

Principal component analysis of social capital indicators

A proposal for a short social capital indicator set informed using principal component analysis – methodology article.

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1 . Introduction

Social capital refers to the connections between people and collective attitudes that result in a well-functioning and close-knit society. Connections have been noted between increased social capital and positive well-being, economic growth and sustainability.

For example, social capital has found to contribute to economic growth (Fukuyama, 1995; Putnam, 1993 and 2000), and is positively associated with improved personal well-being (Helliwell, 2003; Helliwell and Putnam, 2004), health (Veenstra, 2000 and 2002) and reduced crime (Sampson, 2012; Sampson and others, 1997). These benefits have been observed at the individual, community and national levels.

As a result, the concept has drawn interest both as a measure of community involvement and cohesion in the UK, and as a source of insight for those wishing to facilitate community well-being and social cohesion. Despite this, and growing policy interest in the topic, social capital has remained a difficult concept to measure. There are several methods of classifying social capital. One such method divides social capital into three forms; bonding, bridging and linking capital:

- bonding capital refers to horizontal ties within a group; this can mean the relationships between friends and family, or relationships between people of the same sex, ethnicity or religious group
- bridging capital refers to ties between individuals that exist between social groups, such as those between colleagues or neighbours
- linking capital refers to the ties between an individual and others with greater resources or power, such as a boss or a teacher

To capture these different facets, social capital is currently measured by the Office for National Statistics (ONS) through a set of 25 headline indicators. These indicators were [most recently revised in 2017](#) and follow a framework based on a [working paper](#) by the Organisation for Economic Co-operation and Development (OECD).

Indicators are aligned to one of four domains:

- personal relationships
- social network support
- civic engagement
- trust and co-operative norms

While this framework provides a robust picture of social capital, a common user request is for a recommendation of a single question, or short set of questions, which can be used to measure social capital in a survey context.

This article aims to use principal component analysis (PCA) to identify the underlying concepts measured by the ONS social capital indicator set and identify the indicators that best measure these concepts. This analysis will provide a statistical rationale in response to user demand for a reduced indicator set which captures the dimensions of the existing indicators. This will provide a starting point for harmonisation consultations and allow ONS to carry out more in-depth analysis exploring social capital. The shortened indicator set will supplement, rather than replace, the existing 25 headlines of social capital.

2 . Project methodology

Data

To conduct this analysis, it was necessary to find a single data source that includes as many of the Office for National Statistics (ONS) social capital indicators, or sensible proxies, as possible. [Understanding Society, the UK Longitudinal Household Survey](#) was selected for analysis for several reasons.

Firstly, more indicators in ONS' social capital indicator set are drawn from Understanding Society than from any other single survey.

Secondly, where the original variable was not available, an acceptable alternative could be constructed or derived for most indicators. Where alternatives were necessary, questions were compared with the published estimates of social capital, to ensure a similar replacement as far as was possible.

Thirdly, though few surveys include the full range of social capital measures, the longitudinal design of Understanding Society offered the potential to link together data from the same individuals asked in different waves of the surveys. This allowed us to capture responses to a wider range of questions than would be possible using a cross-sectional survey.

Analysis was conducted using collapsed response categories, to ensure similar response categories were used for all variables. In some cases, it was not possible to measure an indicator accurately with a single question. Where possible, a variable has been derived to measure the concept, ensuring that the indicator is represented in this analysis. Where a variable was derived, the variables used to do so are presented.

Some questions were asked multiple times through different waves of the survey. In these cases, the most recent available data have been used for analysis and the time period for each question is provided. Detailed information regarding the variables considered for inclusion in this analysis can be found in [Methodology notes](#).

Analysis

The goal of principal component analysis (PCA) is to transform a set of possibly correlated variables into a smaller set of uncorrelated variables called principal components. Indicators that measure a similar underlying concept cluster onto a component and are weighted within each component relative to the variance explained. In this way, the concepts measured by an analysed dataset, and the variables most associated with these concepts can be identified.

