Individual belonging to neighbourhoods and interaction with neighbours. Age related effects or generational change?

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Abstract

Structural processes associated with modernity, globalisation and individualisation may be reshaping, potentially weakening, the relationships that exist between individuals and local neighbourhoods. Empirical studies generally report that older individuals have higher levels of belonging to neighbourhoods and a greater likelihood of talking to neighbours. However, these studies are predominantly cross-sectional, and so cannot determine whether observed age differences reflect changes that occur within individuals over time, or changes that occur between successive generations. This paper looks to test for the existence of generational change, using data from the British Household Panel Survey, for England, between 1998 and 2008, and employing longitudinal growth trajectory models. The findings suggest that there has been a decline in the likelihood of talking to neighbours between successive generations; and that the magnitude of generational change is greater for higher income groups. In contrast, there are no generational differences for individual levels of belonging to neighbourhoods; belonging increases within individuals as they get older. Therefore, cross-sectional studies should be careful when making inference about observed age differences in outcomes measuring aspects of individual relationships with neighbourhoods and others in the neighbourhood. Further work, particularly longitudinal analysis that engages with theories about structural processes and generational change, would be useful.

Key words: Neighbourhood belonging. Interaction between neighbours. Generational change. Individualisation.

Introduction

Recent social and structural processes associated with modernity may have led to fundamental changes in the relationship between individuals and the neighbourhoods in which they live.

The current era has been characterised as 'liquid modernity' (Bauman, 2000), where relationships and identities are no longer fixed, instead becoming increasingly mobile (Urry, 2007). Globalisation has been associated with a compression of time and space (Harvey, 1990), leading to changing individual relationships with local place (Giddens, 1991). Consequently, it has been suggested that in late modernity there has been a ‘transcendence of place’ (Coleman, 1993), a shift in human consciousness from being centred, part of place and period, to being decentred, transcending the here and now (Nagel, 1986; Entriken, 1991; Szerszynski and Urry, 2006). However, there are strong arguments to suggest that any such changes may be dependent upon an individual’s position in the global social hierarchy, that there is a power geometry of time-space compression (Massey, 1991). It may be that the affluent have transcended local place but the poor remain localised (Castells, 1997; Bauman, 1998a), perhaps increasingly so (Turner, 2007).

In addition, there are processes of individualisation associated with late modernity and the rise of neo-liberal politics that may constitute a new relationship between the individual and society (Beck and Beck-Gernsheim, 2002). It has been suggested that individualisation has become the greatest threat to notions of shared experience (Bauman, 2001), and that the capacity for human cooperation is being undermined by the individualised nature of modern society (Sennett, 2012). Processes of individualisation are seen by some as central to the ideology of late capitalism, where the atomisation of society into private individuals is part of the alienation of everyday life, with place being both the location and source of abstractions (Lefebvre, 1991

[1974]). It has also been argued that the nature of local place has changed, with increased homogenisation, and a reduction in diversity (Relph, 1976; Harvey, 1982; Taylor, 1982), reflecting a consumer society characterised by increasing banality and shallowness (Baudrillard, 1994 [1981]; Bauman, 1998b).

Together, these structural processes may have resulted in changes to the relationship that successive generations have with the neighbourhoods in which they live, and to the relationships they have with others in those neighbourhoods. The concept of generational change, change between successive birth cohorts, is useful for understanding processes of social change (Ryder 1965, Glenn 1976).

Notions of social change and the loss of community are not new, and have occupied sociology since its beginnings (Delanty, 2007). Influenced by the views of Tonnies, Wirth believed that three aspects of modern urban life population size; population density and population heterogeneity were each acting to reduce the bonds between members of the community (Wirth, 1938). This has been challenged (Kasarda and Janowitz, 1974), and, though the debate has continued, it is generally agreed that community, or more precisely the relationships between individuals within neighbourhoods, survived the processes of early modernity (Gans, 1968; Fischer, 1973; Buttel et al, 1979; Wasserman, 1982).

More recently the concept of community has been the subject of renewed interest, with theories of, declining, social capital (Putnam, 2000). The decline in social capital is attributed to generational change, the passing of the 'world war two generation', but there is little actual evidence provided to evaluate any such change (Putnam, 2000); (and also see Putnam, 1995; Robinson and Jackson, 2001). Putnam's version of social capital has been criticised for ignoring inequality, the effects of globalisation and processes of individualisation (McLean et al, 2002; Fischer, 2005).

There is a need for empirical evidence that evaluates the existence, and extent of, generational change in the relationship that individuals have with neighbourhoods and neighbours. This paper looks to contribute to this understanding by estimating separate age and cohort effects on the individual level outcomes of belonging to the neighbourhood and the likelihood of talking to neighbours.

Existing empirical studies examining these outcomes tend to focus on age related life course or life cycle effects, and studies consistently report finding that older age groups have higher levels of belonging and interaction with others in the neighbourhood (Sampson, 1988; Lewicka, 2011; Finney and Jivraj, 2013). It is generally argued that positive individual outcomes result from accumulated biographical experience (Gieryn, 2000). However, empirical studies in this area are predominately cross-sectional, and so cannot separate age and cohort effects (Trentelman, 2009; Lewicka, 2011), and there is a recognised need for more longitudinal studies that are capable of doing so (Hernandez et al, 2014). Therefore, while older individual age is universally observed to be associated with higher levels of belonging to the neighbourhood, and talking to neighbours, it is not clear to what extent this is as a result of changes within individuals as they age, and to what extent this is a result of change between successive generations.

