Social Capital and Health Inequality: Evidence from Taiwan[*]

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ABSTRACT

Does social capital, resources embedded in social relationships, influence health? This research examines whether social capital impacts depressive symptoms and overall perceived health status over and above the effects of social support. Our analyses use unique data from the Taiwan Social Change Survey collected in 1997, and measure social capital and social support through two network instruments (the position generator and the name generator). Results replicate the effects of social support, as measured through the name generator, on both outcomes. Results show that social capital, as measured through the position generator, has direct effects on both outcomes net of social support, while social support is a stronger predictor than social capital. This research indicates that social capital contributes to health beyond and distinct from the contribution of social support. This research suggests that social capital and social support are two independent relationship-based causes of disease and require different instruments.

Key words: social capital, social support, health inequality

Social relationship is one of the most well-established social antecedents of disease (House, Landis, and Umberson 1988). Its association with health inequality has been a long-lasting tradition in medical sociology. Among the diverse aspects of social relationship, social support has received the bulk of research attention (Thoits 1995). Medical sociologists are now challenged to elaborate different aspects of social relationship through recent mainstream sociological theories derived from the social network perspective (House et al. 1988; Lennon 1989). Prominent among these theories is the notion of social capital, resources embedded in social relationship. Social capital has garnered increasing attention in the sociological literature (Portes 1998). However, the question of whether it influences health over and above the effects of other social relationship concepts remained under-explored.

Data from the Taiwan Social Change Survey collected in 1997 provide a unique opportunity to examine whether social capital impacts depression and self-reported health beyond and distinct from the effect of social support. These data contain two different network instruments -- the name generator and the position generator. We can derive social capital measures and social support measures from each instrument, and compare their relative usefulness in explaining the variation in depression and self-reported health. This paper is organized as follows: First, we introduce social capital theory, and distinguish social capital from other relationship-based causes of disease, social support in particular. We then derive hypotheses from social capital theory, along with the social support hypothesis. Next, we conduct analyses using the Taiwan data. We conclude with the theoretical and methodological implications of this study for future research.

SOCIAL CAPITAL AS A NETWORK RESOURCES THEORY

Social capital has a broad range of definitions (Coleman 1988; Bourdieu 1983/1986; Lin 2001; Putnam 1993). While this article does not attempt to reconcile these debates, it contributes to this burgeoning literature by asking whether social capital theory as proposed by Lin applies to health inequality. This theory is grounded in the classic tradition of capital theories (e.g., Marx's capital theory, human capital theory, cultural capital theory) that explicate the nature of various types of capital and how each generates returns to an actor. It defines social capital as "resources embedded in a social structure that are accessed and/or mobilized in purposive actions" (Lin 2001: 29). It presupposes a hierarchical social structure in the shape of a pyramid, where resource allocation depends on structural positions (e.g., education, occupation, authority). It further specifies social capital as resources embedded in one's social networks (Lin 1999b), that is, structural positions of one's network members. Social capital differs from personal capital (e.g., economic capital, human capital, cultural capital). Personal capital stems from an individual perspective, and is controlled by individuals themselves. Social capital comes from a relational perspective, and is possessed by individuals' network members. Individuals can access and use social capital only through their social ties with their network members.

Social capital measures can be derived from two network instruments, the name generator and the position generator. The name generator is not as useful and efficient as the position generator for capturing social capital (Van der Gaag, Snijders, and Flap 2008). The name generator maps personal networks (McCallister and Fischer 1978). It asks respondents to name a fixed number of contacts (usually five) with whom they

discuss important matters (Burt 1984). Social capital is indicated by structural positions of named contacts. The name generator captures networks characterized by strong ties (i.e., high-intimacy relationships), small size, higher socioeconomic homogeneity, bounded contents and locations (Campbell and Lee 1991; Granovetter 1973; Marsden 1987). Further, it focuses on individuals rather than structural positions, and fails to capture the full range of resources embedded in social networks (Lin 2006).

In contrast, the position generator maps positional networks (Lin and Dumin 1986; Lin, Fu, and Hsung 2001). It asks respondents to identify contacts associated with a representative sample of ordered structural positions, occupational positions.[1] If respondents know several people in that type of position, they are usually asked to name the one that occurs to them first. Social capital is indicated by the distribution of accessed positions. The position generator captures networks less constrained by strong ties, locations, contents, and homogeneity (Lin et al. 2001; Lin forthcoming). Also it centers on structural positions network members occupy, and catches the core meaning of social capital – resources embedded in social networks. It proves to be flexible, reliable, valid, and economical in describing access to social capital across societies (Lin 1999a; Van der Gaag et al. 2008).