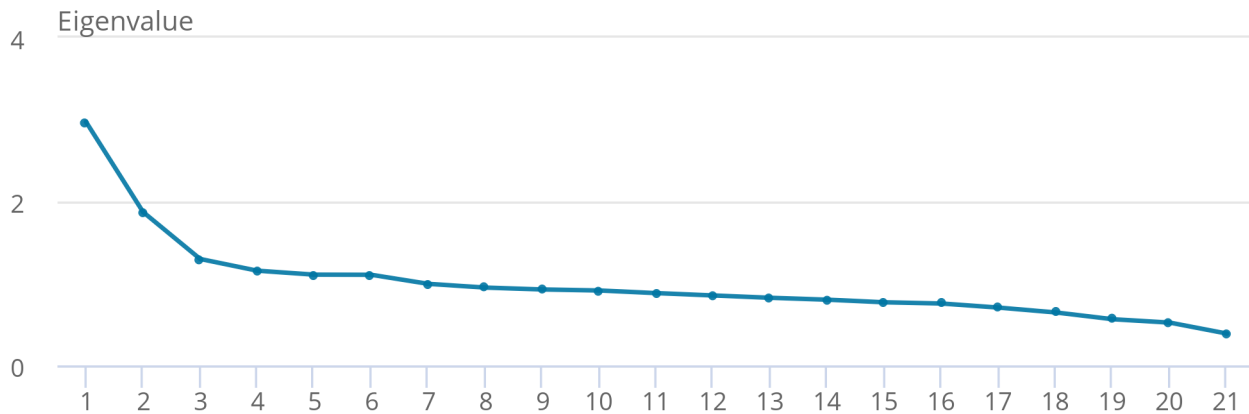
Initial testing suggested that six components should be retained for analysis, as they reported an eigenvalue greater than 1. When these values were plotted on a scree plot (Figure 1), the point of inflexion of the graph, or the point at which the eigenvalues begin to level off, occurs at four components. When considered together these tests suggest a cut-off point between four and six components. Preliminary models were conducted retaining four, five and six components to determine best fit.

Figure 1: Scree plot showing eigenvalues from principal component analysis, UK

between 2009 to 2011 and 2016 to 2018

Figure 1: Scree plot showing eigenvalues from principal component analysis, UK

between 2009 to 2011 and 2016 to 2018



Source: Understanding Society, the UK Longitudinal Household Survey

PCA was conducted using 21 variables (Tables 5 and 6 in the [methodology notes](#)), using orthogonal rotation (varimax). Where an individual did not provide an answer for a selected variable, the individual was removed from the analysis entirely, resulting in a sample size of 4,680 responses in this model. Five components were retained in the final analysis, as this model explained the greatest proportion of variance within the data without incidence of cross-loaded variables or components with high loadings for only one variable. The five-component model explained 42% of the variance in the data. Additional information regarding component retention and rotation can be found in [Methodology notes](#).

Component loadings are shown in Table 1. Items such as belonging to your neighbourhood and talking to neighbours clustered onto Component 1, suggesting that it relates to neighbourhood relationships. Component 2 appears to represent organised social and civic engagement, such as group membership and volunteering. Items clustered onto Component 3 related to political engagement, such as interest in politics and attitudes towards voting. Component 4 was associated with giving and receiving care. Component 5 related to social relationships. Items with high loadings included having a close friend, meeting with friends and having someone to rely on. For the purposes of this analysis, a variable is considered to load highly onto a component with a loading of 0.3 or greater (Hair and others, 1998).

The five component model contrasts with the Organisation for Economic Co-operation and Development (OECD) framework, which divides indicators among four domains. Components 2 and 3 largely comprise indicators drawn from the civic participation domain of the indicator framework, and Component 4 from the social network support domain. Components 1 and 5 draw on indicators from across several domains of the OECD framework, however.

Table 1: Component loadings from principal component analysis, UK, 2009 to 2011 to 2016 to 2018

