Applying Qualitative Comparative Analysis (QCA) to evaluate a public health policy initiative in the North East of England.

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Abstract

This paper presents a Qualitative Comparative Analysis (QCA) analysis of data produced as part of the evaluation an NHS commissioned intervention in the North East of England. QCA is a case-oriented method that allows systematic comparison of cases as configurations of set memberships based on their attributes and the relationship of these to particular outcomes. QCA provides an alternative to conventional quantitative approaches which are generally concerned with isolating the independent effect of one variable whilst controlling the influence of others. Instead, QCA allows for interactions between multiple attributes and recognises that the same outcomes may be generated by different configurations of attributes.

The intervention evaluated provided case management for individuals who were out of work due to ill health, and had been for three years or more. It aimed to improve the health of individuals and move them closer to the labour market. The intervention and a comparison group were assessed at base line (T1), after 3 months – (T2) after 6 months (end of the intervention - T3) and after 9 months (three months post intervention - T4). The size of the respective populations at each time point were, Intervention group at T1, N=131, T2, N=44, T3, N=79, T4, N=95. Comparison group at T1, N=229, T2, N=188, T3, N=166, T4, N=154.

General health was measured using EQ5-D (a standardized instrument for use as a measure of general health outcome) and SF-8. Two condition specific measures were included: the Hospital Anxiety and Depression Scale (HADS) and the Nordic Musculoskeletal questionnaire.

Data was also collected on socio demographics (gender, age, housing tenure), social capital (contact with family and friends and participation with the wider community), and work history (previous jobs, time spent in the job, time spent on sickness absence).

The aim of the QCA analysis was to identify whether individuals with certain characteristics or combinations of characteristics benefited from the intervention. In order to do this the cases were sorted according to whether their EQ-5D VAS (Visual Analogue Scale) scores (a self rated measure of general health) narrowed or did not narrow towards the population norm for the measure between baseline (T1) and (T4) 9 months (three months post intervention - T4). Cases which narrowed toward the UK population norm of 82.48 were judged to be experiencing a

health improvement whilst those whose scores did not narrow toward the norm were judged to not have experienced a health improvement. A crisp set (cs) QCA analysis was then performed.

The paper assesses the benefits of using QCA, and asks whether it can provide a viable and practical tool for social policy evaluations.

Background

Work, or its absence, is the most important single social determinant of population health and health inequalities. Work both directly, via the distribution of industrial diseases, and indirectly, as in the increased risk of coronary heart disease as a result of workplace stress, affects the prevalence and distribution of mortality and morbidity. The absence of paid work - worklessness - is also negatively associated with health). For example, a study using European Community Household Panel Data from the 1990s found that people who developed chronic health problems whilst in employment were twice as likely to become workless within a four year period as those who remained healthy (Schuring et al, 2007). Over the same period, women in poor health and men in poor health were 60% and 40% less likely to enter paid employment than men in good health (Schuring et al, 2007). The importance of work to population health, and of worklessness as a cause of social exclusion and health inequalities, is increasingly being recognized by policymakers with, for example, the government commissioning of the Black review of working age health (Black, 2008) and getting the National Institute for Clinical Excellence (NICE) to produce guidelines on incapacity and sickness absence (NICE, 2009).

The NICE guidelines recommended that case management approaches were the most effective in helping people with ill health return to work. This paper presents the results of an evaluation of a pilot case management intervention that was commissioned as a result of the NICE guidance by a Primary Care Trust (PCT) in 2009 in the North East of England, UK.

This 'health first' approach was piloted by County Durham and Darlington PCT who commissioned another NHS based enterprise to provide a 'health first' case management approach for long-term IB recipients (3 years or more). This pilot programme used telephone and face to face case management programmes to identify individual health needs and any other related barriers to employment (such as debt or housing). The scheme complemented mainstream services with case-managers signposting the patients to NHS, DWP and other health and welfare services. Additionally, patients were referred to physiotherapy and counselling services which were provided as part of the scheme. Patients were referred onto the programme by other NHS services (such as the Alcohol Service), their GPs, or could self-refer. The length of engagement with the service varied according to the needs of individuals

The need for new approaches and initiatives was and remains particularly important in the North East of England where levels of deprivation, ill health and health inequalities exceed those of any other English region. For example, across County Durham, in May 2011 there were over 31,140 people receiving Incapacity Benefit (IB), or Employment Support Allowance (ESA)

amounting to 9.4% of the working age population. The equivalent figure for the North East region as a whole was 8.4 % and the National figure of 6.5% (NOMIS 2011). In keeping with the national IB population, the majority (58.9%) were in receipt of incapacity-related benefits due to mental ill health (38.2%) or musculoskeletal problems (20.7%) (NOMIS 2011).