Social capital theory proposes that resources embedded in social networks may enhance one's life chances through four mechanisms: providing information, exerting influence, acting as social credentials, and reinforcing identification. These mechanisms apply to health outcomes. First, network members' resources can bring valuable, updated, and timely health information. Second, network members' resources, such as power and authority, can exert influence on health in the same way that individually possessed

power and social ordering affects health policies, controls health information, and impacts exposure and vulnerability to health risks (Adler et al. 1994; Williams and Collins 1995). Next, network members' resources can act as social credentials. A case study shows that the care and attitude from a hospital changed dramatically for a black woman near death after her ex-husband, a physician, advocated on her behalf (Abrums 2000). Finally, network members' resources can reinforce identification, which directly influences health, mental health in particular. [2]

Social capital theory has guided extensive research for the past three decades across society, but this research focuses on the role of social capital in improving economic well-being, especially status attainment in the labor market (Lin 1999a). While this theory implicates the contribution of social capital to physical and mental well-being, there is a lack of research on this contribution. An exception is praiseworthy as the first to focus attention on the health benefits of social capital (Acock and Hurlbert 1993). It uses the name generator and calculates the average educational level of named contacts to indicate social capital. The work finds that social capital enhances life satisfaction and reduces anomia. We are still not certain whether social capital measures derived from the position generator impact health, and whether the health effect of social capital is distinct from those of other relationship-based factors, social support in particular. To answer these questions we need to clarify the distinction between social capital and other relationship-based concepts, including social support.

Conceptual and Operational Clarification

While a growing body of multidisciplinary studies on individual and public health has labeled itself as "social capital" research (Baum and Ziersch 2003), this literature equates social capital with other relationship-based concepts such as social networks, social support, social integration, and social cohesion. Such equalization pours old wine into new bottles (Kawachi et al. 2004), and endangers the added theoretical value of social capital (Lin 2001; Portes 1998).

A social network is "a specific set of linkages among a defined set of persons, with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behavior of the persons involved" (Mitchell 1969: 2). The notion of social networks is not a theory but a perspective (Mitchell 1974). It focuses on causes and consequences of various network properties. Specific theories are derived from the social network perspective (Lin and Peek 1999; Pescosolido 2007), including social integration, social support, and social cohesion, as well as social capital. Social integration is the extent of participation in social networks, indicated by active engagement in social roles and social activities, and cognitive identification with network members (Brissette, Cohen, and Seeman 2000). Social support is the assistance from social networks, indicated by the quantity and quality of perceived or received help from network members (Lakey and Cohen 2000; Pearlin 1989). Social cohesion is the degree of social bonds and social equality within social networks, indicated by trust, reciprocity, and the lack of social conflict (Kawachi and Berkman 2000). By comparison, social capital comes from a resource dimension. It uniquely captures structural positions possessed by individuals' network members, which differs from individuals' own social

participation; their network members' assistance; or equality, trust, and reciprocity between them and their network members. [3]

Each of these social relationship concepts must be independently measured, and their relationships in causal sequence must be systematically investigated. Based on the available data set, our major goal in the present study is limited: to examine the relative contribution of social capital and social support to health. While both social capital and social support focus on network members, social capital reflects network members' structural positions, and social support refers to network members' emotional, instrumental, or informational assistance (House and Kahn 1985). Social support is a potential fundamental cause of disease (Link and Phelan 1995). A large body of literature has documented how social support protects against disease, especially mental illness (Cohen, Underwood, and Gottlieb 2000). Often the strong-tie relationship is used as a surrogate for social support (Lin and Peek 1999). Stronger ties benefit health to a greater degree than weaker ties by implicating higher availability of social support or providing higher quality of social support. Similar to measures of social capital, measures of tie strength can also be derived from both the name generator and the position generator. These are indicated by the closeness of relationships between individuals and their named contacts. We expect the name generator to be more capable of measuring social support, considering that it captures stronger ties than the position generator.

Both network instruments, the name generator and the position generator, are available in the data set we used. We thus had a unique opportunity to assess the relative effect of social capital and social support on health, and compare the relative usefulness of social capital measures and social support measures derived from each instrument.

HYPOTHESES

In this analysis we propose six hypotheses based on our theoretical and methodological interests, and available data. We first replicate the social support proposition.

H1: Social support has a positive effect on health net of personal capital.

Social capital theory expects the explanatory power of social capital for health to be independent of personal capital and social support, due to its unique mapping of network resources. The social capital hypothesis postulates that:

H2: Social capital exerts positive impact on health net of personal capital and social support.

Apart from filling in the gap between social capital and health, we also seek to make a methodological contribution. We compare two instruments, the name generator and the position generator, in capturing the health effects of social capital and social support. As explicated earlier, the position generator brings a better measure of social capital, while the name generator derives a better measure of social support. Thus the confirmation of our first two hypotheses is contingent on the type of instruments used.

H3: The social support proposition is more likely to hold for social support measures derived from the name generator than from the position generator.

H4: The social capital proposition is more likely to hold for social capital measures derived from the position generator than from the name generator.