| | Component 1 | Component 2 | Component 3 | Component 4 | Component 5 |
|--|--------------------------------------|--|-------------------------------|------------------------------------|-------------------------------|
| | 'Neighbourhood relationships' | 'Organised social and civic engagement' | 'Political engagement' | 'Giving and receiving care' | 'Social relationships' |
| Feel that you belong to your neighbourhood | 0.74* | 0.03 | 0.03 | 0.06 | -0.02 |
| People around where you live are willing to help their neighbours | 0.72* | 0 | 0.1 | -0.06 | 0.01 |
| Regularly stop and talk with people in your neighbourhood | 0.72* | 0.05 | -0.04 | 0.11 | 0.03 |
| Feel most people in their neighbourhood can be trusted | 0.64* | 0.01 | 0.22 | -0.04 | -0.07 |
| Borrow things and exchange favours with neighbours | 0.61* | 0.07 | -0.02 | -0.07 | 0.12 |
| Participate in the activities of an organisation or group | 0.1 | 0.84* | 0.05 | -0.02 | 0.06 |
| Member of an organisation or group | 0.08 | 0.8* | 0.14 | -0.04 | 0.06 |
| Volunteered more than once in the last 12 months | 0.03 | 0.48* | 0.16 | 0.01 | 0.05 |
| Participate in the activities of a political party or trade union | -0.02 | 0.43* | 0.02 | -0.01 | -0.02 |
| Feel that voting is a civic duty | 0.09 | 0.12 | 0.69* | 0.16 | -0.1 |
| Interested in politics | -0.04 | 0.15 | 0.68* | -0.04 | 0.02 |
| Feel they can affect decisions in the local area | 0 | 0.04 | 0.55* | -0.16 | 0.1 |
| Feel most people can be trusted | 0.2 | 0.12 | 0.44* | -0.15 | -0.01 |
| Receive help from a child over 16 not living with you | 0.04 | -0.07 | -0.1 | 0.61* | 0.05 |
| Give help to a sick, disabled or elderly person living or not living with them | 0 | 0.08 | -0.02 | 0.54* | 0.16 |
| Have at least one close friend | 0.05 | -0.02 | 0.05 | 0.13 | 0.66* |
| Go out socially or visit friends when you feel like it | 0.17 | 0.08 | 0.07 | -0.16 | 0.51* |
| Belong to any social network | -0.17 | 0.05 | -0.15 | -0.45 | 0.42* |
| Have a spouse or partner, friend or family member to rely on if you have a serious problem | 0.13 | -0.04 | 0.27 | 0.18 | 0.36* |
| Are friends with people of a different age, ethnicity, level of education or income | -0.14 | 0.06 | -0.1 | -0.01 | 0.36* |
| Feel safe walking alone after dark | 0.19 | 0.06 | 0.1 | -0.54 | 0.28 |

Source: Understanding Society, the UK Longitudinal Household Survey

Notes

1. Loadings highlighted with an asterisk (*) load strongly onto the component. [Back to table](#)
2. Detailed information related to variables used in this analysis can be found in Methodology notes. [Back to table](#)

The decision to evaluate the indicator set as a whole has an effect on the structure of the sample. PCA requires a complete set of responses for each case. In this analysis, one indicator concerns an individual's relationship with a child over the age of 16 years. As a result, the sample for this analysis is limited to responses from those who have a child of this age. It is possible that individuals of this group respond to these questions differently than the wider population. To address this, PCA was also run with this variable removed. The removal of this variable expanded the number of individuals who had responded to the selected questions, resulting in a sample of 10,450 respondents for this model.

Again, analysis was run using orthogonal (varimax) rotation. Analysis retained four components based on eigenvalues and examination of the scree plot, as this model explained the greatest amount of the variance within the dataset without incidence of components associated strongly with only a single variable. This model explained 37% of the variance in the data. Table 2 shows the component loadings after rotation for this model.

Table 2: Component loadings from principal component analysis for those with or without a child over 16 years, UK, 2009 to 2011 to 2016 to 2018

| | Component 1 | Component 2 | Component 3 | Component 4 |
|--|--------------------------------------|-------------------------------|--|--------------------------------|
| | 'Neighbourhood relationships' | 'Political engagement' | 'Organised social and civic engagement' | 'Friendship and safety' |
| Feel that you belong to your neighbourhood | 0.74* | 0.09 | 0.03 | -0.05 |
| Regularly stop and talk with people in your neighbourhood | 0.73* | -0.06 | 0.06 | -0.1 |
| People around where you live are willing to help their neighbours | 0.7* | 0.16 | -0.01 | 0.08 |
| Borrow things and exchange favours with neighbours | 0.63* | -0.03 | 0.1 | 0.11 |
| Feel most people in their neighbourhood can be trusted | 0.62* | 0.29 | -0.01 | 0.04 |
| Interested in politics | -0.05 | 0.64* | 0.15 | -0.11 |
| Feel that voting is a civic duty | 0.05 | 0.64* | 0.12 | -0.24 |
| Feel they can affect decisions in the local area | -0.01 | 0.55* | 0.04 | 0.15 |
| Feel most people can be trusted | 0.15 | 0.49* | 0.12 | 0.05 |
| Participate in the activities of an organisation or group | 0.09 | 0.09 | 0.8* | 0.09 |
| Member of an organisation or group | 0.06 | 0.19 | 0.76* | 0.09 |
| Volunteered more than once in the last 12 months | 0.04 | 0.15 | 0.51* | 0.02 |
| Participate in the activities of a political party or trade union | -0.02 | -0.02 | 0.42* | -0.03 |
| Belong to any social network | -0.14 | -0.13 | 0.03 | 0.63* |
| Have at least one close friend | 0.11 | -0.04 | 0.07 | 0.44* |
| Feel safe walking alone after dark | 0.16 | 0.29 | 0.03 | 0.38* |
| Go out socially or visit friends when you feel like it | 0.17 | 0.18 | 0.04 | 0.28 |
| Have a spouse or partner, friend or family member to rely on if you have a serious problem | 0.14 | 0.27 | -0.01 | 0.1 |
| Give help to a sick, disabled or elderly person living or not living with them | 0.03 | -0.19 | 0.21 | -0.43 |
| Are friends with people of a different age, ethnicity, level of education or income | -0.14 | -0.14 | 0.09 | 0.24 |