Method

In order to evaluate the intervention, the health of the intervention group (N=131) was assessed via a questionnaire at base line (T1), after 3 months (the intervention's midpoint, (T2)) after 6 months (the intervention's endpoint (T3)) and after 9 months (three months post intervention (T4)). Data were collected from individuals whose baseline interviews took place between September 2009 and June 2010. Over the time period the service provider recruited 131 individuals to the intervention.

Data were collected from both groups on socio demographics, (gender, age, housing tenure) social capital, (contact with family and friends and participation with the wider community) and work history (previous jobs, time spent in the job, time spent on IB). The questions were drawn from large scale continuous social surveys such as the GHS (General Household Survey) and the BHPS (British Household Panel Survey). Health was measured via four short self reported health questionnaires, including EQ5-D, a general measure of health, and SF-8 a general measure of health which is a shorter version of SF36. Also, two condition specific measures were included on the basis that the two largest clinical categories of IB recipients in the UK are those with mental health or musculoskeletal issues. They are the Hospital Anxiety and Depression Scale (HADS) and the Nordic Musculoskeletal questionnaire (see Box 1 for further details).

The analysis for this study is based on a method that is somewhat new in the field of public health research - QCA. QCA has been developed by Ragin (1987, 2000, 2006a, 2006b, and 2008) and applied by growing groups of methodologists and/or researchers (see for example, Rihoux and Ragin, 2009, Cooper, 2005; Fiss, 2009; Glaesser et al., 2009a, 2009b; Grofman and Schneider, 2009; Longest and Vaisey, 2008; Olsen and Nomura, 2009). The method enables researchers to compare cases systematically and identify cross-case patterns and set-theoretic membership with outcomes, such as the effectiveness of public health interventions.

Conventionally, quantitative approaches to causality in social science have in common a focus on the relation between supposedly independent (predictive and/or causal) variables and a dependent outcome variable (Blackman *et al,* 2011a). Attempts are made to locate the independent average net effect of one variable on another, while controlling for the effects of other independent variables. In contrast, Byrne (2012: 18) argues that QCA:

> 'is wholly compatible with a generative and contingent understanding of causation in the realist tradition in that it allows for causes to be both multiple and complex. Conventional regression-based methods can only deal with complex causation very

> clumsily through the insertion of interaction terms and even this is seldom done in published work. They cannot deal with multiple causation at all.'

QCA can deal with multiple causation. In this respect, Berg-Schlosser et al (2009:17) argue that:

> 'QCA conveys a particular conception of causality: 'multiple conjunctural causation'. It is a nonlinear, non additive, non-probabilistic conception that rejects any form of permanent causality and that stresses equifinality (different paths can lead to the same outcome), complex combinations of conditions and diversity.'

Consequently, QCA can be regarded as a methodological response to how the societies in which we live are increasingly complex. Social science theory has sought to take account of increased complexity, with policy-oriented work particularly concerned with how interventions work across heterogeneous contexts (Byrne, 1998; Pawson and Tilley, 1997; Cilliers, 1998; Wright, 2001). We use QCA to capture this complexity and build on an application of the methodology developed by Blackman *et al* (2011a and 2011b) to do so. Adopting a holistic perspective, each individual case is considered as a complex combination of properties, a specific 'whole' that should not be lost or obscured in the analysis (Berg-Schlosser et al 2009:6). Consequently, complex cases can be compared systematically by transforming cases into *configurations* of combinations of factors (or stimuli, causal variables, determinants etc.) that are referred to as *conditions* that produce a given *outcome* of interest (Rihoux and Ragin, 2009). QCA does not attempt to compare single variables but configurations of case attributes. To quote Bujis et al. (2009, p. 45):

> '... this allows for the specification of complex and contingent causes (because it does not centre on isolating variables), which are however not unique, but may in fact be shared across a number of cases. This allows the researcher to develop knowledge beyond the detailed ideographic description of unique instances.'

A key question QCA seeks to address is which conditions (or combinations of) are 'necessary' or 'sufficient':

- A condition is *necessary* for an outcome if it is always present when the outcome occurs. In other words, the outcome cannot occur in the absence of the condition.

- A condition is *sufficient* for an outcome to if the outcome always occurs when the condition is present. However, the outcome could also result from other conditions (Rihoux and Ragin, 2009: xix).