Additionally, we are interested in the moderating effects of personal capital, one fundamental cause of disease and illness (Link and Phelan 1995), on the relationship between social capital and health. [4] Current social capital theory does not predict moderating relationships. We propose two alternative hypotheses to determine which moderating process is more likely. One hypothesis is the compensation effect proposition. People lacking personal capital are more motivated to resort to social capital for health resources. Thus their health is likely to benefit more from social capital than that of those with more personal capital (H5). The alternative hypothesis is the cumulative advantage proposition. People with more personal capital are able to invest more resources in mobilizing social capital, and obtain health resources from their network members more successfully and more efficiently. Thus their health is likely to benefit more from social capital than that of those with less personal capital (H6).

H5: Social capital has greater positive health effects for those with low personal capital than for those with high personal capital.

H6: Social capital has greater positive health effects for those with high personal capital than for those with low personal capital.

DATA AND METHODS

Data

Data are from the Taiwan Social Change Survey collected in 1997 by the Academia Sinica in Taiwan, a capitalist Chinese society.[5] The detailed survey procedure has been reported elsewhere (Lin et al. 2001). It comprises an islandwide stratified probability sample of adults aged twenty to seventy-four, with interpersonal interviews of 2,835 respondents. The data are quite unique. They are the best data available that include both the position generator and the name generator. They contain information on two well-established self-rated health measures: CES-D (the Center for Epidemiological Studies Depression Scale) and self-reported health.[6] Excluding respondents who do not have complete information on all analytic variables, the analysis sample is composed of 2,081 adults, representing 73 percent of the total sample.[7] Table 2 summarizes sample characteristics.

Table 1 about here

Dependent Variables

Depression. This survey included the original twenty CES-D items (Radloff 1977). In our sample, the summated total score ranged from 0 to 53. The distribution of depressive symptoms is rightly skewed. We applied a square root transformation to normalize this variable.

Self-reported health. This survey asked respondents to rate their own health status with the question, "On the whole, how do you evaluate your health condition?" This item

is rated on a four-point scale (1=very good, 2=good, 3=not very good, and 4=not good at all). We reversed the order of values. The higher the score, the healthier respondents feel.

Explanatory Variables

The survey used the position generator to capture positional networks, and the name generator to map two functional networks: emotional networks and instrumental networks. For each of these three networks, social capital measures are based on occupational positions of network members, while social support is based on the strengths of relationships between respondents and their network members. Table 2 shows the distribution of these measures.

Table 2 about here

Position-based social capital. The position generator listed a sample of fifteen ordered occupational positions salient in Taiwan, ranging from housemaids/cleaning workers up to physicians (see Table 1). It asked respondents, "Of your relatives, friends, and acquaintances, are there any who have the jobs listed in the following table?" If respondents knew several contacts who held a particular job, they were asked to name only the one that occurred to them first. We created three social capital indices: extensity, upper reachability, and range. Extensity estimates the quantity of social capital; it is the total number of occupations in which respondents identified one contact. Its values range from one (i.e., respondents knew one contact in only one of the fifteen listed positions) to fifteen (i.e., respondents knew one contact in each of the fifteen listed positions).[8] Upper

reachability indicates the quality of social capital. It is the highest prestige score of occupations that respondents have access to.[9] Its values range from twenty-two (i.e., respondents only knew a housemaid/cleaner worker) to seventy-eight (i.e., respondents knew a physician). Range reflects the diversity of social capital. It is the difference between the highest and lowest prestige scores of occupations that respondents have access to. Its values range from zero (i.e., the highest and lowest prestige scores of accessed occupations were equal, or respondents knew one contact in only one of the fifteen listed positions) to fifty-six (i.e., respondents knew both a housemaid/cleaner worker and a physician).

Position-based social support. The survey did not ask respondents to rate the intimacy in their relationships with identified contact, but it did ask respondents about their role relationships. [10] We use the percentage of kinships among identified relationships to indicate tie strength. The higher the percentage, the stronger the ties.

Function-based social capital. For emotional networks, the survey asked respondents to name at most five contacts with whom they had communicated in the last year to discuss worries and personal problems, such as emotional problems and personal relations. For instrumental networks, it asked respondents to name at most five contacts that they reached for actual help or information in the last year when encountering difficulties in life, such as work, family, law, or illness. Similar to the measures of position-based social capital, we respectively created three emotion- and instrument-based social capital indices: extensity, upper reachability, and range. Extensity is the total number of unique occupational positions held by named contacts. Its values range from one (i.e., respondents named only one contact, or all named contacts held the same type

of job) to five (i.e., respondents named five contacts, and each contact held a unique job). Upper reachability is the highest prestige score of occupational positions held by named contacts, whose values range from twenty-two to eighty-five. Range is the difference between the highest and lowest prestige scores of occupational positions held by named contacts, whose values range from zero to around fifty-seven.