Notes

1. Loadings highlighted with an asterisk (*) load strongly onto the component. [Back to table](#)
2. Detailed information related to variables used in this analysis can be found in Methodology notes. [Back to table](#)

Component 1 again relates to neighbourhood relationships, with the same variables clustering onto the component in both models. Component 2 relates to political engagement and is associated with the same variables as the third component in the previous model. Component 3 seems to be associated with organised social and civic engagement, similarly to Component 2 of the previous model. Component 4 is somewhat less defined, associated with social media use, having a close friend and feeling safe walking alone after dark. There were also a greater number of indicators that did not relate strongly to any component in this model.

After examining both models, the variables suggested for the reduced question set are detailed in Table 3, alongside their corresponding indicator and OECD domain. The questions selected represent the variables with the strongest loading for each component in both models presented in this analysis.

Table 3: Questions suggested for inclusion in a reduced social capital indicator set

| ONS social capital indicator | Associated question | Understanding Society question | OECD domain |
|---|--|--|------------------------------|
| Percentage who agree or agreed strongly that they felt they belonged to their neighbourhood | I feel like I belong to this neighbourhood | I feel like I belong to this neighbourhood | Trust and Co-operative Norms |
| Proportion of people who have been involved in at least one social action project in their local area in the previous 12 months | <p>Looking at this card, have you personally been involved in helping out with any of these types of activity in your area in the last 12 months? Please only include unpaid involvement. Do not select any activities where you only signed a petition but took no further action.</p> <p>(Trying to set up a new service or amenity to help local residents; Trying to stop the closure of a local service or amenity; Trying to stop something happening in my local area; Running local services on a voluntary basis (eg. Childcare, youth services, parks and community centres); Organising a community event such as a street party; Another issue affecting my local area; None of these)</p> | <p>Whether you are a member or not, do you join in the activities of any of these organisations on a regular basis?</p> <p>(Political party; Trade unions; Environmental group; Parents' groups or school association; Tenants' or residents' group; Religious or church organisation; Voluntary services group; Pensioners' group or organisation; Scouts or Guides; Professional organisation; Other community group; Social/working men club; Sports club; WI/townswomen's guild; Women's group/feminist organisation; Other)</p> | Civic Engagement |
| Voter turnout in UK General Elections | Voter turnout data, Electoral Commission | I would be seriously neglecting my duty as a citizen if I didn't vote | Civic Engagement |
| Proportion of parents who regularly receive practical or financial help from a child aged 16 or over not living with them | <p>And do you regularly or frequently receive any of these things from your children aged 16 or older not living here?</p> <p>(Getting lifts in their car; Shopping for you; Providing or cooking meals; Help with basic personal needs like dressing, eating or bathing; Washing, ironing or cleaning; Dealing with personal affairs; Decorating, gardening or house repairs; Financial help; Anything else; None of these)</p> | <p>And do you regularly or frequently receive any of these things from your children aged 16 or older not living here?</p> <p>(Getting lifts in their car; Shopping for you; Providing or cooking meals; Help with basic personal needs like dressing, eating or bathing; Washing, ironing or cleaning; Dealing with personal affairs; Decorating, gardening or house repairs; Financial help; Anything else; None of these)</p> | Social Network Support |
| Proportion of people who have at least one close friend | How many close friends would you say you have? | How many close friends would you say you have? | Personal Relationships |

| Proportion of people who have used the internet for social networking in the last 3 months | Which activities they used the internet for (personal use) in the last three months. (Sending and/or receiving emails, Telephoning over the internet, Social Networking, Reading online news, Finding information about goods or services, Listening to web radio, Playing or downloading games, images, films or music) | Do you belong to any social networking websites? | Personal Relationships |
|--|--|--|------------------------|
|--|--|--|------------------------|

Source: Understanding Society, the UK Longitudinal Household Survey

While the questions recommended here do represent all domains of the social capital indicators, the question associated with social network support relates only to those with a child over the age of 16 and warrants further discussion. One potential solution would be to use the question related to borrowing things and exchanging favours with neighbours. This question loaded highly onto the first component of both models and is the highest loaded question related to this domain across all components, though it was not the highest loaded question for any component.

