Chapter 8
Neighbourhood Social Capital and Individual Mental Health

Gindo Tampubolon

Introduction

It has been claimed that neighbourhood effects have been found to be important for a wide range of outcomes, including schooling, housing and health (Durlauf 2004). Many of the empirical works reviewed by Durlauf claim to present evidence of the importance of neighbourhood effects and identified some of the underlying causal mechanisms such as peer group effects and (lack of) information effects. Durlauf also noted that a significant part of the existing body of evidence does not deal with identification problems or selection problems, thus potentially weakening claims about causal neighbourhood effects. (Econometric) identification of causal mechanisms is the main challenge in neighbourhood effects research and in recent years major advances have been made in this field. Durlauf (2004) also noted that a tighter link between empirical work and substantive theory (human capital theory or housing demand theory or health capital theory) is needed in order to transform the promise of neighbourhood effects research into real advances. Such advances will spur more fruitful theoretical works and more relevant policy input. For policy responses to assumed neighbourhood effects it is crucial to identify causal pathways which link neighbourhood characteristics with individual level outcomes.

Relatively recent but intense efforts focusing on neighbourhood effects originate from within the body of literature on public health and social epidemiology. There is a fast growing body of literature which focuses on neighbourhood effects on individual health outcomes such as obesity, mental health, physical health and health-related quality of life. This literature has identified two neighbourhood attributes potentially relevant for individual health: physical/environmental deprivation of the neighbourhood and neighbourhood social capital.
The claim that neighbourhood social capital matters seems intuitive; yet supporting evidence remains elusive. Studies in the US show that neighbourhood social capital correlates with individual health (Kawachi et al. 1997, 1999; Subramanian et al. 2005; Viswanath et al. 2006; Farquhar et al. 2005; Perry et al. 2008). In the UK however comparable evidence is difficult to find. The few existing studies of social capital and health in the UK failed to find a general association between social capital and health outcomes (Duncan et al. 1993; Sloggett and Joshi 1998; Mohan et al. 2005; Propper et al. 2005; Stafford et al. 2008). The nearest to find a negative effect of neighbourhood social capital on individual mental health is a study by Stafford et al. (2008: 304). They report a negative association “between social capital and common mental disorders which was limited to economically ‘stressed’ residents and neighbourhoods.” Studies from other countries such as New Zealand and Sweden have failed to settle the issue (Blakely et al. 2006; Islam et al. 2006). Kawachi and Berkman (2003) have identified some of the mechanisms which are thought to link neighbourhood social capital and individual health (see the next section for an overview).

Despite the identification of potential mechanisms, studies on social capital and health fail to connect with a theoretical model of health production, particularly the Grossman health model (Grossman 1972a, b), thereby depriving them of formal grounding. In this influential model of health demand, Grossman posits that health, like human capital, is produced using various market and non-market inputs. Initially endowed with health stock at birth, individuals maintain or produced the level of health desired by consuming various inputs including time, medical care, housing, exercise, education and other goods.

Conversely, studies in health economics which follow Grossman’s model largely ignore the potential of neighbourhood social capital in influencing individual health decisions. How neighbourhood social capital produces a better quality of life through health benefits for neighbourhood residents is left unspecified. Another potential shortcoming of studies on neighbourhood social capital and individual health outcomes is that they often rely on respondents’ reports of their neighbourhood social environment. The assessment of social capital was obtained from the same respondents whose health outcomes were measured and this raises a potential reflection problem (Manski 1993), which might prevent the identification of causal effects. Also, the level of spatial aggregation to define ‘neighbourhoods’ has varied across previous studies. For example, many studies in the UK, admittedly by necessity rather than by design, use the administrative units of wards as a proxy of ‘neighbourhoods’ – which many consider to be too large and heterogeneous for studying the impact of neighbourhood social environments on health outcomes (e.g. Mohan et al. 2005). In 2009 the population of wards ranged from 90 in Walbrook to 32,373 in Sparkbrook with a mean of 5,945 (Office of National Statistics www.statistics.gov.uk/statbase/ Accessed 29 October 2010). Finally, rarely does a study on the effects of neighbourhood social capital on health outcomes use a widely validated health instrument.

This chapter contributes to the literature on neighbourhood effects and health outcomes by proposing an extension of the influential Grossman model of health
Neighbourhood Social Capital and Individual Mental Health

(Grossman 1972a, b), by explicitly including interactions with the neighbourhood context. The extended model elaborates on social interactions and their effects on individual decisions, particularly health maintenance and health risk decisions. I shall draw upon the Blume-Brock-Durlauf social interaction model which will be discussed below (Blume 1993; Brock 1993; Durlauf 1997; Brock and Durlauf 2001a, b; Durlauf 2002; Blume and Durlauf 2005) to study the effect of social capital on mental health, using data from the Welsh Health Survey 2007 (WHS) and the Living in Wales 2007 (LiW) survey.

