). As noted above, we did not apply an IV estimator to these models because the number of instruments we draw upon are too few to use when predicting the relationship between three independent variables and a dependent variable.

[INSERT TABLE 7 HERE]

The results shown in Table 4 indicate that levels of political engagement are positively related to Category A response times across ambulance trusts, but that none of the separate elements of the index of social capital makes a difference within trusts. Electoral turnout is also positively related to category B responses times both across and within ambulance trusts, with community organizational life also making a statistically significant contribution, in the expected direction, to the explanation of category B response times within trusts. The size of the coefficient for the turnout variable suggests that a ten per cent increase in turnout during the study period within the area served by a trust would result in one per cent improvement in its Category A performance and about a half per cent improvement in its Category B performance when compared with its peers. It would also likely result in a half per cent improvement in its own Category B response time. These figures indicate

that political engagement can bring benefits for emergency service performance, but that those benefits may be comparatively small ones. By contrast, a ten percent increase in community organizational life within the area served by a trust would result in about a six per cent improvement in its own Category B performance.

These findings imply that community based organizations may play some kind of role in enhancing the potential for ambulance trusts to realize citizens' positive contributions to service delivery, whether by making their members more public spirited or actively contributing to service provision in some way. Likewise, it appears that, at the margins, high voter turnout may enhance bottom-up citizen-led pressure on ambulance trusts to perform well. However, a higher rate of criminal activity does not appear to be compounding the emergencies being dealt with by ambulance crews, even though there are reports of attacks on paramedics in some notoriously crime-scarred areas. Thus, the efforts of ambulance trusts to elicit the involvement of residents within service provision through formal volunteering, critical friend and educative schemes may, if effective, be an especially pertinent means for harnessing social capital for the improvement of emergency responsiveness.

## **CONCLUSION**

The empirical analysis presented in this paper illustrates that there may be good reason to think that regional emergency service providers can benefit from co-production, but that there may be limits to the kinds of tasks where social resources can be productively brought to bear. Although we consistently identify a cross-sectional relationship between social capital and emergency service performance, the identification of causal effect via within variations in the dependent variable varies

according to the performance indicator studied. The statistical estimates of within variations failed to uncover a relationship between social capital and the responsiveness of English ambulance trusts to life-threatening emergencies, but did reveal a strong positive correlation with serious but not urgent emergencies, which offer trusts greater discretion to involve citizens in service production. These results were observed when considering both an index of social capital and of that index's separate dimensions.

The analysis provides food for thought for policy-makers at national, regional and local levels about the potential for co-production to contribute towards better emergency service outcomes. Scholars and practitioners increasingly draw attention to the benefits of social capital for the responsiveness of public organizations in general (see ANDREWS, 2012) and emergency services in particular (MURPHY, 2007). The analysis presented here illustrates that efforts to draw upon the social resources present within an area are only likely to succeed for those aspects of service provision that exhibit significant openness to the contributions of citizens. Thus, attempts to design-in community involvement in the production of emergency services may be especially beneficial when ambulance providers are facing serious but not critical incidents, which can (in part) be entrusted to local volunteers.

The findings presented within the paper imply there may be two key focal points for the efforts of policy-makers concerned with building social capital. Firstly, they suggest that involving community-based organizations in emergency service provision may have benefits within trusts. Although cultivation of the capacity for community organizing is recognized to be extremely resource intensive for public organizations (LEACH and WILSON 1998), the ability of community-based organizations to meet complex social needs can undoubtedly be harnessed to the provision of

emergency services. For example, community organizations in the UK (and elsewhere) have helped to support more volunteers in the community who are trained in resuscitation and fibrillation techniques as CFRs to provide assistance to ambulance trusts in meeting this target (see SNOOKS *et al.*, 2004; WASEEM *et al.*, 2011). The role of these organizations in supplementary community awareness programmes about personal safety, acting as gatekeepers to community groups and in critical friend networks can clearly also help local ambulance trusts do better.

Secondly, the findings highlight that a politically engaged citizenry brings benefits for emergency service providers. A strong turnout in the local democratic process might therefore be seen as a good pressure point in monitoring the delivery of the local services. While political disaffection is now regarded as widespread within many countries (PHARR and PUTNAM 2000; BLAIS and RUBENSON 2013), research suggests that electoral turnout can be encouraged through the use of “get-out”the vote” campaigns (e.g. FIELDHOUSE, CUTTS, WIDDOP AND JOHN 2012) or ballot initiatives (e.g. SMITH 2002). Given that such engagement is also thought to bring myriad other beneficial social outcomes (SULLIVAN and TRANSUE 1999), there is every reason to regard a positive performance pay-off for emergency services as further justification for investing in initiatives to improve electoral turnout. In fact, recent research in the U.S. has highlighted that community-based organizations can play a crucial role in driving voter turnout upwards (LE ROUX and KRAWCZYK 2013), illustrating that there may be great potential for synergy between alternative social capital development activities.,