Function-based social support. The name generator measures emotion- and instrument-based social support through two indicators of tie strength. One indicator is relationship intimacy, with a four-point scale (1=not intimate at all; 2= not very intimate; 3= intimate; and 4= very intimate). We sum responses for each tie and then calculate average intimacy with the summed scores divided by the number of named contacts. The other indicator is the same as in the position generator, the percentage of kinships among identified relationships. We use both indicators for the purpose of comparing their health effects.

Control Variables

Based on previous literature, this study controls for respondent's demographic factors and personal capital. Demographic variables include age, gender (1=female), and marital status (1= married). Personal capital has two socioeconomic indicators: education as an ordinal variable with values ranging from one to fourteen, and average monthly income as an ordinal variable with values ranging from one to twenty-four. Income distribution is rightly skewed. We take its natural log.[11]

Analytic Strategy

We create OLS regression models for both outcomes. [12] Our basic model for each outcome only contains controlled variables. We add explanatory variables into two basic models based on their correlations with each outcome. We first respectively test the main effects of position-based, emotion-based, and instrument-based social capital and social support. We then examine independent effects of social capital net of social support, and the interaction effects of social capital with personal capital. We also use the instrumental variables (IV) method. The relationship between social capital and health we find using cross-sectional data may be an artifact of reverse causation or incidental association. The IV method helps us to identify the causality in this relationship.

RESULTS

Our basic models for depression and self-reported health only contained controlled variables (Models 1, 3 in Table 3). Consistent with previous studies, being a male, being married, and having more monthly income decreased depression, while increasing self-reported health. Age and education influenced self-reported health. Younger and more educated respondents feel healthier. Next, we respectively added position-based, emotion-based, and instrument-based social capital and social support into these two basic models based on their correlations with each outcome.

Table 3 about here

Position-Based Social Capital and Social Support

Three position-based social capital indices were highly correlated with each other

(p< .001). Factor analysis offers a singe factor solution. We constructed a composite variable (.36 upper reachability + .38 range + .35 extensity) to represent position-based social capital. [13] Position-based social capital was correlated with both outcomes in a protective direction (p< .001). [14] The position-based percentage of kinships was negatively associated with self-reported health (p< .001).

We then added position-based social capital into two basic models (Models 2 and 4 in Table 3). Position-based social capital significantly predicted depression (β=-.086, p < .01) and self-reported health (β=.032, p< .05). Its addition raised predictive powers in basic models respectively from .075 to .080 and from .114 to .116. Its addition also decreased coefficient magnitudes for marital status, education, and monthly income. Next, we entered the position-based percentage of kinships into the basic model for self-reported health (Model 5 in Table 3). The corresponding coefficient was not significant.

Emotion-Based Social Capital and Social Support

For emotion-based social capital indices, upper reachability and range were negatively correlated with depression (p<.10); upper reachability was positively associated with self-reported health (p<.01). For emotion-based social support, average intimacy was correlated with both outcomes in a protective direction (p< .01); the percentage of kinships was negatively associated with self-reported health (p< .01).

We then added upper reachability, range, and average intimacy respectively into the basic model for depression (Models 1, 2, 3 in Table 4), and upper reachability, the percentage of kinships, and average intimacy respectively into the basic model for self-reported health (Models 4, 5, 6 in Table 4). Among these variables, only average intimacy

exerted significant effects on depression (β=-.252, p<.01) and self-reported health (β=.112, p<.01). The addition of this variable raised the values of adjusted R-squared in basic models respectively from .075 to .094 and from .114 to .124.

Table 4 about here

Instrument-Based Social Capital and Social Support

For instrument-based social capital indices, upper reachability and range were associated with both outcomes in a protective direction (p< .05). For instrument-based tie strength, average intimacy was negatively correlated with depression (p< .01); the percentage of kinships was negatively associated with self-reported health (p < .01). Note that both gender and income are correlated with self-reported health and average intimacy in opposite directions (p<.01). The existence of opposite signs suggests that these two controls are potential suppressor variables for average intimacy (Sharpe and Roberts 1997). The importance of average intimacy may increase in the presence of these two suppressors. We chose to keep average intimacy in the following multivariate analyses on self-reported health.

We then added upper reachability, range, and average intimacy respectively into the basic model for depression (Models 1, 2, 3 in Table 5), and upper reachability, range, and two tie-strength indicators respectively into the basic model for self-reported health (Models 4, 5, 6, 7 in Table 5). Among these variables, only average intimacy exerted significant effects on depression (β=-.238, p< .01) and self-reported health (β=.072 p< .01). Adding this variable raised the predictive powers in basic models respectively

from .075 to .090 and from .114 to .118.

Table 5 about here

Position-Based Social Capital versus Function-Based Social Support

We further explored whether position-based social capital exerts effects net of function-based social support (see Table 6). We first entered position-based social capital and emotion-based average intimacy into two basic models (Models 1, 5); then entered position-based social capital and instrument-based average intimacy into two basic models (Models 2, 6); and next added three of them into two basic models simultaneously (Models 3, 7).