Instruments or exclusion restrictions that are theoretically motivated within the extended Grossman model are readily obtained from other studies in public health, epidemiology, and economics using the Grossman model within a neighbourhood context. For this study neighbourhoods are defined as lower super output areas (LSOA), a geography purposefully designed for social research, with a mean population of about 1,500. For comparison, wards have a mean population of about 2,500 people in Wales and a general practice or ‘primary care doctor practice’ has a catchment area with a mean population of 5,600 (Department of Health 2006). LSOAs are thus a finer scale for delineating neighbourhood for the purpose of health research. Moreover, this standardised geography enables independent measures of neighbourhood social capital and neighbourhood deprivation, obtained from administrative sources, to be linked to the data.

This study uses a widely validated instrument of health related quality of life, Short Form-36 (SF36), to measure mental health (Ware 2004; Wilkin et al. 1992). SF36 is the most frequently used measure of generic health status across the world (Bowling 2005: 63). It consists of 36 item health status questions and has been widely psychometrically validated. The items measure eight health dimensions including physical functioning, social functioning, role limitations due to physical problems, role limitations due to emotional problems, mental health, energy/vitality, pain and general health perception. Two summary scores are derived from these eight dimensions: the physical component summary and the mental component summary. It is the latter summary that used here.

Neighbourhood Social Capital and Health

The concept ‘social capital’ is the result of a crystallisation of ideas that have been around since researchers began to examine systematically the relationships between society, especially neighbourhoods, and individual outcomes. A definition that will suffice for our purpose comes from Putnam (1993: 167): “social networks and norms and trust” residing in a neighbourhood. It is obvious that social networks, norms and trust grow out of and circulate in social interactions; see also the discussion by Woolcock (1998). The literature on models of social interactions will be one of the main sources of econometric modelling ideas drawn upon in this study.

Recent works in social epidemiology have attempted to be more specific about how social capital in the neighbourhood can influence health and well-being (Berkman and
Kawachi (2000; Kawachi and Berkman 2003). Kawachi and Berkman (2003) write about four mechanisms linking neighbourhood social capital and individual health. First, more cohesive neighbourhoods are better equipped to disseminate information and mobilize collective action, for example, to prevent fast food outlets to open in a neighbourhood. Second, more cohesive neighbourhoods are better equipped to enforce and maintain social norms, and hence to maintain residents’ sense of health. However, it is now also recognised that social norms can influence health in negative ways, as shown in the case of obesity (Christakis and Fowler 2007). The third mechanism is indirect; collective efficacy and informal control in preventing crime and violence reduce environmental stresses suffered by residents in their day to day activities and increases the take up of health maintenance behaviour such as physical exercise. Finally, Marmot et al. (2010: 136) note that high levels of neighbourhood social capital also enable communities to be more responsive to national and local organisations that seek involvement and engagement at the local level. The above overview of mechanisms reminds us that social processes remain to an important extent rooted in places.

The Grossman Model of Health and Its Extensions to Neighbourhood Effects

The formal model of neighbourhood social capital and individual health outcomes developed in this chapter draws on the Grossman model (Grossman 1972b; see also Grossman 1972a). In the Grossman model, health is produced using various market and non-market inputs. Initially endowed with health stock at birth, individuals produced the level of health desired by consuming various inputs including medical care, housing, exercise, education and other goods. Following the notation of Case and Deaton (2005), assume there is an instantaneous felicity function to represent the utility of consumption for an individual where $a_t$ is age, $c_t$ is consumption, and $H_t$ is the stock of health. Health is produced according to:

$$H_{t+1} = \theta m_t + (1 - \delta) H_t$$

(8.1)

where $m_t$ is the decisions and behaviours for maintenance of health (including medical care bought and health behaviours like regular physical exercise ($m^+_t$), and smoking ($m^-_t$), positive and negative behaviours respectively), $\theta$ is the efficiency or conversion factor which is affected by education (and other socioeconomic status indicators) and $\delta$ is the rate of health deterioration at $t$. People maximise a life cycle welfare function:

$$U = \sum_{0}^{T} (1 + \rho)^{t} \nu(c_t, H_t)$$

(8.2)
where $\rho$ expresses time preference, and $T$ is the length of life. The welfare function is optimized subject to full wealth constraints incorporating both wealth and time limits:

$$
\sum_{t=0}^{T} \frac{c_t}{(1+r)^t} + \sum_{t=0}^{T} \frac{p_m m_t}{(1+r)^t} = W_0 + \sum_{t=0}^{T} \frac{y_t(H_t)}{(1+r)^t}
$$

(8.3)

where $r$ is the market rate of interest, $p_m$ is the price of medical care and other health behaviours, $W_0$ is initial assets, and $y_t(H_t)$ is earnings, itself a function of health.