The specific QCA technique employed is known as 'crisp set' QCA. This is based on Boolean algebra, which uses binary data based on a condition being either present or absent (variables with values of 1 or 0, such as 'yes' or 'no'). It therefore relies on the dichotomization of variables. Dichotomization forces choices that are often difficult but this is as much an

advantage as a limitation. Blackman et al (2011a) argue that it allows the researcher to move beyond a gradualist perspective, so that the importance of differences in kind are not masked by viewing them as differences in degree, and in doing so creates models that are easier for practitioners to engage with.

We applied QCA to the dataset described at the start of this section. The dataset included 120 conditions. The number of conditions needed to be reduced because conducting a QCA with six conditions has 64 (i.e. 2^6) possible combinations, whereas one with nine conditions has 512 (i.e. 2^9) possible combinations. Berg-Schlosser and De Meur (2009: 27) identify this as the *limited diversity* problem: 'the observed data are far less rich than the potential property space delineated by the conditions.' Therefore, it is better to select a limited number of conditions because the danger is that otherwise only a *description* will be obtained rather than establishing core elements of possible mechanisms leading to the outcome of interest. Amongst others King *et al.* (1994) and De Meur *et al.* (2009) have argued that simplification in the social sciences is necessary to allow us to understand complexity.

Table 2 outlines the different stages of analysis undertaken for the results of this study. The first stage was to determine the outcome measure for the study. Given that the remit of the intervention was to improve health we focused on the general measure of self-reported health, EQ5-S score for the outcome measure. In doing so we defined two states for the conditions: improving or not improving health compared with the UK population norm score of 82.48 (Kind, Hardman and Macran, 1999). We did so by producing relative differences with the UK population norm for each of the cases between T1 and T4. Following an approach adopted by Blackman et al (2011b) all of the conditions were explored using cross-tabulations to establish the strength of relationship with the outcome measure to set thresholds for binarisation. In doing so, a relatively small number of conditions (12) had any patterned relationship, or 'skews' with the outcome. Consequently, the dichotomization used to generate binary conditions for csQCA also provides an approach to reducing the number of conditions to conduct a QCA[1]. The cases and dichotomised conditions were imported into fsQCA software to explore their effects in combination. Approximately 40 combinations (effectively 40 different QCA outputs) of the twelve conditions with patterned relationships with the outcome were explored, through adding and removing conditions, before the most plausiblesolution in Table 3 was reached. In doing so we have followed Rihoux and Lobe's (2009) 'funnel of complexity' in our applied approach to QCA by moving from 'maximal complexity' (exploring the whole dataset) to 'maximal parsimony' (reduced dataset resulting in 'truth table) and 'back to more complexity' (returning to the wider dataset to explore unexplained similarities and differences in the QCA output) through the different stages of our analysis. The configurations in Table 3 represent 30 of the possible 32 logical possible combinations in the property space (i.e. 2^5).

[1] This approach relied on pre-selecting conditions through essentially symmetric associations that were then incorporated into QCA which rests on the idea of asymmetric causation.

A Boolean minimization was conducted, using fsQCA software, which produced 15 different groupings for the improving and not improving configurations. Consequently, the minimization did not produce a substantially reduced output. Furthermore only two logical remainders exist and including these for further minimization would not produce a significantly more plausible solution.

Given the limited utility of the Boolean minimization and logical remainders for this analysis we have chosen to focus on the configurations as they appear in Table 3. However, due to limitations in space it is not possible to describe here each of the configurations produced in our analysis. Consequently, we have chosen to group and order our discussion of the configurations by age and gender. This is a pragmatic approach but, we feel, the correct one. As these conditions are intractable in terms of policy interventions (i.e. it is not possible to devise policy to change someone's age or gender), combinations of conditions nested around age and gender can be identified, explored and policy can be directed towards these groups. The results of this analysis are shown in Tables 4, 5, 6 and 7.

Results QCA Analysis 1: A description of four groups

This section outlines the key characteristics of four groupings which were based on a combination of age and gender.

Within these results we have excluded discussion of configurations of conditions which we considered to be contradictory. Following Ragin (2008) we have defined a contradictory configuration as having an observed consistency score of less than 0.75 or more than 0.25. Ragin argues that this is the minimum basis for maintaining on substantive grounds that a set-theoretic relation exists. Following this principle, some of the configurations presented here contain 'contradictory cases', i.e. cases that have a different outcome to those cases in the configuration that form the basis of the set-theoretic relation. We focus on an example of a contradictory case later in the paper.

The conditions which combined in each age and gender group to produce either positive or negative configurations were primary health problem, The skill level of their last paid job, and the frequency which they spoke to their neighbours. There are no freestanding necessary or sufficient conditions. However, each of the configurations that is 100% consistent (e.g. configuration 9) is sufficient because only one outcome occurs with this configuration. None of the full configurations produced here are necessary because the outcome does not only occur in relation to this configuration.