Therefore, the first hypothesis that this paper looks to test is:

> Hypothesis 1: that older individuals have higher levels of belonging to the neighbourhood and likelihood of talking to neighbours partly as a result of generational change; resulting in observable differences by birth cohort, independent of any age related changes that occur within individuals over time.

There is also the question of whether poorer groups have remained more localised, whether any generational changes in levels of belonging to neighbourhoods and talking to neighbours are more pronounced for affluent groups. Often in the literature there is an implicit assumption that poor individuals lack the resources for interaction and cohesion and that this leads to 'unsuccessful' neighbourhoods (Wilson, 1987; Walker and Walker, 1997; Laurence and Heath, 2008). While, undoubtedly, stark spatial inequalities exist, it may be that poorer individuals require extended networks and connections in order to deal with everyday life (Stack, 1974), that relationships with neighbours may be more important for poorer individuals (Guest and Wierzbicki, 1999), and that poor people spend more time in their neighbourhood (Forest and Kearns, 2001).

As noted, existing studies have been predominantly cross-sectional, and so cannot engage in notions of generational change. Therefore the question about conditional generational change is not addressed. However, if poorer groups have remained more localised then it would be expected that cross-sectional studies identify higher levels of belonging and likelihood of talking to neighbours for such groups. While evidence is mixed (Hidalgo and Hernandez, 2001; Brown et al, 2003; Lewicka, 2011), there is some evidence to suggest that higher socio-economic groups are less attached to their neighbourhood (Gerson et al, 1977; Sampson, 1988; Finney and Jivraj, 2013).

Therefore, the second hypothesis that this paper looks to test is:

> Hypothesis 2: that lower income individuals have higher levels of belonging to the neighbourhood and likelihood of talking to neighbours. Also that, over time, any reduction in these outcomes as a result of generational change is more pronounced for affluent groups.

Data and Methods

Longitudinal data is required in order to address the research question and the two specific hypotheses. This study uses longitudinal data from the British Household Panel Survey (BHPS), carried out by the Economic and Social Research Council UK Longitudinal Studies Centre. The initial BHPS sample, in 1991, consisted of 9,912 adults, nested within 5,511 households. All eligible adult household members were interviewed in wave one and annually thereafter, and the sample increased over time with the addition of new adult household members, and a number of booster samples (Taylor et al, 2010).

Data, for England, was obtained for the periods 1998, 2003 and 2008, when questions regarding belonging the neighbourhood and talking to neighbours were included in the survey. Respondents were asked to rank their agreement, on a five point Likert scale, with the statements "I feel like I belong to this neighbourhood" and "I regularly stop and talk with people in my neighbourhood".

There were 8,128 responses in 1998, 7,639 in 2003 and 7,751 in 2008. The longitudinal sample, those with at least one response in any wave, consists of 7,692 individuals, the percentage with three, two and one completed interview is 60 percent, 17 percent and 23 percent respectively. The results at each survey wave have been produced using the relevant cross-sectional weights at each period. Weights were not employed in the regression models.

The survey also collects information on year of birth, and household income. Net household income, after housing costs, was equivalised using the Organisation for Economic Co-operation and Development (OECD) equivalence scale (Haagenars et al, 1994), to take account of differences in household size and composition. The mean net monthly equalised household income at 1998, 2003 and 2008 is £1,128, £1,405 and £1,680 respectively. The values are positively skewed, ranging from near zero to over £20,000 per month, median values are £956, £1,201 and £1,401 at 1998, 2003 and 2008 respectively.

This paper presents descriptive analysis and longitudinal models, with the objective of distinguishing between age and cohort effects. While, conceptually, age, period and cohort effects can be considered as separate concepts (Schaie, 1965; Firebaugh, 1997), they cannot in practice be independently estimated in a single statistical model. There is an identification problem (Mason et al, 1973; Firebaugh, 1997), as any one of the three variables of age, period and cohort is determined by the other two (Goldstein, 1968; Palmore, 1978).

There have been some recent attempts to tackle the identification problem (Yang and Land 2006, Winship and Harding 2008). However these methods are still to be fully evaluated and their strengths and weaknesses have not been fully explored yet (Harding 2009). All attempt statistical solutions to the identification problem, but even if this were possible the problem of substantive interpretation remains, that it makes little sense to conceive of separate affects of age, period and cohort. It is not conceptually possible to hold two of these variables constant and estimate the effect of the third (Goldstein 1979, Kosloski 1986). Therefore the analysis presented uses both descriptive analysis of repeated cross-sectional data, along with longitudinal models to distinguish between age and cohort effects.

Longitudinal models are able to distinguish change in individual level outcomes over time from between individual difference (Goldstein 1968, Diggle et al 2002, Singer and Willet 2003). Such models allows for the simultaneous measurement of within and between person differences, in conjunction with a number of time constant or time varying explanatory variables (Rogosa and Willett, 1985; Raudenbush and Chan, 1993; Plewis, 1994; Steele, 2008; Goldstein, 2011; Snijders and Bosker, 2012). In addition, by allowing the effects of time to be random at the individual level, the models estimate individual differences in the rate of change over time (Steele, 2008; Hox, 2010; Goldstein, 2011; Snijders and Bosker 2012).