Optimising the welfare function subject to the constraints (3) and the changes in health stock (1) gives insights into the role of education and inequalities in health. These have been widely tested empirically by assuming functional forms of the elements of the theory (often of Cobb-Douglas form). Wagstaff (1986) provides some example assumptions which enable empirical estimation. On estimation, Van Doorslaer (1987) recommends a focus on the health production function to avoid problems when estimating the health demand function. Equations for health production function and for health maintenance suitable for estimation are:

$$
H = H(M, W, X, \mu_h)
$$

(8.4)

and

$$
M = M(W, Y, \mu_m)
$$

(8.5)

where $W$ is wealth, $X$ and $Y$ include age, education and other exogeneous variables; and the $\mu$’s are residuals.

This is emphatically a recursive or triangular system as $M$, in turn, enters the health production function. Maintaining or neglecting health is affected by various determinants including access to wealth and individual resources; in turn, health maintenance ultimately affect individual health stock or health status. This system is also known as multiprocess system. Recently, for example, Balia and Jones (2008) estimated a similar recursive system of health maintenance behaviour, health outcomes and mortality. Their recursive structure is intuitively and formally in this order: health maintenance, health outcome, mortality.

I propose an extension broadening the formal model to include neighbourhood effects. This extension acts as a bridge between the economics of health and epidemiology and public health. In the Grossman model, demand for the maintenance of health, $M$, is narrowly defined for each individual. However, if we construe maintenance to include the general maintenance of health and the avoidance of health risks then we are in a position to include neighbourhood effects. As explained earlier, the neighbourhood context can be expected to influence individual health outcomes. The inclusion of neighbourhood effects have the potential to better explain health outcomes, and offer scope for policy intervention.

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1 The published version dropped citation to Grossman and introduced a typographic error compared to the working paper version.
Statistical Mechanics of Social Interactions, Social Capital and Health

The theoretical justification for including broader actions, specifically neighbours’ actions, on a resident’s individual health is grounded in works on social interaction and its identification (Blume 1993; Brock 1993; Manski 1993; Durlauf 1997; Young 1998; Becker and Murphy 2000; Manski 2000; Brock and Durlauf 2001a, b; Glaeser and Scheinkman 2001; Durlauf 2002; Glaeser et al. 2002; Glaeser and Scheinkman 2003; Cutler and Glaeser 2005; Durlauf and Fafchamps 2005; Blume and Durlauf 2005). Blume, Brock and Durlauf in a series of papers cited earlier draw upon statistical mechanics to understand the process of social interactions and how individual choices within them give rise to interesting aggregate behaviours. In our context, social interactions facilitate the various forms of social capital which give rise to aggregate or widespread health behaviours such as jogging in the neighbourhood or smoking.

I follow closely Durlauf (1997) and Brock and Durlauf (2001b) which consider a binary choice setting. This setting allows all parameters to be given their structural interpretation and facilitates econometric identification. Other works (Brock and Durlauf 2001a; Durlauf 2002) discuss identification in a linear-in-means setting as discussed below. Each individual is set in a population \( N \) where social interactions are present. Each individual resident chooses a binary action \( m_i \) with support \( \{−1, 1\} \). This support, instead of the usual \( \{0,1\} \), is common in a social interactions model and shows its provenance in statistical mechanics. There the support is typically ‘spin up’ and ‘spin down’ and the aggregate behaviour of the ‘population’ of interest is typically macroscopic magnetization. Intuitively, these spin directions map onto jogging or not while macroscopic magnetization maps onto neighbourhood health activity.

Individual utility \( V(m_i) \) is assumed to consist of three terms: private utility associated with a choice, \( u(m_i) \); social utility associated with the choice, \( S(.,.) \); and a random utility term which is independently and identically distributed, \( \epsilon(m_i) \); in the following equation:

\[
V(m_i) = u(m_i) + S(m_i, \mu^c_i(m_i)) + \epsilon(m_i). \quad (8.6)
\]

The term \( \mu^c_i(m_i) \) denotes the conditional probability that resident \( i \) puts on the choice of others at the time of making his or her own decision. In case of indiscriminate or total strategic complementarity, this social utility depends solely on \( \bar{w}^c_i = (N−1)^{-1} \sum_{j \neq i} w^c_{i,j} \), where \( w^c_{i,j} \) denotes the subjective expected value from the perspective of resident \( i \) of resident \( j \) choice.