There are some similarities between the questions suggested for inclusion here and other approaches to measuring social capital. A [social capital index](#) was recently released by the Scottish Government as part of their National Performance Framework, measuring social capital through four domains: social networks; community cohesion; community empowerment; and social participation. Questions about a person's feelings of belonging to a neighbourhood and unpaid participation in groups, clubs and organisations both form a part of this index and were identified by our analysis as important to the measurement of social capital. Also, the [National Survey for Wales](#) collects information on neighbourhood belonging.

While there is overlap between these indicator sets and our analysis, both organisations use other measures of social capital that do not align with these findings. The [Better Life Index](#) published by the OECD incorporates indicators related to social capital, such as trust in national government and quality of social support network. Of these indicators, only voter turnout corresponded with a variable identified through our analysis.

The lack of a question related to trust within the reduced set should also be noted. Social trust and trust in institutions are commonly viewed as an important element of social capital. Other research has indicated that [generalised trust, and trust in people relative to trust in institutions are significant contributing factors to social capital \(PDF,6.77MB\)](#). Additionally, trust was recently adopted by the Industrial Strategy Council as their [proposed measure of social capital \(PDF,6.77MB\)](#). The questions selected for this question set are drawn from the variables that exhibited the strongest loading onto a component. Although trust in the people in your neighbourhood and general trust in people do load strongly onto their respective components, they did not exhibit the strongest loading in either case.

3 . Discussion

The aim of this analysis was to identify indicators and questions for inclusion in a reduced indicator set for the Office for National Statistics's (ONS's) measurement of social capital. The findings from this article highlight what could form part of this reduced indicator set. Themes identified by this analysis include neighbourhood relationships, organised social and civic engagement, political engagement, relationships with friends and engagement with social media.

There are limitations to this form of analysis that should be considered. The results of principal component analysis (PCA) describe the components underlying the analysed dataset, but these results cannot be assumed to generalise to the concept of social capital as a whole. The components identified by this analysis describe this dataset, but analysis using other variables or data sources may be explained through different variable combinations.

The requirement for a single survey source that captured all indicators necessitated the use of replacement variables, some of which are not fully aligned with the original indicators. For example, it is difficult to directly connect beliefs about voting with actual voting behaviour, though the proportion of people who felt that voting was a civic responsibility was broadly similar to voter turnout. Other variables were omitted entirely, in particular trust in government, as no variable could be found which adequately measured the concept within the Understanding Society dataset. Variables relating to trust in others and trust in neighbours were included in this analysis, however.

An indicator for loneliness was also omitted from this analysis. Although Understanding Society began collecting information on loneliness in 2017-19, data was not available at time of publication. While loneliness was not included in this analysis, questions for measuring loneliness among adults and children were introduced as an interim harmonised principal in 2018. These questions and guidance for their use can be found on the [ONS website](#).

The variables selected for this analysis were chosen to represent our existing indicator set as closely as possible. While this allowed us to assess the dimensions underlying the indicator set, variable selection may not have represented all aspects of social capital. In particular, there is no variable included in this analysis that can be said to represent bridging social capital. In the indicator set, this concept is represented by trust in government, which could not be included in this analysis. Similarly, the variable related to giving help could not be included in this analysis, as it did not meet the sampling requirements of PCA.

Another limitation is the need to piece together data over several years in an effort to capture the full range of social capital indicators. Data linkage allows variables to be included that represent the majority of the social capital indicators, but respondents answered questions at different time points over a period of eight years. Although capital measures do not typically vary greatly over time unless a shock is felt, it is reasonable to expect that a person's social capital may fluctuate over this period, potentially affecting the relationships between variables.

For example, a person who felt that most people could not be trusted at the first wave of the survey (2009 to 2011) may have become settled and feel that most people in their neighbourhood can be trusted when asked six years later (2014 to 2016).

Variables included in our PCA used reduced response categories or were constructed from several questions to accurately measure each concept. To ensure that the component structure was not substantially different when original response categories were used, additional PCA models were run using the uncollapsed response scales. Although precise component loadings varied, these models returned components with similar themes and the same groups of variables clustered onto each component.