The approach taken is to accommodate the longitudinal data in a multilevel structure whereby measurement occasions are nested within individuals (Laird and Ware, 1982; Sternio et al, 1983; Singer and Willett, 2003, Snijders and Bosker, 2012). Multilevel longitudinal can accommodate data missing at random, leading to more efficient estimates, compared to methods that exclude cases to obtain balanced data (Plewis, 1994; Rasbash et al, 2012).

A single level empty model, that is a model just estimating the overall individual level average, can be specified as in equation 1. The outcome is measured on a 5 point Likert scale, treated as continuous. Similar models were constructed using a binary outcome, the substantive interpretation of the models was the same, but the binary outcome models had difficulties in estimating variance (due to their additional complexity and the relatively small number of time points per individual). The constant term represents the overall average outcome for individual i, and the error term ei represents the variance from the average for individual i, the total variance is assumed to have a standard normal distribution, with a mean of zero.

$$y_i = \beta_{0i} cons$$
$$\beta_{0i} = \beta_0 + e_i$$
$$[e_i] \sim N(0,\Omega_e): \Omega_e = [\sigma^2_e] \qquad (1)$$

The addition of a second level so that occasion is at level one, with individual now at level two, can be expressed as in equation 2. Here the outcome y_{ij} for individual j at time point i is estimated as the average plus the residual at level two and the residual at level one, both of which are assumed to have a standard normal distribution with a mean of zero. This model enables the separate estimation of within person variance, σ^2_e, and between person variance, σ^2_u.

$$
\begin{aligned}
y_{ij} &= \beta_{0ij}cons \\
\beta_{0ij} &= \beta_0 + u_j + e_{ij} \\
[u_j] &\sim N(0,\Omega_u) : \Omega_u = [\sigma^2_u] \\
[e_{ij}] &\sim N(0,\Omega_e) : \Omega_e = [\sigma^2_e]
\end{aligned} \qquad (2)
$$

In order to investigate trajectories of individual change, and in particular to distinguish between age and cohort effects, the models can be extended to include a metric of time. Introducing a random slope to the metric of time, enables individuals to have different trajectories, different rates of change over time (Singer and Willett, 2003; Snidjers and Bosker, 2012). This specification is set out in equation 3, there are now two random coefficients estimated at the individual level, variance between individuals as estimated by σ^2_{u0}, and variance in the trajectories of change, as estimated by σ^2_{u1}. Also σ_{u01} is estimated, which is the covariance between the intercept and slope. The additional assumption is that the two random effects at the individual level have a multivariate normal distribution. The term σ^2_e remains the variance within individuals.

$$
\begin{aligned}
y_{ij} &= \beta_{0ij}cons + \beta_{1j}time_{ij} \\
\beta_{0ij} &= \beta_0 + u_{0j} + e_{ij} \\
\beta_{1j} &= \beta_1 + u_{1j} \\
\begin{pmatrix} u_{0j} \\ u_{1j} \end{pmatrix} &\sim N(0,\Omega_u) : \Omega_u = \begin{pmatrix} \sigma^2_{u0} & \\ \sigma_{u01} & \sigma^2_{u1} \end{pmatrix} \\
[e_{ij}] &\sim N(0,\Omega_e) : \Omega_e = [\sigma^2_e]
\end{aligned} \qquad (3)
$$

It is known that the choice of metric, whether individual age or years of the study period, can lead to very different conclusions (Hoffman, 2012). This difference is exploited in the analysis presented, in order to compare age and cohort effects. Using age as the metric of time has advantages, in that growth curves can be estimated for age ranges that are greater than the data collection period. Known as an accelerated longitudinal design, or cohort sequential design (Hox, 2010), this approach uses a mixture of cross-sectional and longitudinal data and requires the assumption that all cohorts are comparable, in other words, that there are no cohort effects. Using time in the study period as the metric draws only on the longitudinal data, and therefore makes no assumptions about the processes causing change over time. With this is mind, models with different metrics of time can be used to test the specific hypotheses regarding the nature of individual level change.

These approaches will be compared, along with a model which extends equation 3 to include year of birth, as in equation 4. The addition of year of birth, equivalent to age at the start of the period, is only possible when time in the study period is the metric and not age, as age and year of birth are confounded in an accelerated design. Also year of birth is a level 2, individual level, variable, in that it varies between individuals and not occasions. In the course of the analysis these models are then extended to include household income and interactions between the explanatory variables.

$$y_{ij} = \beta_{0ij} cons + \beta_{1j} time_{ij} + \beta_2 year\ of\ birth_j$$
$$\beta_{0ij} = \beta_0 + u_{0j} + e_{ij}$$
$$\beta_{1j} = \beta_1 + u_{1j}$$
$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N(0,\Omega_u): \Omega_u = \begin{bmatrix} \sigma^2_{u0} & \\ \sigma_{u01} & \sigma^2_{u1} \end{bmatrix}$$
$$[e_{ij}] \sim N(0,\Omega_e): \Omega_e = [\sigma^2_e] \qquad (4)$$

The models are estimated using MLWiN software (Rasbash et al, 2005), and Monte Carlo Markov Chain (MCMC) methods within a Bayesian framework beginning with diffuse priors (Browne, 2012; Rasbash et al, 2012). The models presented below employ up to 500,000 iterations. Model fit was evaluated using the deviance information criteria (DIC) (Spiegelhalter et al, 2002).