\(^2\)The closely related field of spatial statistics which is interested in spatial interactions also draws upon the same statistical mechanics literature, see Ripley (1990).

\(^3\)Their model parallels the probability structure of the so-called Curie-Weiss model in statistical mechanics (Brock and Durlauf 2001b: 240). They refer to Ellis (1985, chap. 4) though Parisi (1988: 24) and Baxter (1982: 39) give more accessible accounts of Ising model with mean field which result in similar aggregate behaviour of magnetization \( m^* \).
Brock and Durlauf assume parametric forms for the social utility term and the probability density of the random utility term.\(^4\) They consider forms of social utility which exhibit indiscriminate strategic complementarity, as above, and are constant. The social utility then obeys \(\frac{\partial S(m_i, \tilde{w}_i^r)}{\partial m_i \partial \tilde{w}_i^r} = J > 0\). These forms allow capture of the degree of dependence across residents’ choices in a single parameter. With the constant degree of dependence, two forms of social utility suggest themselves. First, \(S(m_i, \tilde{w}_i^r) = J m_i \tilde{w}_i^r\) which exhibits proportional spillovers (strength of dependence). Second, \(S(m_i, \tilde{w}_i^r) = -\frac{1}{2} (m_i - \tilde{w}_i^r)^2\) which exhibits conforming or restraining norms. The latter penalises deviations from the mean more strongly than the former. Additionally, the two forms differ in levels.

With \(\epsilon\) assumed to be independent and extreme-value (Gumbel) distributed, the differences in the errors become logistically distributed. This widely used assumption in discrete choice literature, see e.g. Maddala (1983), allows a direct link between the theoretical model and its econometric estimation. To derive an equilibrium condition, we assume that decisions are made in noncooperative fashion, that is, each resident makes a choice without strategic communication or coordination. It follows from the extreme-value distribution assumption that:

\[
\text{Prob}(m_i) = \frac{\exp(\beta(u(m_i) + Jm_i \tilde{w}_i^r))}{\sum_{n_i \in \{-1,1\}} \exp(\beta(u(n_i) + Jn_i \tilde{w}_i^r))}.
\]  

(8.7)

The parameter gives the extent to which the deterministic components of utility determine actual choice. Because of independence, the joint probability over all choices is:

\[
\text{Prob}(m) = \frac{\exp(\beta \sum_{i=1}^{N} (u(m_i) + Jm_i \tilde{w}_i^r)))}{\sum_{n_1 \in \{-1,1\}} \ldots \sum_{n_N \in \{-1,1\}} \exp(\beta \sum_{i=1}^{N} (u(n_i) + Jn_i \tilde{w}_i^r)))}.
\]  

(8.8)

In the absence of a social interaction effect, \(J = 0\), the probability above is proportional to logistic density; in its presence, \(J \neq 0\), it captures interaction influence on behaviours in the neighbourhood. They then linearise the private utility \(u(m_i) = hm_i + k\) with a further inspiration from statistical mechanics.\(^5\) With this linearization, and using the definition of hyperbolic functions, the expectation becomes:

\[
E(m_i) = \tanh(\beta (h + J(N-1)^{-1} \sum_{i \neq j} m_{i,j}^r)).
\]  

(8.9)

\(^4\)Physicists, instead, start with the working assumption that the coordinates and momenta in the equation of motion, at equilibria, follow the canonical distribution given by the so-called Boltzmann formula. See Parisi (1988: 2, Eq. 1.5) or Baxter (1982: 8, Eq. 1.4.1).

\(^5\)Again see Parisi (1988: 2) on \(h\) the magnetic field and \(k\) the Boltzmann coefficient.
Furthermore, self-consistent and symmetric beliefs of residents (no residents are privileged compared to any other resident) give \( E(m_i) = E(m_j) \forall i, j \). Together with the last equation, these guarantee there exists at least one expected choice level \( m^* \) [1, Proposition 1]:

\[
m^* = \tanh(\beta(h + Jm^*))
\] (8.10)

Demonstrating the existence of equilibrium is one thing; achieving identification is another. Identification has always been a fraught issue in social interaction models. Manski (1995) and Durlauf (2002) have done a lot of work on deriving the conditions necessary for identification in linear and non-linear models of social interaction. Manski (2000: 129) lists a number of possibilities for identification including time lags and spatial lags of individual behaviours, non-linear models such as Brock and Durlauf’s above, or other non-linearities (such as median neighbourhood behaviour), and the use of instrumental variables which affect the outcomes of a subset of the neighbours. The last possibility is the most relevant here. Durlauf (2002: 468, proposition 3) demonstrates that two or more instruments are needed to estimate the effect of neighbourhood social capital on an individual outcome; see also Brock and Durlauf (2001) on linear-in-means model identification.