Group 1 Younger Men (Table 4)

Configurations 2, 3, 13, 20 and 21

These configurations all share a common age and gender profile. All are men who are age 49 and under.

Health improving

Those in configurations 2, 3, and 13 (15 cases) showed health improvement. Further common features of these cases were that they did not suffer from a musculo skeletal problem as their primary health problem and that they **did not** speak to their neighbours on a weekly basis (configurations 2 and 3). Two further cases (configuration 13) saw a health improvement but suffered from a primarily musculo skeletal problem and spoke to their neighbours on a weekly basis. Interestingly, this configuration had an occupational background of skilled manual or higher work in their previous employment.

Health not improving

Those in configurations 20 and 21 (4 cases) did not show health improvement. These cases appear to have a necessary combination of conditions for younger men because all had a musculo skeletal primary health problem and an occupational background of semi-skilled or unskilled manual work in their previous employment. Talking to neighbours appears to have limited impact here as the not improving outcome occurs regardless of the presence or absence of this condition. An instance such as this demonstrates the and/or logic of the QCA approach.

Group 2 Younger Women (Table 5)

Configurations 1, 6, 9, 12 and 16

These configurations all share a common age and gender profile. All are women who are age 49 and under.

Health Improving

Those in configurations 1, 6, 9 and 12 (17 cases) showed health improvement. The common feature that these configurations shared was that they did not speak to their neighbours on a weekly basis. This appears to be a necessary and sufficient condition for health improvement within this age and gender group. The apparent significance of speaking to neighbours on a weekly basis for younger women is further emphasised by configuration 9, which only has this condition 'present' (i.e. coded as '1' see Table 3) and could, therefore, be considered to be missing other receptive conditions for health improvement.

Health not improving

Those in configuration 16 (4 cases) did not have a health improvement. They did not have a musculo skeletal primary health problem, they had semi-skilled or unskilled backgrounds and they spoke to their neighbours on a weekly basis. This final feature contrasts with those from

this age /gender group whose health did improve and confirms both the necessary and sufficient nature of this condition for health improvement.

Group 3 Older Men (Table 6)

Configurations 4, 5,8,10, 11, 15 and 18

These configurations all share a common age and gender profile. All are men over the age of 49.

Health improving

Those in configurations 4,5,8,10,11 and 15 (16 cases) displayed improved health. Amongst this age/gender group there are a variety of configurations leading to the same outcome i.e. health improved. Consequently, there was no clear pathway for success. Configurations 5, 8, and 10 shared the common feature that they did not speak to neighbours on a weekly basis. This was similar to what was found in group 2. Configuration 4, 11 and 15 (7 cases) experienced a health improvement but spoke to their neighbours on a weekly basis. Configurations 4, 5 and 15 (9 cases) had skilled manual or higher occupational backgrounds as opposed to configurations 8, 9 and 11 (7 cases) who had semi-skilled or unskilled backgrounds. There was an even split regarding primary health problems and health improvements for this group in configurations 4, 10 and 11 (8 cases) having non musculo skeletal primary health problems and configurations 5, 8 and 15 (8 case) who had musculo skeletal primary health problems. Thus, for this age and gender grouping the pattern for health improvement was less clear than is some of the other groups.

Configuration 4 consists of four cases; three improving and one not improving. This is an example of a configuration that meets Ragin's minimum basis for establishing a set-theoretic relation and also contains a contradictory case. We consider the contradictory case here as an exemplar of the potential for further exploration of cases using QCA and large datasets (in terms of both numbers of cases and causal conditions). In the wider dataset (i.e. those conditions not included in the final QCA analysis) the not improving case in this configuration had a number of characteristics that distinguished it from the remaining (improving) cases in this configuration. These included: not having a car; not speaking to friends; not talking to neighbours; being extremely (as opposed to moderately) depressed; and leaving work much more recently than the individuals improving their health. Consequently, we can speculate that despite sharing a generally 'improving configuration' of conditions that this individual was very isolated and depressed and struggling to come to terms with recently leaving employment. In addition, QCA provides a very useful technique for identifying cases for further qualitative investigation. Consequently, researchers could pursue the issues raised above in an interview with this individual and other members of this configuration in order to provide a more detailed level of explanation and further useful information to guide future practice.

Health not improving

For this age gender group the factors which appeared to indicate a lack of improvement were less ambiguous than for those in the 'health improving' group. Those in configuration 18 (3 cases) did not see their health improve. They spoke to their neighbours on a weekly basis, their occupational backgrounds were semi-skilled or unskilled, and all had primary health problems that were musculo skeletal in nature. Consequently, this configuration of cases of older men had all of the apparently receptive conditions 'absent'. This was a necessary and sufficient combination for this age/gender group. This is significant given the general association older men had with improvements in health. Accordingly, we can speculate that the intervention was, in general, effective for older men and particular attention should be placed on those without any of the receptive conditions.