Results

The outcomes at each survey wave are shown in table 1, most individuals agree that they belong to their neighbourhood and talk regularly to their neighbours. The overall percentage agreeing remains fairly consistent across the three survey waves for both outcomes.

Table 1: Description of outcomes at each survey wave.

Belong to neighbourhood	**1998**	**2003**	**2008**
Strongly agree	15.8%	16.3%	16.1%
Agree	53.5%	54.7%	56.2%
Neither	19.3%	19.9%	19.3%
Disagree	9.1%	7.2%	6.7%
Strongly disagree	2.3%	1.8%	1.8%
Valid n	*8,841*	*7,178*	*6,585*
Missing	*23*	*24*	*16*
Talk regularly to neighbours	**1998**	**2003**	**2008**
Strongly agree	15.9%	12.9%	13.6%
Agree	56.9%	56.1%	56.8%
Neither	11.8%	13.7%	13.3%
Disagree	11.9%	14.0%	12.8%
Strongly disagree	3.5%	3.3%	3.5%
Valid n	*8,843*	*7,185*	*6,584*
Missing	*21*	*17*	*17*

The association between individual age and cohort groups and the percentage that strongly agree or agree that they belong to their neighbourhood is shown in table 2. Older age groups and birth cohorts at each time point are much more likely to agree that they belong to their neighbourhood. There appears to be a linear relationship with age, with increased levels of belonging for subsequent age groups. These age differences do not vary much over time, individuals of any given age have similar levels of belonging at 1998, 2003 and 2008.

However, these are different individuals, for example those aged 26 in 1998 are not the same individuals aged 26 in 2008. Cohorts represent the same individual, for example those aged 26 in 1998 will be aged 36 in 2008, and all birth cohorts experience an increase in levels of belonging over the eleven year time period, apart from those born prior to 1930 who already have high levels of belonging in 1998. Taken together, the age and cohort descriptive analysis suggests that levels of belonging increase as individuals get older, and that age, rather than cohort effects are in operation.

Table 2: Percentage who belonging to their neighbourhood by age group and birth cohort, at each survey wave.

Age group	**1998**	**2003**	**2008**
16-29	52.7%	53.0%	53.1%
30-39	60.8%	63.3%	64.1%
40-49	69.4%	68.7%	69.3%
50-59	75.6%	75.3%	73.8%
60-69	81.7%	81.7%	82.4%
70 plus	84.0%	84.8%	86.7%
Spearman's rho ρ	0.271	0.259	0.244
Chi Squared $\chi^2(20)$	684.3	574.54	534.8
Cohort	**1998**	**2003**	**2008**
1975-82	51.7%	51.6%	57.1%
1965-74	53.0%	61.2%	65.9%
1955-64	63.9%	69.8%	70.3%
1945-54	72.7%	73.9%	79.0%
1930-44	79.5%	82.7%	85.6%
Prior to 1930	84.0%	84.2%	84.9%
Spearman's rho ρ	0.265	0.253	0.238
Chi Squared $\chi^2(20)$	667.55	517.96	418.29

χ^2 and ρ calculated with outcomes as 5 point scale, all significant at $p < 0.001$
The outcomes are grouped into those that belong (strongly agree or agree), and those that do not (all other responses), for illustrative purposes.

The association between individual age and cohort groups and the percentage that strongly agree or agree that they talk regularly to their neighbours is shown in table 3. Again, older age groups and birth cohorts are much more likely to agree that they talk regularly to neighbours, however there appears to be a different relationship with age and cohort for this outcome, compared to the outcome of belonging to neighbourhoods. There is still a positive relationship with age and cohort groups, but while older age groups are more likely to talk to neighbours, this decreases in each age group over the time period.

So, for example, individuals aged 26 in 2008 have lower levels of talking to neighbours compared to different individuals who were aged 26 in 1998. Also each cohort does not seem to change their level of talking to neighbours over the time period. So for cohorts, for the same individual, for example those aged 26 in 1998 and 36 in 2008, the likelihood of talking to neighbours does not increase over the time period. This suggests that there may be cohort effects in operation, that the observed differences in talking to neighbours for different age groups may be partly due to generational change. In addition the oldest birth cohort, those born prior to 1930, decrease their likelihood of talking to neighbours quite sharply over the period, suggesting that very old age may be associated with increased social isolation.

Table 3: Percentage who talk regularly to their neighbours by age group and birth cohort, at each survey wave.

Age group	**1998**	**2003**	**2008**
16-29	58.3%	52.0%	51.4%
30-39	68.4%	65.9%	62.5%
40-49	72.2%	67.3%	68.6%
50-59	74.2%	69.6%	71.8%
60-69	85.3%	83.4%	80.1%
70 plus	83.3%	80.5%	81.4%
Spearman's rho ρ	0.200	0.206	0.199
Chi Squared $\chi^2(20)$	420.85	429.06	455.82
Cohort	**1998**	**2003**	**2008**
1975-82	58.7%	55.3%	58.0%
1965-74	66.9%	65.6%	68.3%
1955-64	68.8%	67.8%	70.8%
1945-54	74.7%	73.2%	74.3%
1930-44	83.3%	82.7%	83.2%
Prior to 1930	83.5%	79.3%	75.6%
Spearman's rho ρ	0.198	0.189	0.152
Chi Squared $\chi^2(20)$	403.01	373.33	241.94

χ^2 and ρ calculated with outcomes as 5 point scale, all significant at $p < 0.001$
The outcomes are grouped into those that talk to neighbours (strongly agree or agree), and those that do not (all other responses), for illustrative purposes.