In sum, social interaction models lay the foundation for understanding the effects of social interaction in neighbourhoods on individual behaviour. With suitable instruments the effect of social capital, facilitated by social interaction on individual health, can be estimated. In fact, the formal model shows that ignoring social interaction may lead to an under-specified model, as leaving out social interaction effectively assumes such interactions to be negligible, \( J = 0 \), and omits any possibility of it being beneficial or harmful, \( J \neq 0 \).

Somewhat more prosaically, the effects of social interaction on health can be illustrated with an example on obesity. Food portions in America have increased over the last three decades (Nielsen and Popkin 2003). Finishing your meal and leaving an empty plate while dining out with friends, can be seen as an effect of social interaction influencing health behaviour in a negative way, \( m_i^* \). What one orders to begin with (“Just a salad for me.” Or “The full monty, please”) and what one finishes are not unrelated to what everyone else around the table orders or how much they eat. This mechanism can be extended to the neighbourhood social context over time. For instance, Christakis and Fowler (2007) suggest that in Framingham, part of the greater Boston area, a network of friends acted as the conduit of an acceptable norm of body weight. Operating over 30 years, interactions in this network of friends led to an increase in obesity through their social interactions. The authors were careful to account for individual socio-demographic factors and other place-based factors. Across the Atlantic, Tampubolon et al. (2009) found, using data from Wales, that friendly neighbours and neighbourhoods can also lead to an increase in obesity. They also separated out the effects of individual sociodemographic and geographic factors in a multilevel multiprocess model which simultaneously explained consumption, physical exercise and obesity. Both
these empirical studies go some way towards revising the notion that social capital is always or primarily associated with positive benefits as read by Durlauf and Fafchamps (2005).6

Glaeser and Scheinkman (2003: 352) show that the so-called moderate social influence condition holds. It means the effect of one’s action on one-self must be greater than the induced effect through social interaction on one’s neighbours. Again, using obesity as an illustration: jogging, a health maintenance behaviour, by an individual should improve the individual’s body mass composition. Ceteris paribus, this improvement should be greater than induced improvement in the body mass composition of the neighbours. Some neighbours were inspired to take up jogging while others were not. Alternatively, consider smoking, a well-known health risk. Smoking by an individual harms the individual’s health. This deleterious effect should be more severe for that individual than the harm induced in the health of the neighbours through either passive smoking or through social interaction or social norm effects. The cases of excessive drinking and social drinking work similarly. In these cases, the moderate social influence condition is satisfied. Because social interaction can produce discrete multiple equilibria in health behaviours, it is not surprising to observe that different neighbourhoods in greater Boston (for instance, Framingham versus Backbay) possess different obesity rates. The discreteness, and hence the possibility of estimating them, is guaranteed by the moderate social influence condition.

Notably, this moderate social influence condition is consistent with the basic tenet of epidemiology or public health research in the form of ‘population strategy’. In the words of Rose (1992: 135) “A 10% lowering of the population’s levels of blood cholesterol can be expected to reduce coronary heart disease by 20–30%, and such a reduction of a condition that now kills one-quarter of the population would be a benefit indeed. A reduction of one-third in the nation’s salt intake, … might also reduce by up to one-half the number of people requiring drug treatment for hypertension.” It is well known that neighbourhood effects on health behaviour are usually much smaller, often an order of magnitude smaller, than the effects of individual characteristics (in individual level regression or multilevel regression models). The threshold for effect magnitude in a public health setting can be lower than that in a clinical setting. An intervention bringing a 2% decrease in the average population body mass index is already considered important though a larger effect by an order of magnitude is perhaps needed for a clinically obese individual.

6 In this connection, none other than Brock and Durlauf (2001a, p. 166) would welcome such empirical studies. “… this hardly means that these literatures [under-theorised empirical studies in the sense below] are incapable of providing useful insights. In this respect, we find arguments to the effect that because an empirical relationship has been established without justification for auxiliary assumptions such as linearity, exogeneity of certain variables, etc., one can ignore it, to be far overstated. In our view, empirical work establishes greater or lesser degrees of plausibility for different claims about the world and therefore the value of any study should not be reduced to a dichotomy between full acceptance or total rejection of its conclusions. Hence the determination of the plausibility of any exclusion restriction is a matter of degree and dependent on its specific context.”
This lower threshold for population or higher sensitivity is accepted because one bears in mind that the ultimate effect is for the whole population and not confined to a single individual.