Table 6 about here

For depression, position-based social capital (β=-.074, p<.01) and emotion-based average intimacy (β=-.244, p<.01) had independent effects net of each other (Model 1). Position-based social capital (β=-.077, p<.01) and instrument-based average intimacy (β=-.231, p<.01) also had direct effects net of each other (Model 2). In Model 3 with all three variables, position-based social capital (β=-.073) and emotion-based average intimacy (β=-.174) still had significant effects at the level of .01, while the coefficient of instrument-based average intimacy became marginally significant (β=-.104, P<.10).

For self-reported health, position-based social capital (β=.026, p<.10) and emotion-based average intimacy (β=.109, p<.01) exerted effects independent of each

other (Model 5). Position-based social capital (β=.029, p<.10) and instrument-based average intimacy (β=.070, p<.01) also had main effects net of each other (Model 6). The coefficients of position-based social capital became marginally significant after the entry of each function-based average intimacy. In Model 7 with three variables, position-based social capital (β=.026, p<.10) and emotion-based average intimacy (β=.121, p<.01) still exerted direct effects. Note that emotion-based average intimacy explains away the effect of instrument-based average intimacy. Emotion-based social support mediates the relationship between instrument-based social support and self-reported health.

Additionally, we examined the moderating effect of personal capital on the relationship between position-based social capital and health. We constructed two product terms of position-based social capital separately with education and income, both of which were mean-centered. We entered each product term into Model 3 and Model 7 separately. Only the interaction term of social capital with education (β=.017, p<.05) increased the explained variance for depression (Model 4).

Finally, we applied the instrumental variables method to identify the causal order between social capital and health outcomes, based on our cross-sectional data. [15] The instrumental variables for position-based social capital are the length of time respondents lived in their current town (1=within one year, 2=1-4 years, 3=5-9 years, 4=10-14 years, 5=15-19 years, 6=20 years or more) for the prediction of depressive symptoms, and voluntary participation (1=yes, 0=no) for the prediction of self-reported health. Theoretically, these two instruments have direct positive association with the establishment of social ties and the accumulation of social capital, but no direct relationship with health outcomes. Statistically, both instruments have significant

coefficients in the first-stage multiple regressions of position-based social capital, but nonsignificant coefficients in the multivariate regressions of corresponding health outcomes. Our Hausman test results failed to reject the null hypothesis that OLS regression estimates (Model 3, 7 in Table 6) and IV regression estimates are equal at the significance level of .01 for both health outcomes. This evidence allowed us to comfortably assert that the relationship between social capital and health is not an artifact of reverse causation or incidental association.

CONCLUSION AND DISCUSSION

This research extends social capital theory into disease and illness. We examined whether social capital impacts depressive symptoms and overall perceived health status over and above the effects of social support, with measures of social capital and social support derived from two instruments (the position generator and the name generator). Main results from OLS regression analyses of both outcomes are consistent. First, findings support the social support proposition (H1). It holds only for function-based, especially emotion-based, social support. This supports our hypothesis that the name generator has greater power than the position generator in catching strong ties (H3). Second, findings demonstrate the social capital proposition that social capital has direct effects on both outcomes net of function-based social support (H2), while the effect size of social capital is smaller than that of function-based, especially emotion-based, social support. It holds only for position-based social capital. This supports our hypothesis that the position generator has greater strength than the name generator in capturing social capital (H4). Findings further show that social capital decreases depression to a greater

degree for those with less education. This supports one of our two moderating effect hypotheses (H5). Additionally, findings from instrumental variable analyses provide strong evidence for the causal flow running from social capital to health.

This study extends relevant literature theoretically in five ways. First, its findings advance our understanding of the social dynamics by which social capital influences health, although this study does not add statistically high explanatory powers to health stratification. Social capital is one of the most acknowledged contributions from sociology to other fields of social science over the past two decades (Portes 1998). Within sociology this concept has received little attention in health literature. This study shows that social capital is a social determinant of health. It sheds light on a new research area of social capital studies and on a new social source of persistent health disparities. Second, its results expand our knowledge of the relationship between two social causes of health, namely social capital and education. Social capital offsets educational inequality in depression. Its negative effect on depression is weaker for those with more education. Note that we report no evidence for the interaction between social capital and income. Future studies should explore the equalizing potential of social capital by examining its interplays with other health risk factors. Moreover, our findings enhance the significance of social relationships in the social production of health, and elaborate on how different aspects of social relationships can act as independent antecedents of disease. Social support is one of the most established relationship-based causes of health. This study indicates that social capital is another unique relationship-based health risk factor. Social capital influences health independent of social support, while the direct effect of social capital is smaller than that of social support. Besides, social capital theory is embedded in

the traditional stratification literature in sociology. The establishment of the linkage between social capital and health contributes to relating health disparities with general stratification theories in sociology. Additionally, our study strengthens the structural perspective in medical sociology, one unique sociological approach to health (Bird, Conrad, and Fremont 2000). Social capital can be another important approach to social structure and health because network members' structural positions reflect "structural arrangements in which individuals are embedded" (Pearlin 1989: 241).