Group 4 Older Women (Table 7)

Configurations 7, 14,17,19,22 and 23

These configurations all share a common age and gender profile. All are women over the age of 49.

Health improving

These configurations all share a common age and gender profile. All are women over the age of 49. Those in configurations 7 and 14 (2 cases) saw their health improve. These older women shared the necessary combination of having a primary health problem that was non musculo skeletal in its nature and an occupational background of skilled manual work or higher.

Health not improving

Those in configurations 17, 19, 22, and 23, (7 cases) did not have a health improvement. None of these configurations shared the combination of non-musculo skeletal primary health problem and a higher skilled occupational background. This illustrates the significance of the necessary combination of conditions in the health improving group. Furthermore, this suggests that older women were less likely to have benefitted from the intervention.

Discussion

The main findings of this study

The key factors in predicting a health improvement from the intervention, in the form of an improved EQ5-D VAS score were age, gender, primary health problem, skill level in their last paid job and whether people spoke to their neighbours on a weekly basis. As the above analysis shows, combinations of these conditions produced noticeable skews in the data. The key factors are discussed below.

Age and gender

Within the younger age groups (49 and under) more individuals experienced a health improvement than did not (7 Configurations experienced an improvement as compared to 3 configurations that did not experience a health improvement). Amongst the older (49 plus) groups the same trend was found amongst older men in 6 configurations improving their health. But amongst older women the trend was reversed with women in this group being much less likely to experience a health improvement, (4 configurations) in comparison to those who did experience a health improvement (2 configurations). Men were more likely to experience a health improvement than women (9 male configurations experienced a health improvement compared to 6 female configurations). However, when scrutinised more closely, it became evident that women in the younger age group (49 and under) in 4 configurations fared just as well as men.

Primary Health Problem

In general, people who reported their primary health problem as musculo-skeletal generally did not see their health improve, 6 configurations. Those reporting other primary health problems, in particular, mental health problems were more likely to see their health improve, 9 configurations.

Skill level of last paid job

The skill level of individuals last paid job was derived from the information they gave about their job i.e. the job title and further information about the duties of the job. Those whose last paid job had been at the level of skilled manual work or above were more likely to have experienced a health improvement. Those whose previous paid job had been semi-skilled or unskilled were less likely to have experienced a health improvement after undergoing the intervention.

Contact with Neighbours

Individuals were asked how frequently they spoke to their neighbours. Those who reported that they had contact their neighbours on a weekly basis were not associated with improving health. Whereas those who had more frequent or less frequent contact with their neighbours were more likely to have a health improvement.

It is, however, important to stress that these conditions and the positive and negative associations attached to them were only evident when in configurations with the other conditions.

What is already known on this topic

It can be argued that the key factors should not be surprising to anyone concerned with health and long-term worklessness. As the guidance published NICE 2009 recognised; case management in order to be successful requires:

> The person's age and gender, the condition that led to the sickness absence, their prognosis for returning to work and the type of work they are involved in all needs to be taken into account. (NICE 2009)

As pointed out above, age, gender and health condition all proved to be key factors in explaining whether those who used the service experienced a health improvement or not after taking up the service.

Socio economic stratification with those who had been employed in skilled manual work or better more likely to report an improvement in their EQ5D VAS score also reflects the wider literature. For example it is known that Ill health related job loss has a social gradient, with adverse employment consequences more likely for those in lower socio-economic groups (Beatty and Fothergill, 2002). This gradient appears to be reflected in whether health improvements as a consequence of initiatives such as this service occur. Furthermore, it is known that lower socio-economic groups are disproportionately at risk of unemployment and that it is a key determinant of the social gradient in health (Popham and Bambra, 2010). In other words, those from semi-skilled or unskilled working backgrounds are more likely to start from a lower health state than those with occupational background of skilled manual or better.