4 . Conclusions

Principal component analysis (PCA) was undertaken to help reduce our current indicator set to a short set of questions, which can be used to capture the main dimensions of social capital. The analysis identified the underlying concepts measured by the indicator set, and the indicators most highly associated with each component. These highly associated indicators are those suggested for inclusion in our short indicator set.

Our analysis has suggested that a short indicator set for social capital could comprise of the following items:

- I feel like I belong to this neighbourhood (Strongly agree, Agree, Neither agree/disagree, Disagree, Strongly disagree)
- Whether you are a member or not, do you join in the activities of any of these organisations on a regular basis? (Political party; Trade unions; Environmental group; Parents' groups or school association; Tenants' or residents' group; Religious or church organisation; Voluntary services group; Pensioners' group or organisation; Scouts or Guides; Professional organisation; Other community group; Social/working men's club; Sports club; Women's Institute/townswomen's guild; Women's group/feminist organisation; Other)
- I would be seriously neglecting my duty as a citizen if I didn't vote (Strongly agree, Agree, Neither agree /disagree, Disagree, Strongly disagree, Can't vote)
- Do you regularly or frequently receive any of these things from your children aged 16 or older not living here? (Getting lifts in their car; Shopping for you; Providing or cooking meals; Help with basic personal needs like dressing, eating or bathing; Washing, ironing or cleaning; Dealing with personal affairs; Decorating, gardening or house repairs; Financial help; Anything else; None of these)
- How many close friends would you say you have?
- Do you belong to any social networking websites? (Yes; No)

5 . Next steps

This article details one possible approach for the development of a short social capital indicator set. The questions proposed here will form part of the process for the development of an interim harmonised principle for the Government Statistical Service.

Part of this process will consider the suitability of these indicators for use, both individually and as a potential question set. ONS will undertake multivariate analysis using these questions to better understand the populations reporting different levels of social capital. For example, analysis could explore whether social media use acts as a proxy variable in the absence of a variable related to loneliness within this question set.

This analysis could be expanded further, incorporating concepts related to linking capital, which were not considered here. Analysis could also explore different data sources, such as the [European Social Survey](#), to gain a wider understanding of the dimensions of social capital.

6 . Methodology notes

Variable selection

The variables selected or omitted from this analysis are outlined in Tables 4, 5 and 6.

Table 4: Variables omitted from principal component analysis

| Indicator | Question | Reason for omission |
|--|---|--|
| Feelings of loneliness often/always | How often do you feel lonely? | Question originally drawn from Community Life Survey. Equivalent question not available on Understanding Society |
| Percentage of those who have trust in national government | For each of the following institutions, please tell me if you tend to trust it or tend not to trust it (National government) | Question originally drawn from Eurobarometer. Equivalent question not available on Understanding Society |
| Proportion of parents who regularly give practical or financial help to a child aged 16 or over not living with them | Nowadays, do you regularly or frequently do any of these things for your aged 16 or older who are living here? (Giving them lifts in your car; Shopping for them; Providing or cooking meals; Looking after their children; Washing, ironing or cleaning; Dealing with personal affairs; Decorating, gardening or house repairs; Financial help; Anything else; None of these) | Question failed to meet KMO adequacy threshold (see Sample Adequacy) |

Source: Understanding Society, the UK Longitudinal Household Survey

Table 5: Original ONS social capital indicators selected for principal component analysis