Our findings nonetheless raise several important questions about the relationship between social capital and regional emergency service performance that are worthy of further analysis. Firstly, the statistical results may simply be a product of when and where the study was conducted. It is therefore important to identify whether the relationships identified here are replicated at a lower

spatial scale amongst the local units within ambulance trusts, as these might intuitively be expected to garner greater benefits from closeness to the communities that they serve. Efforts to build social capital are also much more likely to be successful at this level (SAEGERT 2006). Moreover, data drawn from this level might facilitate the development of a more successful set of instruments, with which to tease out the validity of the causal effects we seek to identify. On this occasion, our IV estimates offered confirmation of only the between estimations. Although Granger causality tests did offer further support for the robustness of the within estimates of Category B responsiveness, identification of a social capital effect for Category A responsiveness could be more achievable at a lower spatial scale. At the same time, because data on volunteering and informal social networks are not readily available on an annual basis for the areas served by ambulance trusts, we are unable to develop a measure of social capital that matches the richness of that used by PUTNAM (2000). As a result, our analysis may only be capturing benefits accruing to ambulance trusts operating in regions with a stronger tradition of formal community involvement, such as London and the South East, rather than Northern regions where informal volunteering is more prevalent (WILLIAMS, 2003). Use of alternative indicators of social capital would therefore cast further light on the relationships that observed here.

The findings presented here indicate that social capital may have important statistically significant effects on the responsiveness of regional ambulance services in England. They also highlight that these effects are likely to emerge for operational activities that are more open to co-production. Ultimately, this implies that the work of community organizations and the role of political engagement, in particular, may be vital to responsiveness to serious (if not life-threatening) emergencies, and that more should therefore be done to understand and support the role of citizens in emergency service production.

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**TABLE 1** *Ambulance trust average emergency response times (2004-09)*

	Category A calls attended within 8 minutes (%)	Category B calls attended within 19 minutes (%)
East Midlands	76.0	96.7
East of England	75.6	96.5
Great Western	72.5	93.1
Isle of Wight	77.8	98.0
London	76.1	97.4
North East	76.4	98.8
North West	74.4	96.3
South Central	74.7	94.5
South East Coast	75.7	97.5
South Western	76.8	95.4
West Midlands	77.2	98.0
Yorkshire	72.3	95.7

**TABLE 2**    *Social capital (2004-09)*

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	Community organizations per 1,000 capita	Local election turnout	Crime rate
2004	2.46	45.25	113.94
2005	2.41	47.38	106.21
2006	2.38	48.20	104.89
2007	2.45	46.62	102.43
2008	2.41	46.44	92.98
2009	2.39	46.04	86.92

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**TABLE 3** *Descriptive statistics for variables included in statistical models*

	Mean	Min	Max	S.D.
Category A calls attended within 8 minutes (%)	75.48	68.37	81.70	2.33
Category B calls attended within 19 minutes (%)	96.50	91.69	99.08	1.80
<i>Social capital</i>				
Community organizational life	2.42	.93	4.66	.92
Local election turnout	46.66	34.21	60.70	7.34
Crime rate	101.23	73.51	146.54	17.53
<i>Control variables</i>				
Emergency calls per 1,000 capita	.13	.09	.19	.02
Population density	709.21	170.44	4883/96	122.88
Indices of Multiple Deprivation	21.72	13.57	30.93	5.32
Principal roads requiring repair (%)	6.39	1.89	17.00	3.11



TABLE 4 *Correlations between main variables*

	1	2	3	4	5	6
1 Category A calls attended within 8 minutes (%)						
2 Category B calls attended within 19 minutes (%)	.50**					
3 Social capital index	.19+	.18				
4 Emergency calls per 1,000 capita	.06	.38**	-.25*			
5 Population density	.08	.17	-.61**	.61**		
6 Indices of Multiple Deprivation	.09	.48**	-.35**	.45**	.24*	
7 Principal roads requiring repair (%)	.09	.06	-.04	-.06	.16	-.17

**TABLE 5** *Determinants of emergency response times for ambulance trusts*

Variable	Category A calls attended within 8 minutes (%) (log)							
	1	2	3	4 (IV)	5	6	7	8 (IV)
Social capital index (log)		1.439** (.401)	1.970** (.374)	2.346** (.372)		-4.713* (.781)	-1.092 (1.300)	3.896 (9.294)
Emergency calls per 1,000 capita (log)	-.003 (.022)	-.026 (.022)	.079+ (.042)	.078* (.039)	.007 (.039)	.012 (.036)	.053 (.052)	.103 (.108)
Population density (log)	.001 (.005)	.014* (.006)	.005 (.005)	.007 (.005)	-.219 (.325)	.594 (.387)	.828+ (.430)	.484 (.775)
Indices of Multiple Deprivation (log)	.017 (.017)	.032+ (.016)	.015 (.018)	.018 (.017)	.105 (.147)	.184 (.134)	.087 (.170)	-.010 (.221)
Principal roads requiring repair (%) (log)	.004 (.008)	.005 (.007)	.017* (.007)	.017* (.007)	.005 (.823)	.001 (.005)	.007 (.005)	.014 (.016)
2008			.001 (.005)	.001 (.005)			.001 (.005)	.004 (.007)
2007			.021** (.005)	.021** (.005)			.019* (.008)	.029+ (.017)
2006			.008 (.005)	.009+ (.005)			.011 (.009)	.019 (.018)
2005			.018** (.005)	.019** (.006)			.019 (.011)	.031 (.025)
2004			.027** (.009)	.029** (.008)			.025+ (.014)	.046 (.041)
Constant	1.848** (.043)	-1.105 (.827)	-2.050** (.744)	-2.813** (.751)	2.313* (.823)	9.517** (1.392)	1.810 (2.682)	-7.109 (16.653)
Unit fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
F/Wald Chi <sup>2</sup> statistic	.37	2.79*	4.19**	55.01**	.52	11.30**	49.32**	3.05E+06**
R <sup>2</sup>	.02	.14	.43	.42	.02	.20	.45	.36