The wider context of the general health inequalities is also a major factor both between and within regions and localities (Bambra 2011). Indeed, the reason for the service being set up was to target those areas of County Durham with the highest levels of ill health related worklessness. Beatty *et al.* (2000) have argued that regional differences in employment rates conceal forms of 'hidden unemployment'. This concentration of 'hidden unemployment' in former industrial areas suggests that some regional economies have not fully recovered from the fallout of deindustrialisation, a conclusion also reached by a number of other researchers (see Turok and Edge, 1999; Webster, 2006; Theodore, 2007). However, individual-level evidence from recent cohort studies suggests that medically certified sickness absence does reflect actual morbidity and mortality (Marmot *et al.* 1995, Kivimaki *et al.* 2003, Vahtera *et al.* 2004), and recent population-level studies found a strong relationship between Incapacity Benefit claims and mortality (Bambra and Norman 2006, Norman and Bambra 2007). The reality is that in an area such as County Durham, a region replete with a coal mining legacy that relates to wider, long term processes in the economy and regional labour market, such an imbalance in the local labour market leads to this group of older workers simply being replaced by a younger generation of disadvantaged and marginalised workers with health problems (Fothergill, 2010:5). It is also important to note that worklessness and its health consequences do not affect individuals in an isolated manner. The negative health experiences of unemployment are not limited to the unemployed only but also extend to families and the wider community (Novo *et al.,* 2001). Therefore, the local communities and neighbourhoods which individuals inhabit are likely to be highly significant factors in whether the service user experiences a health improvement. These issues are reflected by the interactions they have with neighbours and the frequency of those interactions.

What this study adds

This study shows that if interventions of this kind are to make a significant impact upon inequalities in health and employment policymakers need to carefully consider the context within which these issues are rooted and that causes interact in complex ways. Indeed, the Marmot Review (2010: 84) concluded that inequalities in health are:

> 'persistent and complex causes and relationships are multi-faceted, between, for instance, early years, education, employment, living environment, income and health. A person's physical and mental health is profoundly shaped by their experiences in all these areas and multiple disadvantages compound to produce significantly worse physical and mental health and well-being.'

Consequently, the use of a QCA approach to analyse data of this sort compared to a more traditional approach has the clear benefit of being able to provide a much more contingent analysis of what is going on and how different factors interact to produce outcomes. This allows us to have a greater insight into the types of contexts in which individuals are likely to progress in a positive manner and experience a health improvement. Judgements can then be made about how the service might be improved or future services targeted.

Older women were the group least likely to benefit from the intervention. However, those who did improve their health had a combination of a non-musculo-skeletal primary health problem and an occupational background of skilled manual work or better. QCA highlights how those older women lacking this combination did not benefit from the intervention. This combination of apparently receptive contextual conditions would not have been apparent without conducting a configurational analysis of this type. This also suggests that policy makers need to consider how people's contextual characteristics interact when targeting, or planning, interventions for health improvement. In contrast older men appeared to be a particularly receptive group for the intervention, with only one configuration not showing a health improvement. The configuration that was not improving reinforces our finding that the intervention was less effective for those who have musculo-skeletal problems and previously worked in lower skilled occupations.

For younger men a combination of musculo-skeletal health problems and lower skilled occupational backgrounds were less likely to benefit from the intervention. This suggests that further or different types, of interventions need to be targeted towards younger men with these characteristics. Given the importance of the frequency of talking to neighbours for younger women (highlighted in the results above) this suggests that social relationships are particularly important for health improvement for this group. However, the way in which the frequency of talking to neighbours interacted with the other factors produced some seemingly counter intuitive results as it suggested the contact with neighbours on a weekly basis was something that some of the groups who did not benefit from intervention shared. Why this should be the

case is unclear but suggests that some communities have *bad/negative* social capital. Blackman cites Stafford *et al.* (2003) who found that high levels of family ties were associated with greater odds of worse health among women, but not men. Parkes and Kearns (2006) found that respondents to the Scottish Household Survey who reported friendly people or good neighbours were more likely to report their health was 'not good'. However, one could also speculate that the most deprived communities may well be mutually supportive but this may only have a negligible effect on their chances of improving their health via participation in schemes of this sort. What it does clearly highlight is the importance of understanding the nature, problems and cultures of communities prior to the commissioning of services such as this, and ensuring that those providing the service consider such issues within their practice.

Conclusion

The application of QCA to this dataset has provided an alternative approach to more conventional statistical methods to assess the success or failure of a health intervention. Rather than assessing progress in terms of the means of aggregate scores of validated health measures; by comparing cases systemically QCA allows interactions between multiple case attributes to be revealed and explored. In other words factors such as socio-demographic, geographic, economic, and health issues can be traced as interrelated parts of the complex whole that comprises each individual's unique situation. This allows for 'multiple conjunctural causation', i.e. certain will be more likely to benefit from the intervention and can be identified. Consequently, policy-makers can reflect on the efficacy of an intervention with certain groups. This study has identified a number of causal pathways for improvement or non-improvement from the case management intervention outlined here. We have reflected these causal pathways above. Here we would note that these configurations provide the basis for further qualitative investigation to explore causation at a more detailed (ideographic) level.