| Indicator | Question | Collapsed response categories | Time period |
|---|---|---|--------------|
| Proportion of people who have at least one close friend | How many close friends would you say you have? | Yes; No | 2014 to 2016 |
| Proportion of people who regularly stop and talk with people in the neighbourhood | I regularly stop and talk with people in my neighbourhood | Agree; Neither agree nor disagree; Disagree | 2014 to 2016 |
| Percentage of people that have a spouse or partner, family member or friend to rely on if they have a serious problem | Thinking about your spouse or partner, how much can you rely on them if you have a serious problem? | A lot; Somewhat; A little; Not at all; No friends, family or spouse | 2013 to 2015 |
| | Do you have any friends? | | |
| | Thinking about your immediate family, how much can you rely on them if you have a serious problem? | | |
| | Do you have any (other) immediate family, for example any children, brothers or sisters, parents, cousins, aunts, uncles, grandparents or grandchildren? | | |
| | Thinking about your friends, how much can you rely on them if you have a serious problem? | | |
| | Does your spouse/civil partner live with you in this household? | | |
| Proportion of people who give special help to at least one sick, disabled or elderly person not living with them | Are you living with someone in this household as a couple? | Yes; No | 2016 to 2018 |
| | Is there anyone living with you who is sick, disabled or elderly whom you look after or give special help to? | | |
| Proportion of parents who regularly receive practical or financial help to a child aged 16 or over not living with them | Do you provide some regular service or help for any sick, disabled or elderly person not living with you? | Yes; No | 2015 to 2017 |
| | And do you regularly or frequently receive any of those things from your children aged 16 or older not living here? (Getting lifts in their car; Shopping for you; Providing or cooking meals; Help with basic personal needs like dressing, eating or bathing; Washing, ironing or cleaning; Dealing with personal affairs; Decorating, gardening or house repairs; Financial help; Anything else; None of these) | | |
| Proportion of people who borrow things and exchange favours with their neighbours | I borrow things and exchange favours with my neighbours | Agree; Neither agree nor disagree; Disagree | 2014 to 2016 |
| Percentage who volunteered more than once in the last 12 months | In the last 12 months, have you given any unpaid help or worked as a volunteer for any type of local, national or international organisation or charity? | Yes; No | 2016 to 2018 |
| | Including any time spend at home or elsewhere, about how often over the last 12 months have you generally done something to help any of these organisations? | | |

| | | | |
|--|--|---|--------------|
| Proportion of people who are members of organisations, whether political, voluntary, professional or recreational | Are you currently a member of any of the kinds of organisation on this card? (Political party; Trade unions; Environmental group; Parents' groups or school association; Tenants' or residents' group; Religious or church organisation; Voluntary services group; Pensioners' group or organisation; Scouts or Guides; Professional organisation; Other community group; Social/working men club; WI/townswomen's guild; Women's group/feminist organisation; Other) | Yes; No | 2014 to 2016 |
| Proportion of people who would say that most people in their neighbourhood can be trusted | People in this neighbourhood can be trusted | Agree; Neither agree nor disagree; Disagree | 2014 to 2016 |
| Proportion of people who agree or strongly agree that people around where they live are willing to help their neighbours | People around here are willing to help their neighbours | Agree; Neither agree nor disagree; Disagree | 2014 to 2016 |
| Percentage who agree or agreed strongly that they felt they belonged to their neighbourhood | I feel like I belong to this neighbourhood | Agree; Neither agree nor disagree; Disagree | 2014 to 2016 |

Source: Understanding Society, the UK Longitudinal Household Survey

Table 6: Replacement variables selected for principal component analysis

| Indicator | Original question | Replacement question | Derived variable | Collapsed response categories | Time period |
|---|---|--|--|-------------------------------|--------------|
| Proportion of people who meet socially with friends, relatives or work colleagues at least once a week | Using this card, how often do you meet socially with friends, relatives or work colleagues? (Never; Less than once a month; Once a month; Several times a month; Once a week; Several times a week; Every day) | Do you go out socially or visit friends when you feel like it? | | Yes; No | 2014 to 2016 |
| Proportion of people who have used the internet for social networking in the last 3 months | Which activities they used the internet for (personal use) in the last three months. (Sending and/or receiving emails, Telephoning over the internet, Social Networking, Reading online news, Finding information about goods or services, Listening to web radio, Playing or downloading games, images, films or music) | Do you belong to any social networking websites? | | Yes; No | 2014 to 2016 |
| Proportion of people who have been involved in at least one social action project in their local area in the previous 12 months | Looking at this card, have you personally been involved in helping out with any of these types of activity in your area in the last 12 months? Please only include unpaid involvement. Do not select any activities where you only signed a petition but took no further action. (Trying to set up a new service or amenity to help local residents; Trying to stop the closure of a local service or amenity; Trying to stop something happening in my local area; Running local services on a voluntary basis (eg. Childcare, youth services, parks and community centres); Organising a community event such as a street party; Another issue affecting my local area; None of these) | Whether you are a member or not, do you join in the activities of any of these organisations on a regular basis? (Political party; Trade unions; Environmental group; Parents' groups or school association; Tenants' or residents' group; Religious or church organisation; Voluntary services group; Pensioners' group or organisation; Scouts or Guides; Professional organisation; Other community group; Social/working men club; Sports club; WI /townswomen's guild; Women's group/feminist organisation; Other) | | Yes; No | 2014 to 2016 |
| Proportion of people who definitely agree or tend to agree that they can influence decisions affecting their local area | Do you agree or disagree that you personally can influence decisions affecting your local area? | Public officials don't care much about what people like me think People like me don't have any say in what the government does | Respondents who disagreed with either statement coded as "Yes". Respondents who agreed coded as "No" | Yes; No | 2014 to 2016 |