This descriptive analysis, of repeated cross-sectional data, is a useful starting point in understanding age and cohort differences in the outcomes under study. However it only provides observed averages for groups at each period. The next step in the analysis is to develop the longitudinal models, as specified in the equations set out above. Results, for both outcomes, from the single level and two level empty model, as specified by equation 1 and 2, are shown in table 4.

Table 4: Results from model 1 (empty single level model), and model 2 (empty two level model), for both outcomes.

Belong to neighbourhood	**Model 1**		**Model 2**	
	Est.	S.E.	Est.	S.E.
Constant (β_0)	3.725	0.006	3.700	0.008
σ^2_u			0.362*	0.009
σ^2_e	0.799*	0.008	0.452*	0.006
DIC	54809.78		48830.52	
Talk regularly to neighbours	**Model 1**		**Model 2**	
	Est.	S.E.	Est.	S.E.
Constant (β_0)	3.654	0.007	3.636	0.009
σ^2_u			0.422*	0.011
σ^2_e	0.960*	0.009	0.552*	0.008
DIC	58686.50		52947.10	

* Significantly different from 0, at $p < 0.05$.

For both models the constant term represents the average. In the single level model, σ^2_e represents the overall variation in the outcomes. When a two level model is considered, with measurement occasions clustered within individuals, the overall variation has now been partitioned into within person variance σ^2_e, and between person variance σ^2_u. The large decrease in the DIC suggests that the two level models are a much better fit than the single level models.

As noted in the descriptive analysis, the proportion of individuals who agree that they belong to their neighbourhood, and talk regularly to neighbours, is similar at each period. However, this cross-sectional analysis confounds within person and between person variance. Similarly the single level models in table 4 cannot separate within and between person variance, both are represented in a single error term. However, in the two level models, that can separate within and between person variance, the variation within individuals over time is estimated as over 50 per cent of the total. So while population level net change is small, for individuals there is a greater amount of within person change over the period, justifying the use of longitudinal models.

The first hypothesis, that this paper seeks to test, is that the positive relationship between individual age and both belonging to the neighbourhood, and talking to neighbours, is partly a result of cohort differences. In other words, that there are generational changes, independent of individual age related developmental effects. To test this hypothesis three models are developed using equations 3 to 5, results from these models, for both outcomes, are shown in table 5.

Table 5: Results from model 3 (with age as the metric), model 4 (with time in the study period as the metric), and model 5 (with time in the study period as the metric and year of birth), for both outcomes.

Belong to neighbourhood	**Model 3**		**Model 4**		**Model 5**	
	Est.	S.E.	Est.	S.E.	Est.	S.E.
Constant (β_0)	3.709	0.008	3.714	0.007	3.719	0.007
Age_{ij}	0.0122*	0.0004				
$Time_{ij}$			0.0122*	0.0013	0.0149*	0.0013
YOB_j					-0.0119*	0.0004
σ^2_{u0}	0.285*	0.010	0.363*	0.009	0.317*	0.008
σ^2_{u1}	0.0001*	0.0000	0.0023*	0.0003	0.0023*	0.0003
σ_{u01}	-0.0011*	0.0002	-0.0072*	0.0009	-0.0063*	0.0008
σ^2_e	0.445*	0.006	0.394*	0.008	0.394*	0.008
DIC	48300.12		47609.39		47342.48	
Talk regularly to neighbours	**Model 3**		**Model 4**		**Model 5**	
	Est.	S.E.	Est.	S.E.	Est.	S.E.
Constant (β_0)	3.648	0.001	3.633	0.009	3.636	0.008
Age_{ij}	0.0095*	0.0005				
$Time_{ij}$			-0.0018	0.0014	0.0005	0.0014
YOB_j					-0.0102*	0.0005
σ^2_{u0}	0.328*	0.012	0.429*	0.011	0.395*	0.011
σ^2_{u1}	0.0002*	0.0000	0.0016*	0.0003	0.0015*	0.0004
σ_{u01}	-0.0029*	0.0003	-0.0017	0.0011	-0.0009	0.0010
σ^2_e	0.545*	0.007	0.515*	0.010	0.514*	0.011
DIC	52610.15		52452.78		52298.59	

Age mean centred at 48 years, study period time mean centred at 5 yrs, and year of birth mean centred at 1955; all in units of one year.
* Significantly different from 0, at $p < 0.05$.

For the outcome of belonging to the neighbourhood it can be seen that the coefficient for age, in model 3, is the same as the coefficient for time, in model 4 (both age and time in the study period are in units of one year). Because of the identification problem, discussed above, this coefficient represents age and cohort confounded effects in model 3 and age and time confounded effects in model 4. As the effect of age is the same as the effect of time it can be concluded that there are no evident cohort effects. For the outcome of talking to neighbours the results are different. While the coefficient for age, in model 3, with age as the metric of time, is positive and significant, in model 4, when time in the study period is the metric, the coefficient is negative, though is substantively very small, and not significant. This suggests that the effects attributed to age in model 3 are actually cohort effects, and that there are cohort, rather than age differences in this outcome.