This study also has methodological implications for future studies. It compares two network instruments, the position generator and the name generator, to test hypotheses on two health outcomes. Three groups of comparison results deserve discussion. First, both instruments have relative strengths and weaknesses. The position generator is more able to map social capital, and the name generator is better suited to capturing information regarding social support indicated by strong ties. Theories of interest should determine the use of specific network instruments in future studies. Second, the name generator with emotional contents is more capable of capturing strong-tie information than that with instrumental contents. Future studies should keep in mind its restricted functions when employing the name generator methodology. Moreover, between two indicators of tie strength in the name generator, the intimacy method is more powerful in indicating tie strength than the role relationship method. This is consistent with previous studies (Marsden and Campbell 1984). Future studies should favor the measurement of intimacy as a surrogate for social support.

This study is only a beginning effort in applying social capital theory to health stratification. Future studies are needed to confirm and generalize the contribution of

social capital to the social processes of disease production in two directions. First, given our results that social capital plays a stronger direct and indirect role for depressive symptoms than for self-reported health, future studies should examine the link between social capital and other health outcomes. Evidence from multiple outcomes will help to confirm a persistent causal association between social capital and health (Link and Phelan 1995). Furthermore, the strict conceptualization of social capital that Lin proposes helps to distinguish social capital from other relevant but distinct relationship-based causes of health (i.e., social networks, social support, social integration, and social cohesion). This study only examines the health effect of social capital net of social support. Future research should examine all these social antecedents of health and their causal relationships in a systematic empirical study for a more comprehensive understanding of how different relationship-based social factors operate together in the social production of health inequality.

There are also two data limitations that should be kept in mind. First, the data are based on a cross-sectional research design. Both social capital and health outcomes were measured at the time of the survey. Despite the fact that our instrumental variables analyses support the social causation argument that social capital primarily influences disease rather than vice versa, a process of social selection is possible. Physical or mental illness may prevent individuals from knowing or contacting others with higher social positions. Future studies should use longitudinal data to examine the competing arguments of social selection and social causation. Additionally, our data only allow us to measure position-based social support by the role relationship method. As our earlier results imply, function-based social support measured by the intimacy method has greater

explanatory power than that measured through the role relationship method. Our results in this paper may underestimate the health effect of position-based tie strength. Future studies should use the intimacy method to examine whether position-based average intimacy has a health effect and whether position-based social capital exerts health effect net of position-based average intimacy.

NOTES

1. Occupations are central to the stratification system in developed societies (Grusky 2001). The hierarchical ranking of occupations captures relative socioeconomic advantages of occupants in the stratification system. Much of the scholarly literature on stratification and mobility has been built on the analysis of the hierarchical structure of occupations and its effects on individual life chances.

2. Social capital may be a precursor of social support since network members' resources are drawn for various supportive purposes. This causal argument remains to be tested.

3. Some studies equate social capital with characteristics within neighborhood social networks, such as social integration, social support, and social cohesion (e.g., Carpiano 2006; Kawachi, Subramanian, and Kim 2008). Our discussion on the distinction between social capital and other relationship-based concepts applies not only to general social networks but also to neighborhood social networks. In brief, within neighborhood social networks social support is assistance from neighbors; social integration is individuals' participation within their neighborhoods; social cohesion is equality, trust, and reciprocity between individuals and their neighbors; and social capital, as Lin defines it, is structural positions of individuals' neighbors.

4. Due to limited space, the interactions between social capital and other health risk factors are beyond the scope of this paper, and will be examined elsewhere.

5. There have been no drastic social changes in Taiwan in the last ten years.

6. Chien and Cheng (1985) first translated the Chinese version of CES-D and found it applicable among Taiwanese adults.

7. To correct missing-data bias, we imputed missing values using the multiple imputation

method (Royston 2004), and reestimated our models. The results are similar to those reported here, with one difference. The significance for the effect of instrument-based average intimacy on depression increases from .10 (Model 3, Table 6) to .05. Thus, given sufficient sample size, the effect of social support indicated by instrument-based tie strength on depression will be stronger.

8. We excluded 373 respondents from our analysis sample who either knew no one in each of the listed fifteen positions, or named no contacts in their emotional or instrumental networks, because for them we could not derive the meaningful values of other social capital indices (i.e., upper reachability, range) as well as tie strength.

9. For the prestige scores of these occupations, we used the comparative occupational prestige scale (Treiman1977). There is strong agreement on this scale across societies, including Taiwan. We applied the same scale to occupations held by named contacts in the name generator.