In parallel to theoretically recognising the importance of social interaction, it is practically acknowledged that built (physical) and social features of neighbourhood can induce benefits as well as pose risks to health (Srinivasan et al. 2003). In sum, the recursive system (Eqs. 8.4 and 8.5) incorporating insights from social interaction (Eq. 8.10) is modified by including neighbourhood effects. These include effects such as neighbourhood social capital and neighbourhood deprivation (to capture lack of leisure space for social interactions), $Z$, in the health production function. This is estimated as a reduced form using instrumental variable estimation.

The extended model can also be presented as in Fig. 8.1 where it is depicted that processes determining health are not circumscribed entirely within the individual but are also affected by neighbourhood social capital and deprivation. By implication, although this extended model is conceived to explain mental health, its application is broad and encompasses other health outcomes such as obesity. The demonstration below shows promising ways of examining how individual and neighbourhood factors bring about healthy outcomes.

**Instruments for Estimating Neighbourhood Effects**

The moderate social influence condition is not a constructive condition; it does not show how to estimate the effect of individual and neighbourhood factors. In the absence of a randomised experiment moving residents from one neighbourhood to
another, instrumental variable estimation is deemed the most appropriate technique to avoid bias estimates. Instruments, \( v \), must satisfy both exclusion restriction \( \mathbb{E}(v, \varepsilon) = 0 \), and relevance condition \( \mathbb{E}(v, Z) >> 0 \). It is well known that the exclusion restriction is essentially untestable due to unobserved \( \varepsilon \) hence a strong theory like the extended Grossman model is needed; whereas the strength of the correlation is routinely judged using a rule of thumb of \( F \) statistics greater than ten (Angrist and Pischke 2009; Cameron and Trivedi 2005).

Two instruments are proposed: ethnic diversity and length of stay in the neighbourhood. Neither the original Grossman model nor the proposed extension has any role for neighbourhood ethnic diversity, hence \( \mathbb{E}(\text{diversity}, \varepsilon) = 0 \). Ethnic diversity as an instrument thus satisfies the exclusion restriction. Furthermore, Putnam (2007) demonstrates that ethnic diversity can erode social capital. This motivates the instrument’s relevance, a test of which is provided below. The second instrument, length of stay in the neighbourhood acts as a proxy for individual attachment to the neighbourhood. Thus, the longer an individual stays in the neighbourhood the greater the intensity of any effect. Transient residents may not be affected one way or another by changes in neighbourhood ethnic diversity or social capital; long-time residents are. In summary, neighbourhood ethnic diversity and average length of stay in the neighbourhood are the instruments.

Data

The Welsh Assembly Government provided two independent surveys: Welsh Health Survey 2007 (WHS) and the Living in Wales 2007 (LiW) survey. The WHS selected a random sample of postcode sectors from the Post Office Postcode Address File. The sample was stratified by the 22 unitary authorities within Wales and 30 addresses were selected in each of them. Health measurements were requested by health care professionals for adults and all children aged between 2 and 15 years old living at the selected addresses. Written consent, in English and Welsh, for these measurements was obtained in advance. Interviewers, who speak English or Welsh, carried out the interviews and measurements according to a standardised written protocol (Fuller and Heeks 2008). More than four in five (82.1%) of adults selected responded to the survey. Further details are available in the WHS technical report.

The neighbourhood here is defined as the lower super output area (LSOA), a geography purposefully designed for social research (Policy Action Team 18, 2000; The Office for National Statistics, 2004; the Office of the Deputy Prime Minister 2005). Such a definition of a neighbourhood compares favourably with other studies using larger or more heterogeneous areas as proxies for neighbourhoods. Neighbourhood and individual variables were selected to conform to the extended Grossman model. The 2005 Index of Multiple Deprivation for Wales (WIMD) provided a measure of neighbourhood deprivation and was also used as a proxy measure for (the lack of) access to various facilities in neighbourhoods. Neighbourhood social capital measures capture the ‘trust’ and ‘network’ social
capital available in neighbourhoods. The LiW survey collected information on trust, sense of community and friendliness of neighbours with the following questions:

- Would you say that you trust ‘most of the people in the neighbourhood’, ‘many’, ‘a few’, or ‘do not trust people in the neighbourhood’?
- What do you like most about living in this neighbourhood? What else? Options include: ‘I feel like I belong to this neighbourhood’, ‘The friendships and associations I have with other people in my neighbourhood mean a lot to me’.