As noted above, year of birth cannot be added to model 3, where age is the metric of time, as age and year of birth would be confounded. But it can be added to model 4, with time in the study as the metric, as in equation 4 and model 5. So in model 5 year of birth represents cohort, but also the age of an individual at the start of the period. It should be noted that this variable is a level 2 variable, in that it varies between individuals, but not within individuals.

In Model 5, with time in the study period as the metric and year of birth, the main effects of time, and the estimated variances, are similar to model 4, the same model without year of birth. In model 5 the coefficient for year of birth, is similar for both outcomes, younger cohorts are less likely to belong to their neighbourhood or talk to neighbours. Year of birth represents the age of an individual at the start of the period, and time represents the effects of aging 11 years over the period. So even though the coefficient for year of birth is similar for both outcomes, it is the coefficient of time that represents developmental change. This allows for a comparison of trajectories estimated from model 3, with age as the metric, and model 5, with time in the study period as the metric and year of birth, and enables an evaluation of the extent of cohort effects. This is illustrated in figure 1 and 2 which compare predictions across age and cohort groups for both outcomes from model 3 and model 5 respectively.

Figure 1: Predicted results from model 3 (with age as the metric of time), for both outcomes.

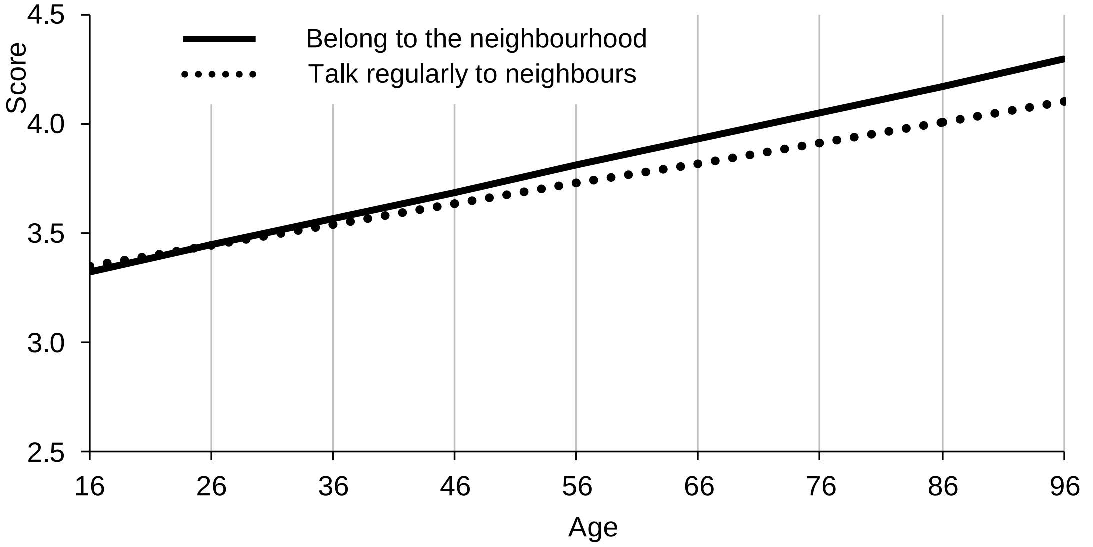


Figure 2: Predicted results from model 5 (with study period as the metric of time, and year of birth), for both outcomes.