Notes: number of observations = 72. +  $p \leq 0.10$ ; \*  $p \leq 0.05$ ; \*\*  $p \leq 0.01$  (two-tailed tests). Standard errors in parentheses.

**TABLE 6** *Determinants of emergency response times for ambulance trusts*

Variable	Category B calls attended within 19 minutes (%) (log)							
	1	2	3	4 (IV)	5	6	7	8 (IV)
Social capital index (log)		1.290** (.204)	1.388** (.210)	1.278** (.269)		.832 (.519)	1.754** (.548)	.650 (4.088)
Emergency calls per 1,000 capita (log)	.014 (.016)	-.006 (.010)	.001 (.020)	.001 (.019)	-.024 (.018)	-.025 (.017)	-.051* (.019)	-.062 (.048)
Population density (log)	.001 (.003)	.012** (.002)	.012** (.003)	.011** (.003)	.376** (.173)	.232 (.150)	.227+ (.116)	.303 (.341)
Indices of Multiple Deprivation (log)	.034** (.009)	.047** (.008)	.047** (.009)	.046** (.008)	-.045 (.037)	-.059 (.040)	-.092* (.037)	-.070 (.097)
Principal roads requiring repair (%) (log)	.003 (.006)	.003 (.004)	.004 (.004)	.004 (.005)	-.001 (.005)	.001 (.004)	.002 (.006)	.001 (.007)
2008			.001 (.002)	.001 (.002)			.001 (.001)	.001 (.003)
2007			.004+ (.002)	.004* (.002)			.004* (.002)	.002 (.007)
2006			.002 (.003)	.002 (.003)			-.001 (.002)	-.002 (.008)
2005			.001 (.003)	.001 (.004)			-.003 (.003)	-.005 (.011)
2004			.004 (.004)	.004 (.004)			.001 (.004)	-.003 (.018)
Constant	1.950** (.024)	-.698+ (.415)	-.889* (.422)	-.666* (.542)	1.040* (.469)	-.232 (1.022)	-2.044+ (1.031)	-.072 (7.326)
Unit fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
F statistic	6.24**	14.23**	8.77**	67.65**	1.91	1.74	22.99**	1.76+E07**
R <sup>2</sup>	.28	.53	.57	.56	.11	.14	.33	.30

Notes: number of observations = 72. +  $p \leq 0.10$ ; \*  $p \leq 0.05$ ; \*\*  $p \leq 0.01$  (two-tailed tests). Standard errors in parentheses.

**TABLE 7** *Elements of social capital and emergency response times*

Variable	Category A calls attended within 8 minutes (%)		Category B calls attended within 19 minutes (%)	
Community organizational life (log)	.168 (.117)	.344 (.567)	-.113 (.075)	.606* (.246)
Local election turnout (log)	.106** (.032)	-.039 (.057)	.057* (.024)	.057+ (.033)
Crime rate (log)	-.017 (.036)	.003 (.064)	-.030 (.020)	-.059 (.050)
Emergency calls per 1,000 capita (log)	.083* (.039)	.064 (.051)	.004 (.022)	-.055** (.015)
Population density (log)	-.013 (.011)	.863+ (.480)	.017** (.006)	.410** (.114)
Indices of Multiple Deprivation (log)	.058+ (.031)	.136 (.206)	.031 (.019)	-.065 (.057)
Principal roads requiring repair (%) (log)	.012 (.008)	.009+ (.005)	.004 (.004)	.003 (.007)
2008	-.001 (.005)	.002 (.005)	.001 (.002)	.002 (.003)
2007	.017** (.005)	.022* (.007)	.004+ (.002)	.005 (.005)
2006	.005 (.005)	.015 (.009)	.001 (.003)	.002 (.005)
2005	.014* (.007)	.023+ (.012)	-.001 (.004)	-.001 (.006)
2004	.022* (.009)	.030* (.014)	.003 (.004)	.003 (.007)
Unit fixed effects	No	Yes	No	Yes
Constant	1.564** (.201)	-.843 (1.681)	1.986** (.133)	.306 (.507)
F statistic	3.83**	3.29**	8.79**	2.76**
R <sup>2</sup>	.47	.45	.57	.41

Notes: number of observations = 72. +  $p \leq 0.10$ ; \*  $p \leq 0.05$ ; \*\*  $p \leq 0.01$  (two-tailed tests). Standard errors in parentheses.