The information for these questions was averaged for each neighbourhood to construct neighbourhood social capital measures. The instrument of ethnic diversity is constructed using the Herfindahl index scaled to range between 0 and 1 as is common in the literature on ethnic diversity and social capital (Putnam 2007; Letki 2008). The average length of residency is constructed from the LiW survey accordingly since respondent was asked how long someone has been resident in the neighbourhood.

**Linking the Welsh Health Survey and Living in Wales Survey**

Neighbourhood social capital information from the LiW is linked to the WHS using the LSOA code assigned to each respondent. Data for a total of 1,152 neighbourhoods was matched to 13,917 respondents. In our data there was an average of approximately 19 residents per neighbourhood, with a minimum of 1 and a maximum of 56. Some respondents did not provide sociodemographic information required by the extended model, hence they were excluded from the analysis. The final dataset included 13,557 respondents with information on health, sex, social class, education, and tenure, plus neighbourhood information such as social capital and deprivation.

**Results**

Table 8.1 gives some summary statistics for the sample used. The Table shows that the data are gender balanced, but that the older age groups are overrepresented. Trust is quite abundant since residents tend to trust many people around them. Residents tend to agree with the statement that local friendships mean a lot to them and with the statement that they belong to the neighbourhood (from the potential categories of completely agree, agree, indifferent, and completely disagree).

The results of the instrumental variable estimation are given in Table 8.2. I elaborate on the neighbourhood deprivation and social capital effects first. Over and above individual determinants and behaviours, neighbourhood effects matter sizably and are significant at 10%. Neighbourhood deprivation reduces mental health quality. However, two forms of neighbourhood social capital more than compensate for this deleterious effect. Living in a trusting neighbourhood (compared to living in
### Table 8.1  Summary statistics for the sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean/mode*</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF36 physical summary</td>
<td>48.0</td>
</tr>
<tr>
<td>Women</td>
<td>54%</td>
</tr>
<tr>
<td>Age (5 year group)*</td>
<td>55–59,75+</td>
</tr>
<tr>
<td>Employed</td>
<td>47%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1.4%</td>
</tr>
<tr>
<td>Professional</td>
<td>35%</td>
</tr>
<tr>
<td>Intermediate</td>
<td>19%</td>
</tr>
<tr>
<td>Degree educated</td>
<td>15%</td>
</tr>
<tr>
<td>Tenure own</td>
<td>78%</td>
</tr>
<tr>
<td>Tenure private</td>
<td>7.4%</td>
</tr>
<tr>
<td>Neighbourhood deprivation: WIMD 2005</td>
<td>20.88</td>
</tr>
<tr>
<td>Trust people in the neighbourhood</td>
<td>2.2 (Many)</td>
</tr>
<tr>
<td>Local friendships mean a lot</td>
<td>1.0 (Agree)</td>
</tr>
<tr>
<td>I feel like I belong to this neighbourhood</td>
<td>1.1 (Agree)</td>
</tr>
</tbody>
</table>

### Table 8.2  Neighbourhood social capital and individual mental health (SF36)

<table>
<thead>
<tr>
<th>Variable</th>
<th>β</th>
<th>p</th>
<th>β</th>
<th>p</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>−1.959</td>
<td>0.000</td>
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<td>1.118</td>
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a less trusting neighbourhood) independent of whether the resident is trusting of other people, increases the resident’s mental health by 1.4 points. To gain a sense of magnitude, SF36 (the Short Form Heath Survey frequently used to assess medical outcomes) is constructed to have a mean of 50 and a standard deviation of ten (Bowling 2005: 65). The second largest benefit for mental health outcomes is related to a sense of belonging where it improves mental health by 1.1 point. The generous level of significance is perhaps excused by the overall significance of two forms of social capital as well as the inefficiency of the estimator. Furthermore, given the predominantly null findings in the literature (Duncan et al. 1993; Sloggett and Joshi 1998; Mohan et al. 2005; Propper et al. 2005; Stafford et al. 2008), the overall pattern of significant effects of different forms of social capital is encouraging.

Tests of strength and relevance for the instruments ($F$, Hansen $J$ and its $P$ value) confirm the usefulness of the instruments in identifying the effects of social capital. In this context, one should not read too much into the substance of the relationship between the instruments and social capital (as captured in the implicit ‘first stage’ regression). There is nothing inevitable nor immutable about the relationship between ethnic diversity and residence length on the one hand and social capital on the other. For contrasting views about this, see Putnam (2007) and Letki (2008).