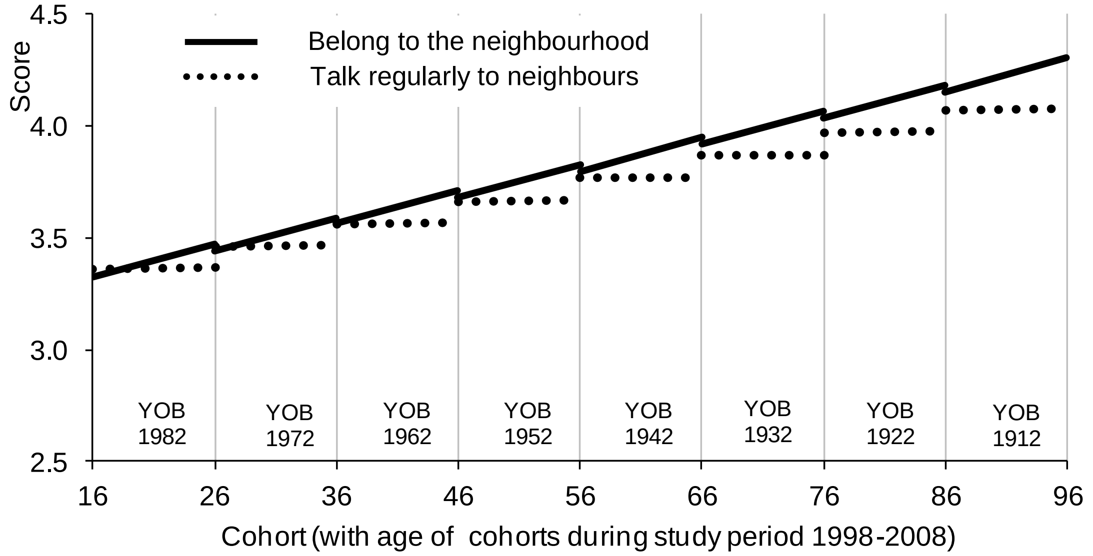


Figure 1 shows predictions from model 3, which has age as the metric, and figure 2 shows predictions from model 5, which has time in the study period as the metric, along with individual level year of birth. For the outcome of belonging to the neighbourhood, figure 1 and 2 illustrate that the developmental changes for different cohorts over the 11 year period from model 5 are similar to the estimated trajectory from the accelerated design from model 3, which confounds age and cohort. This provides more support for the conclusion that the outcome of belonging is associated with age, rather than cohort effects. For the outcome of talking to neighbours, predictions from model 3, which confounds age and cohort, show a trajectory similar to the outcome of belonging. However the predictions from model 5 suggest that the difference by age is actually a result of cohort differences. As figure 2 demonstrates, each successive cohort do not increase their likelihood of talking to neighbours over the time period but there are differences between cohorts. For example those aged 26 have a lower likelihood of talking to neighbours in 2008, compared to those aged 26 in 1998. These predicted values suggest that, unlike the outcome of belonging to the neighbourhood, there is evidence of generational change in the likelihood of individuals talking to their neighbours.

Table 5 also reports the estimated variances at each level and the covariance between random slopes and random intercepts at level 2. As noted, these models allow for the individual trajectories to vary in their rates of change by introducing a random coefficient for the trajectory over time at level 2, σ^2_{u1}, in addition to the coefficient for the random intercept at level 2, σ^2_{u0}. For both outcomes, there is more variation in the random slopes, σ^2_{u1}, for models that have time in the study period as the metric, as in model 4 and 5, compared to model 3 with age as the metric. It should also be noted that model 5, with time as the metric and year of birth is the best model fit for both outcomes.

The covariance between random intercept and slope, σ_{u01}, is also estimated and is negative for both outcomes which suggests that the random slopes are 'fanning in', that those with higher starting predicted values have flatter trajectories of change over time, while those with lower starting predicted values have steeper trajectories. It is noticeable that the covariance is greater for the outcome of belonging in models 4 and 5, with time in the study period as the metric, compared to model 3, with age as the metric. The opposite is the case for the outcome of talking to neighbours. This means that in model 5 there is more variation in individual rates of change for the outcome of belonging, along with the significant effect of time, compared with the outcome of talking to neighbours where there is no overall effect of time and less variation in individual trajectories of change.

Next the second hypothesis is tested; that lower income individuals have higher levels of belonging to the neighbourhood and likelihood of talking to neighbours. Also that, over time, any reduction in these outcomes as a result of generational change is more pronounced for affluent groups. Therefore, in the final models presented, model 6, net equivalised household income is added, and results from this model are shown in table 6. The coefficient for household income represents the change in the outcome associated with a £100 increase in monthly net household equivalised income above the mean. The size of the effect is similar for both outcomes, and the addition of this variable improves the model fit for both outcomes, but the direction of the effect is different. Those in households with higher incomes are more likely to belong to their neighbourhood and are less likely to talk to their neighbours.

A number of interactions were tested in the construction of this final model. There was no significant interaction between time and household income for either outcome, therefore the effects of household income are the same at each time period. Adding the interaction between year of birth and household income, which considers whether the household income effects are different for different cohorts, did improve the model fit for the outcome of talking to neighbours but not belonging to the neighbourhood. So for the outcome of belonging to the neighbourhood increased household income has a positive effect, and this effect size is the same in all cohorts. But for the outcome of talking to neighbours increased household income has a negative effect, and this negative effect is stronger for younger cohorts and less strong for older cohorts.

Table 6: Results from model 6 (final models with time as metric, year of birth, household income and significant interactions), for both outcomes.

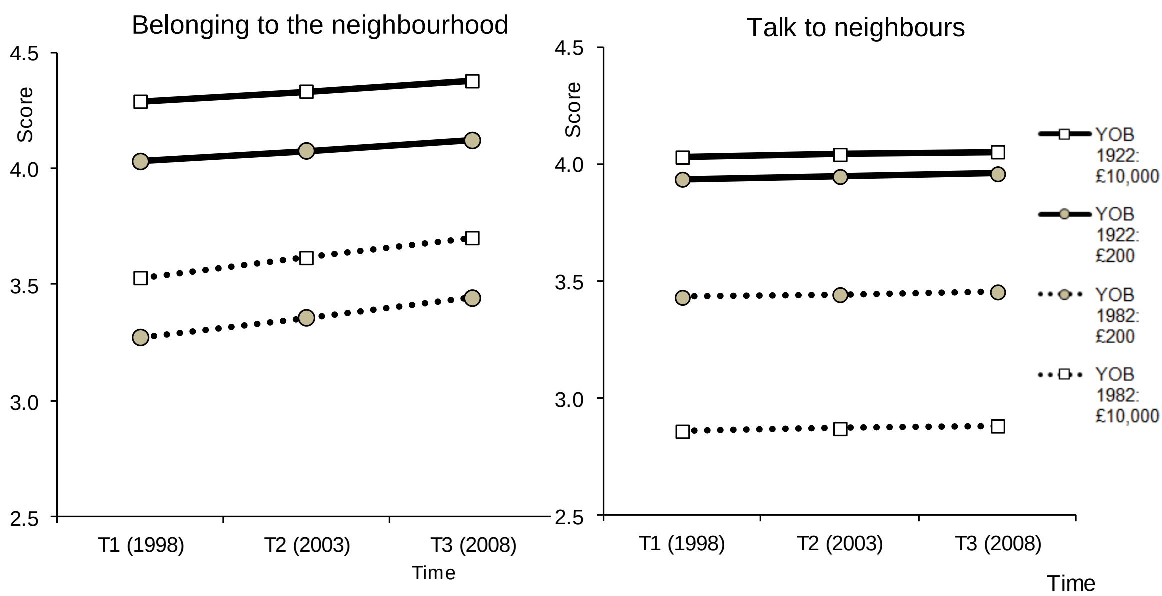
	Belong to neighbourhood		**Talk to neighbours**	
Model 6	Est.	S.E.	Est.	S.E.
Constant (β_0)	3.716	0.008	3.639	0.009
Time $_{ij}$	0.0134*	0.0013	0.0023	0.0014
YOB $_{j}$	-0.0120*	0.0004	-0.0098*	0.0005
Household Income $_{ij}$	0.0026*	0.0006	-0.0028*	0.0006
Time*YOB $_{ij}$	0.0003*	0.0001		
YOB*Household Income $_{ij}$			-0.00011*	0.00004
σ^2_{u0}	0.316*	0.008	0.392*	0.011
σ^2_{u1}	0.0023*	0.0003	0.0015*	0.0003
σ_{u01}	-0.0063*	0.0008	-0.0011	0.0011
σ^2_{e}	0.394*	0.008	0.515*	0.010
DIC	47324.58		52249.76	