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Table 1: Baseline Characteristics of Survey Participants

	Intervention N=131	Intervention Frequency
Gender		
Male	49.6%	65
Female	50.4%	66
Age		
Mean (Years)	44.9	
Median (Years)	47	
Mode (Years)	51	
Range (Years)	21-64	
45 years and under	43.5%	57
Over 45	56.5%	74
Marital Status		
Married	31.3%	41
Divorced	24.4%	32
Single	34.4%	45
Tenure		
Renting	58%	76
Renting (Social Housing)	59.8%	49
Transport		
No access to a motor vehicle	47.3%	62
Occupational Class (based on last job)		
Professional	5.6%	7
Intermediate	6.3%	8
Skilled Non Manual	6.3%	8
Skilled Manual	21.4%	27
Semi-Skilled	21.4%	27
Unskilled	38.9%	49
Workless Households	74%	97
Time spent on IB/ESA		
Mean (months)	98	
Mode (months)	36	
Primary Health Problem		
Musculo-Skeletal	38%	49
Mental Health	48.1%	62
Digestive/Gastric	3.1%	4
Cardiovascular	5.4%	7
Respiratory	3.1%	4
Other	2.3%	3
Multiple (3 or more) Health problems	43.4%	56
Seen health practitioner in past 30 days	81.7%	107

	Intervention N=131	Intervention Frequency
Smoking and Drinking		
Regular Smokers	42.7%	56
Drink Alcohol	61.1%	80
Average Units per week consumed	24.6 units	
Health Scores **Validated Measures** **(Mean)**		
EQ5D	0.30320	
EQ5D-VAS	42.08	
SF8 PCS	34.2427	
SF8 MCS	33.7232	
HADS -A	12.68	
HADS-D	10.70	
NORDIC 2	3.40	

Box 1: **Detailed description of health measures used in the evaluation**

EuroQol (EQ-5D) and (EQ5D-VAS)

Two parts: a questionnaire and a 'health thermometer'. The EQ-5D questionnaire asks participants about their mobility, ability to self-care, their ability to carry out their usual activities, pain and discomfort and anxiety and depression on the day when they are interviewed. The responses are converted to a value between 0 and 1. The higher the value is the better the health state. The second element is the Visual Analogue Scale, often known as a 'Health Thermometer' due to the show card which is used. Participants are asked to rate their health on the day they are interviewed on a scale of 0 -100. 0 represents the worst health state the participant can imagine, 100 represents the best health state they can imagine with 50 representing the midpoint.

Hospital Anxiety and Depression Scale (HADS)

There are two parts: HADS-A (Anxiety) and HADS-D (Depression). Both ask participants to choose options that best describe how they are feeling. Both generate a score between 0-21. A higher score indicates a higher degree of Depression.

Quality Metric Short Form 8 (SF-8)

SF-8 is a measure of health that produces a physical health score (PCS) and a mental health score (MCS). Participants are asked 8 questions about their health during the past four weeks. These generate two scores, both between 0-100: the higher the score the better the health state.

Nordic Musculoskeletal Questionnaire (element 2)

There are three elements. Only the second element Nordic 2 was appropriate to this study Nordic 2 is a measure of musculoskeletal problems over the preceding 7 days. Participants are asked whether they have had problems with different areas of the body. The measures produce a scores of between 0 (no problem) areas and 9 (nine problem areas).

Table 2: Stages of analysis
1) Establish whether individuals were improving or not improving their self-reported health (EQ5-DVAS) compared to the UK population norm score of 82.48.
2) Produce cross tabulations for each 'condition' against the outcome measures to clarify which conditions were associated with improving or not improving health.
3) Categorise the conditions (through a process of dichotomisation) as 'present' or 'absent' in relation to the outcome measure.
4) Draw up a shortlist of those conditions associated with either improving or not improving outcomes. Those conditions with no strong association were not included in the shortlist.
5) Enter the shortlisted conditions associated with improving or not improving health into fsQCA software.
6) Explore different iterations and combinations by adding and removing shortlisted conditions using fsQCA software to identify the most plausible configurations associated with both improving and not improving health.
7) Conduct Boolean minimization using fsQCA software.