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|--|---|---|--|---|--------------|
| Voter turnout in UK General Elections | | I would be seriously neglecting my duty as a citizen if I didn't vote | | Agree; Disagree | 2014 to 2016 |
| Proportion of people who have been involved in at least one political action in the previous 12 months | Over the last 12 months, have you done any of the following activities? (Attended a meeting of a trade union, political party or action group; Attended a protest or demonstration; Signed a petition; Contacted a politician or public official (other than routine contact through public services)) | Whether you are a member or not, do you join in the activities of any of these organisations on a regular basis? (Political party; Trade unions) | | Yes; No | 2014 to 2016 |
| Proportion of people who are very or quite interested in politics | How interested would you say you are in politics? | How interested would you say you are in politics? | | Yes; No | 2015 to 2017 |
| Proportion of people who would say that most people can be trusted | Using this card, generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people? Please tell me on a score of 0 to 10, where 0 means you can't be too careful and 10 means that most people can be trusted. | Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people? | | Yes; Depends; No | 2009 to 2011 |
| Proportion of people who definitely agree or tend to agree that their local area is a place where people from different backgrounds get on well together | To what extent do you agree or disagree that this local area is a place where people from different backgrounds get on well together? | What proportion of your friends are of a similar age as you? What proportion of your friends are of the same ethnic group as you? What proportion of your friends have a similar level of education as you? What proportion of your friends have similar incomes to you? | Respondents who reported that at least half of their friends differed from them in some way coded as "Yes". Otherwise, respondents coded as "No" | Yes; No | 2014 to 2016 |
| Felt fairly /very safe walking alone after dark | How safe do you feel walking alone in this area after dark? | How safe do you feel walking alone after dark? | | Agree; Neither agree nor disagree; Disagree | 2014 to 2016 |

Source: Understanding Society, the UK Longitudinal Household Survey

Sample adequacy

Before conducting principal component analysis (PCA), some preliminary tests were conducted. The Kaiser-Meyer-Olkin measure was run to assess the sampling adequacy of the data. This test is a measure of the proportion of variance among variables that may be common variance; the lower this proportion, the more suited data are to PCA.

When included, the variable "Regularly give help to a child, aged 16 or over, not living with you" failed to meet the adequacy threshold of .5, and was removed from further analysis. Testing of the remaining 21 items returned KMO = .75 ('Middling', as defined by [Kaiser, 1974 \(PDF, 230KB\)](#)), and individual KMO values of greater than .6. Bartlett's test of sphericity, $2(210) = 9820.534$, $p < .001$, indicated that the correlations between items were sufficiently large for PCA. Correlation between variables was also examined but was found to be relatively low.

These tests were repeated following the removal of the variable 'Regularly receive help from a child, aged 16 or over, not living with you'. Testing of the 20-item dataset returned KMO = .77, and individual KMO values greater than .5. Bartlett's test of sphericity, $2(190) = 22333.31$, $p < .001$, again indicated that correlations between items were sufficiently large for PCA.

Component retention

When selecting components for retention in PCA, the aim is to retain components that explain the greatest portion of the variance in the data. One method of determining this is to retain any component with an eigenvalue greater than 1, known as Kaiser's criterion ([Kaiser, 1960](#)). Each component, or eigenvector, has a corresponding eigenvalue, which indicates how much variance is explained by a component. A larger eigenvalue means that a component explains a large amount of variance in the data. A theoretical eigenvalue of 0 would explain none of the variance within the data, while an eigenvalue of 1 represents the amount of variance explained by an average, individual variable.

Another method of component retention is through use of a scree plot ([Cattell, 1966](#)). Using this method, eigenvalues are plotted against component numbers on a graph, known as a scree plot (Figure 1). Scree plots are typically characterised by sharply decreasing eigenvalues, levelling off into a gentler decline among later components. This method retains any component before this decline.

Rotation

When PCA is conducted, most variables will have high loadings onto a single component and comparatively small loadings on all other components. To combat this, a technique known as "rotation" is used. If a component is thought of as an axis along which variables can be plotted, rotation rotates these axes to ensure that each variable load strongly onto only one component.

There are several methods of rotation, which broadly break down into two distinct groups. Orthogonal rotation assumes that components will be independent and uncorrelated, while oblique rotation allows components to correlate. This analysis has been conducted using varimax rotation, a form of orthogonal rotation.

7 . References

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