10. Wording was as follows: "What is your relationship to them?"

11. Two socioeconomic indicators, employment status and occupational prestige score for the current or last job, are also possible confounders. We did not consider the former to avoid multicollinearity. This variable is substantially correlated with monthly income (.77, $p < .01$). We did not consider the latter for two reasons. First, its addition reduced the analysis sample size by 25 percent. Its values were missing for 524 cases who never worked. Second, its coefficients were not significant in multivariate analyses.

12. Parallel analyses, using Poisson regression and negative binomial regression models to predict depression as a count variable and generalized ordered logit/partial

proportional odds models to predict self-reported health as an ordinal variable, found similar results. We report results from OLS for the sake of simplicity.

13. Results of factor analyses are available upon request.

14. Results of correlation analyses are available upon request.

15. Results of IV analyses are available upon request.

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Table 1 Summary of sample characteristics (N=2,081)

	Mean or Percent (Standard Deviation)
Health outcomes	
Summed depressive symptoms	13.61 (8.42)
Self-reported health	
Not good at all	1.63%
Not very good	8.75%
Good	56.13%
Very good	33.49%
Demographic factors	
Gender (female)	50.26%
Age	40.68 (13.37)
Married	71.84%
Socioeconomic factors	
Education	
Elementary school or lower	27.78%
Junior school	14.27%
High school	31.28%
College and graduate	26.67%
Monthly income (new Taiwan dollar)	
No income	24.56%
Less than 19,999	16.19%
20,000-39,999	29.89%
40,000 and more	29.36%
Occupational positions in the position generator (Occupational prestige scores, Treiman 1977)	
Physician (78)	54.78%
Lawyer (73)	26.77%
Owner of large factory/firm (70)	37.87%
Assemblymen/women (69)	33.30%
Manger of large factory/firm (62)	47.86%
High school teachers (60)	63.91%
Division head (55)	23.79%
Reporter (55)	22.92%
Nurse (54)	58.15%
Owner of small factory/firm (48)	73.81%
Police (40)	61.12%
Electrician (36)	74.68%
Truck driver (31)	55.02%
Office workman/guard (26)	47.57%
Housemaid, cleaning worker (22)	33.30%

Table 2 Distribution of social capital indices and social support measures (N=2,081)

	Position Generator	Name Generator	
	Positional Networks	Emotional Networks	Instrumental Networks
I. Social capital			
Extensity			
Mean	7.14	3.04	3.05
Standard deviation	3.69	1.22	1.22
Range of scores	1-15	1-5	1-5
Upper reachability			
Mean	70.20	45.33	46.45
Standard deviation	11.53	11.21	12.19
Range of scores	22-78	22-85	20-85
Range			
Mean	40.94	9.89	11.39
Standard deviation	15.84	10.01	10.87
Range of scores	0-56	0-56.57	0-56.57
II. Social support			
Percentage of kinships			
Mean	.26	.55	.65
Range of scores	0-1	0-1	0-1
Average intimacy			
Mean	--	3.35	3.37
Standard deviation	--	.61	.58
Range of scores	--	1-4	1-4

Table 3 OLS regression of depression and self-reported health on control variables, position-based social capital, and social support (N=2,081)

	Depression		Self-Reported Health		
	Model 1	Model 2	Model 3	Model 4	Model 5
Gender--female	.253***	.261***	-.102***	-.105***	-.101***
	(.115)	(.118)	(-.077)	(-.079)	(-.076)
Age	.001	.001	-.011***	-.011***	-.011***
	(.012)	(.014)	(-.230)	(-.231)	(-.229)
Married	-.444***	-.420***	.097**	.088**	.098**
	(-.181)	(-.171)	(.066)	(.060)	(.067)
Education	-.006	.001	.016***	.013**	.016***
	(-.020)	(.005)	(.087)	(.072)	(.086)
Monthly income (logged)	-.185***	-.167***	.091***	.084***	.089***
	(-.136)	(-.122)	(.111)	(.103)	(.108)
Position-based social capital					
Social capital factor		-.086***		.032*	
		(-.078)		(.048)	
Position-based social support					
Percentage of kinships					-.041
					(-.017)
Constant	3.938***	3.836***	3.445***	3.482***	3.456***
	(3.568)	(3.475)	(5.183)	(5.239)	(5.199)
Adjusted R-squared	.075	.080	.114	.116	.114

Note: standardized coefficients in parentheses; † $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$ (two-tailed tests).