Table 3: Conditions associated with health improvement (1 = present; 0 = absent)

Configuration	Age	Sex	Primary Health Problem	Skill	Talk to Neighbours	Number of Cases	Consistency
1	**1**	**0**	**1**	**0**	**1**	8	0.75
2	**1**	**1**	**1**	**0**	**1**	7	0.86
3	**1**	**1**	**1**	**1**	**1**	5	0.8
4	**0**	**1**	**1**	**1**	**0**	4	0.75
5	**0**	**1**	**0**	**1**	**1**	4	0.75
6	**1**	**0**	**1**	**1**	**1**	4	0.75
7	**0**	**0**	**1**	**1**	**1**	3	1
8	**0**	**1**	**0**	**0**	**1**	3	1
9	**1**	**0**	**0**	**0**	**1**	3	1
10	**0**	**1**	**1**	**0**	**1**	2	1
11	**0**	**1**	**1**	**0**	**0**	2	1
12	**1**	**0**	**0**	**1**	**1**	2	1
13	**1**	**1**	**0**	**1**	**0**	2	1
14	**0**	**0**	**1**	**1**	**0**	1	1
15	**0**	**1**	**0**	**1**	**0**	1	1
16	**1**	**0**	**1**	**0**	**0**	4	0.25
17	**0**	**0**	**1**	**0**	**1**	3	0
18	**0**	**1**	**0**	**0**	**0**	3	0
19	**0**	**0**	**0**	**0**	**0**	2	0
20	**1**	**1**	**0**	**0**	**1**	2	0
21	**1**	**1**	**0**	**0**	**0**	2	0
22	**0**	**0**	**0**	**1**	**1**	1	0
23	**0**	**0**	**0**	**1**	**0**	1	0
24	**0**	**0**	**0**	**0**	**1**	5	0.4
25	**0**	**0**	**1**	**0**	**0**	3	0.67
26	**0**	**1**	**1**	**1**	**1**	3	0.67
27	**1**	**0**	**0**	**0**	**0**	3	0.67
28	**1**	**1**	**1**	**1**	**0**	3	0.67
29	**1**	**0**	**1**	**1**	**0**	2	0.5
30	**1**	**1**	**1**	**0**	**0**	2	0.5

Key to Table 3

Condition	Descriptor
Age	Present: less than 49 years old. Absent: more than 49 years old.
Sex	Present: male. Absent: female.
Primary Health Problem	Present: Non-musculo skeletal Absent: Musculo-skeletal
Skill	Present: skilled manual or higher Absent: semi-skilled or unskilled
Talk to neighbours	Present: 'other' Absent: talk to neighbours weekly

Table 4: Younger men

Configuration	Age	Sex	Primary Health Problem	Skill	Talk to Neighbours	Number of cases	Consistency
2	**1**	**1**	**1**	**0**	**1**	7	0.86
3	**1**	**1**	**1**	**1**	**1**	5	0.8
13	**1**	**1**	**0**	**1**	**0**	2	1
20	**1**	**1**	**0**	**0**	**1**	2	0
21	**1**	**1**	**0**	**0**	**0**	2	0
28	**1**	**1**	**1**	**1**	**0**	3	0.67
30	**1**	**1**	**1**	**0**	**0**	2	0.5

Table 5: Younger women

Configuration	Age	Sex	Primary Health Problem	Skill	Talk to Neighbours	Number of cases	Consistency
1	**1**	**0**	**1**	**0**	**1**	8	0.75
6	**1**	**0**	**1**	**1**	**1**	4	0.75
9	**1**	**0**	**0**	**0**	**1**	3	1
12	**1**	**0**	**0**	**1**	**1**	2	1
16	**1**	**0**	**1**	**0**	**0**	4	0.25
27	**1**	**0**	**0**	**0**	**0**	3	0.67
29	**1**	**0**	**1**	**1**	**0**	2	0.5

Table 6: Older Men

Configuration	Age	Sex	Primary Health Problem	Skill	Talk to Neighbours	Number of cases	Consistency
4	**0**	**1**	**1**	**1**	**0**	4	0.75
5	**0**	**1**	**0**	**1**	**1**	4	0.75
8	**0**	**1**	**0**	**0**	**1**	3	1
10	**0**	**1**	**1**	**0**	**1**	2	1
11	**0**	**1**	**1**	**0**	**0**	2	1
15	**0**	**1**	**0**	**1**	**0**	1	1
18	**0**	**1**	**0**	**0**	**0**	3	0
26	**0**	**1**	**1**	**1**	**1**	3	0.67

Table 7: Older Women

Configuration	Age	Sex	Primary Health Problem	Skill	Talk to Neighbours	Number of cases	Consistency
7	**0**	**0**	**1**	**1**	**1**	3	1
14	**0**	**0**	**1**	**1**	**0**	1	1
17	**0**	**0**	**1**	**0**	**1**	3	0
19	**0**	**0**	**0**	**0**	**0**	2	0
22	**0**	**0**	**0**	**1**	**1**	1	0
23	**0**	**0**	**0**	**1**	**0**	1	0
24	**0**	**0**	**0**	**0**	**1**	5	0.4
25	**0**	**0**	**1**	**0**	**0**	3	0.67