**Individual Effects**

The model in Table 8.2 also includes a range of control variables. The results show that overall men are more likely to report that they are healthier in comparison with women. As age increases people report that they are less healthy. The results show clear health inequality between occupational classes. Manual workers (compared to the intermediate and professional workers) tend to be less healthy. Another measure of socioeconomic status, education, appears not to stratify mental health in the population. Homeowners and private renters report better mental health than those living in social housing such that homeowners’ health is a full three points better that that of social renters. Housing tenure is the second best predictor of mental health, an unsurprising result. Wealth, represented through housing is well known to improve health since it enables access to healthier foods and more active leisure activities along with other advantages. However, reverse causality is also likely to play a role as healthy people are more likely to be home owners.

Last years subjective health condition (i.e. the individual’s assessment of their general health in the previous year) is the strongest predictor of mental health. If mental health was poor, then the current state of health is also likely to be poor. Respondents who smoke and drink alcohol report better mental health than non-smokers and non-drinkers (Lasser et al. 2000; Hughes et al. 1986). There is a sizeable literature on these behaviours which discusses these behaviours as somehow mentally ‘comforting’. For instance, Lasser et al. (2000) elaborates on the relationship between smoking and mental health. Notably, the sizes of the effects are
comparable to those of social capital. In other words, a similar improvement in mental health can be gained by smoking/drinking (generally accepted as a health risk) as is obtained by living in a trusting neighbourhood.

**Discussion and Conclusion**

This chapter contributes to the literature on neighbourhood social capital and health by extending the Grossman health model by explicitly including interactions between individuals within a neighbourhood context. The extended model draws upon the Blume-Brock-Durlauf social interaction model and includes social interactions and their effects on individual mental health. Compared to recent studies on neighbourhood social capital and health in developed countries such as Sweden, New Zealand and England (Blakely et al. 2006; Islam et al. 2006; Duncan et al. 1993; Sloggett and Joshi 1998; Mohan et al. 2005; Propper et al. 2005; Stafford et al. 2008) the study reported in this chapter finds contradicting evidence with neighbourhood social capital generally being beneficial to individual mental health.

The evidence presented here is obtained using a combination of an extended theoretical model and an instrumental variable (IV) method for causal estimation. The extended theoretical model allows causal effects of neighbourhood social capital on health to be estimated. It achieves this by motivating the strong instruments of ethnic diversity and length of stay in the neighbourhood which help to recover the effect of neighbourhood social capital on individual health related quality of life. Various aspects of neighbourhood social capital, such as social cohesion aspects (trust, a sense of belonging) are effective in improving individual health. Each of these aspects of social capital is shown to more than compensate for the deleterious effect of overall neighbourhood deprivation. These causal effects help to identify entry routes for public health interventions involving the neighbourhood as well as the individual and could include, for instance, interventions to make neighbourhood spaces friendlier for interaction.

Given that the effect of neighbourhood social capital on individual health has so far proved elusive in other industrial countries, why is Wales different? It might be tempting to explain this result in the commonly accepted argument of egalitarian society (Islam et al. 2006). In highly unequal societies, neighbourhood social capital tends to be effective to fill in the vacuum of needed health services that are not provided by the state or other organisations. Yet this is not the case with Wales since the UK National Health Service provides such services.

The extended Grossman health production function combined with independent neighbourhood social capital measures may have uncovered the elusive effect of neighbourhood social capital. Previous studies have not benefited from recent methodological development nor have the fortune of access to independent data (e.g. neighbourhood data are often derived from the same individual sample). Mohan
et al. (2005) for instance desired for the latter to address their null finding on the effect of social capital.

This study indicates that the extended Grossman model is applicable in settings other than health quality of life such as obesity (Tampubolon et al. 2009) and it facilitates the tracing of the mechanisms by which neighbourhood effects improve individual health. The last words should probably go to Geoffrey Rose, the eminent public health educator. Despite the difficulties, anticipated by prominent economists, facing researchers setting out to examine the effects of social interactions in the neighbourhood on individual health, one should not be disheartened. Ultimately, as Rose (1992: 161) insisted, “The primary determinants of disease are mainly economic and social, and therefore its remedies must also be economic and social. Medicine and politics cannot and should not be kept apart.”

Acknowledgments I thank the Welsh Assembly Government – Llywodraeth Cynulliad Cymru – for funding this work. Data used in this analysis are provided by the Government under contract designed to protect the anonymity of respondents and neighbourhoods. Ichiro Kawachi and Subu Subramanian have been especially generous with their ideas for which I am in debt. I am also grateful to the participants of the seminar series “Neighbourhood Effects” and in particular to Maarten van Ham and David Manley who organised the series.

References


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