Table 4 OLS regression of depression and self-reported health on emotion-based social capital and social support (N=2,081)

	Depression			Self-Reported Health		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Gender--female	.260***	.254***	.277***	-.107***	-.103***	-.112***
	(.118)	(.115)	(.125)	(-.081)	(-.078)	(-.085)
Age	.001	.001	.001	-.012***	-.012***	-.012***
	(.016)	(.012)	(.017)	(-.235)	(-.232)	(-.234)
Married	-.444***	-.444***	-.410***	.097**	.092**	.082*
	(-.181)	(-.181)	(-.167)	(.066)	(.062)	(.055)
Education	-.002	-.005	-.005	.013*	.016***	.015***
	(-.006)	(-.016)	(-.018)	(.070)	(.089)	(.085)
Monthly income (logged)	-.183***	-.183***	-.189***	.090***	.092***	.093***
	(-.134)	(-.134)	(-.139)	(.109)	(.112)	(.113)
Emotion-based social capital						
Upper reachability	-.003			.002		
	(-.026)			(.033)		
Range		-.003				
		(-.030)				
Emotion-based social support						
Percentage of kinships					.026	
					(.015)	
Average intimacy			-.252***			.112***
			(-.139)			(.102)
Constant	4.007***	3.956***	4.728***	3.393***	3.437***	3.096***
	(3.630)	(3.584)	(4.284)	(5.104)	(5.171)	(4.657)
Adjusted R-squared	.075	.075	.094	.115	.114	.124

Note: standardized coefficients in parentheses; † $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$ (two-tailed tests).

Table 5 OLS regression of depression and self-reported health on instrument-based social capital and social support (N=2,081)

	Depression			Self-Reported Health			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Gender--Female	.257***	.254***	.283***	-.105***	-.102***	-.098***	-.111***
	(.117)	(.115)	(.128)	(-.079)	(-.077)	(-.074)	(-.084)
Age	.001	.001	.001	-.012***	-.011***	-.011***	-.012***
	(.016)	(.013)	(.016)	(-.234)	(-.229)	(-.228)	(-.232)
Married	-.444***	-.444***	-.422***	.097**	.097**	.103***	.090**
	(-.181)	(-.181)	(-.172)	(.066)	(.066)	(.070)	(.061)
Education	-.002	-.005	-.004	.014**	.016***	.015***	.015***
	(-.008)	(-.015)	(-.014)	(.075)	(.088)	(.085)	(.084)
Monthly income (logged)	-.182***	-.181***	-.196***	.089***	.092***	.088***	.095***
	(-.133)	(-.132)	(-.144)	(.109)	(.112)	(.107)	(.115)
Instrument-based social capital							
Upper reachability	-.002			.001			
	(-.023)			(.023)			
Range		-.003			-.000		
		(-.031)			(-.003)		
Instrument-based social support							
Percentage of kinships						-.049	
						(-.028)	
Average intimacy			-.238***				.072**
			(-.126)				(.064)
Constant	3.989***	3.952***	4.697***	3.414***	3.446***	3.473***	3.214***
	(3.614)	(3.580)	(4.255)	(5.136)	(5.184)	(5.224)	(4.836)
Adjusted R-squared	.075	.075	.090	.114	.114	.114	.118

Note: standardized coefficients in parentheses; † $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$ (two-tailed tests).

Table 6 OLS regression of depression and self-reported health on position-based social capital and function-based social support (N=2,081)

	Depression				Self-Reported Health		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Gender--female	.283***	.289***	.289***	.280***	-.114***	-.113***	-.113***
	(.128)	(.131)	(.131)	(.127)	(-.086)	(-.085)	(-.085)
Age	.002	.002	.002	.000	-.012***	-.012***	-.012***
	(.019)	(.018)	(.019)	(.003)	(-.235)	(-.233)	(-.235)
Married	-.390***	-.401***	-.390***	-.396***	.075*	.082*	.075*
	(-.159)	(-.164)	(-.159)	(-.161)	(.051)	(.056)	(.051)
Education	.001	.002	.002	-.003	.013**	.013**	.013**
	(.003)	(.008)	(.005)	(-.009)	(.073)	(.071)	(.073)
Monthly income (logged)	-.173***	-.179***	-.177***	-.182***	.087***	.088***	.086***
	(-.126)	(-.131)	(-.129)	(-.133)	(.106)	(.107)	(.105)
Position-based social capital	-.074**	-.077**	-.073**	-.050†	.026†	.029†	.026†
	(-.067)	(-.070)	(-.066)	(-.046)	(.040)	(.044)	(.040)
Function-based social support							
Emotion-based average intimacy	-.244***		-.174***	-.174***	.109***		.121***
	(-.134)		(-.096)	(-.096)	(.099)		(.110)
Instrument-based average intimacy		-.231***	-.104†	-.104†		.070**	-.018
		(-.122)	(-.055)	(-.055)		(.061)	(-.016)
Position-based social capital*education				.017*			
				(.057)			
Constant	4.614***	4.582***	4.729***	4.785***	3.136***	3.258***	3.156***
	(4.180)	(4.151)	(4.284)	(4.336)	(4.718)	(4.901)	(4.748)
Adjusted R-squared	.097	.094	.098	.100	.125	.119	.125

Note: standardized coefficients in parentheses; † $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$ (two-tailed tests).