Age mean centred at 48 years, study period time mean centred at 5 yrs, and year of birth mean centred at 1955; all in units of one year. Household income mean centred at £1,400 net per month (equivalised), in units of £100.
* Significantly different from 0, at $p < 0.05$.

Also an interaction between time and year of birth was introduced. This examines whether the developmental effects associated with 11 years of aging in the study period is different for individuals depending on their year of birth, their age at the start of the period. This interaction did not improve the model fit for the outcome of talking to neighbours but did so for the outcome of belonging to the neighbourhood, though the effect size is relatively small. The interaction suggests that, for the outcome of belonging to the neighbourhood, the effects of 11 years of time have a greater positive effect for younger cohorts, compared to older cohorts.

Predicted values from model 6 are shown in figure 3, which illustrates the difference in the outcomes by cohort and household income. Figure 3 demonstrates that, for the outcome of talking to neighbours, the differences by household income are greater for younger cohorts, or, in other words, cohort differences are greater for individuals in households with higher levels of income, and that cohort changes have had less impact on individuals in lower income households. Therefore there is some evidence to support hypothesis 2 for the outcome of talking to neighbours. However there is no evidence to support hypothesis 2 for the outcome of belonging to the neighbourhood.

Figure 3: Predicted outcome from model 6 (final models with time as metric, year of birth, household income and significant interactions), for both outcomes, for different cohorts and household incomes.



Conclusions

Despite the predominance of theories, reviewed in the introduction of this paper, suggesting there has been a fundamental shift in the relationship between individuals, neighbourhoods and neighbours, there is a lack of empirical evidence about generational change. Existing empirical studies overwhelmingly find that older individuals have higher levels of belonging to neighbourhoods and are more likely to interact with others in their neighbourhood. However, these studies are predominantly cross-sectional, and therefore cannot separate age and cohort effects.

The aim of this paper was to test whether younger birth cohorts had lower levels of belonging to neighbourhoods, and less likelihood of talking to neighbours, as a result of generational change. Also, to determine whether any observed generational change is greater for high income groups. By employing multilevel growth trajectory models it is possible to separate, and compare, differences between birth cohorts and the changes that occur within individuals over time.

The findings suggest that empirical studies investigating measures relating to neighbourhood or community should be careful about inferences made regarding associations with age. Unless longitudinal methods are employed there is no way to distinguish age and cohort effects.

The analysis presented in this paper identified cohort differences, independent of age effects, for the outcome of talking to neighbours, but not for the outcome of belonging to the neighbourhood. Older individuals were found to talk more to neighbours, but the likelihood of talking to neighbours did not increase within individuals over time. This suggests older individuals talk more to neighbours than younger individuals because of generational change, not because individuals increase their likelihood of talking to neighbours as they get older. Also the observed generational change in the likelihood of talking to neighbours was found to be greater for more affluent groups.

Younger individuals from affluent groups had the lowest likelihood of talking to neighbours.

In contrast, while older individuals were found to belong more to their neighbourhood, all individuals increased levels of belonging to neighbourhoods over time, as they became older. Differences by age can be explained by this increased belonging to neighbourhoods that occur within individuals. Therefore there is no evidence for generational change for individual belonging to neighbourhoods.

Belonging is an emotive measure, while talking to neighbours is more of a behavioural measure. Perhaps this suggests that any structural changes associated with globalisation and individualisation impact more on behaviour, and less on attitudes or emotions. This may be a fruitful area of further research, considering patterns of change for a range of outcomes.

While identifying change between birth cohorts does not explain why these changes occur (Fischer 2005), this paper demonstrates that longitudinal analysis, considering generational change, is able to engage with sociological theories about structural processes. Future empirical work could contribute to an understanding of the relationship between individualisation, and community.

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