A Regression Model of Social Capital and Self-Evaluated Health

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***Abstract*—**The aim of this study was to map the social capital profile and examine the association between social capital and three dimensions of self-reported health in Taiwan. Data were taken from a nationwide survey conducted in 2010. The results confirmed that (1) there was no difference for social capital between males and females; (2) individual-level social capital was the consistent and significant predictor of physical, psychological and social health, while females' physical health was not as good as males'. Theoretical and empirical implications and future research are discussed.

***Keywords*—**social capital, self-rated health, physical, psychological, social health, guanxi

I. Introduction

Social capital literature has grown rapidly and the concept has come to be part of standard vocabulary in public health. And social capital has a broad range of definitions [1-4]. This article describes social capital and contributes to this burgeoning literature by asking whether social capital theory proposed by Lin can be applied to health.

Following Lin [5], social capital could have been considered as resources embedded within social networks that are used by individuals to facilitate particular actions. Characteristics of individuals would enhance or hinder access to social capital, then influence health. For example, gender difference in the creation of social capital was found by Emmerik [6]. Emmerik found that men were shown to be more effective in creating hard social capital which would be useful to accumulate task-oriented resources and achieve valued career outcomes.

Social resources embedded in networks may provide various benefits, such as information, influence, and control. Individuals access and use these resources for the creation of social capital has been demonstrated for various facets of life, such as job search [7], exposure to stress and access to social support [8], status attainment [9], and income differences [10]. Much has been said about the existence of social capital. Furthermore, Carpiano [11] found the residents may have network ties living outside of their neighborhood and receiving useful information from a variety of diffuse sources, and argued that, in terms of furthering health research on social capital, Granovetter's work [7] offers a nice bridge to more specific network approaches to social capital found in the non-health sociological literature.

While Lin's social network theory implicates the contribution of social capital to physical and mental well-being, but its concept and measurement remain under explored. Song and Lin [12] tested the impact of social capital on depressive symptoms and overall perceived health status, we are still not certain whether social capital measures derived from the position generator are associated with physical, psychological, and social health. To answer these questions, Lin's social capital theory was adopted and a nationwide data was analyzed.

This paper is organized as follows: (1) introducing social capital theory and its measurement, (2) literature review of related research, (3) conducting analyses using a set of nationwide data, and (4) theoretical and methodological implications are discussed.

II. Literature

In this section, the concept of social capital, Lin's social capital theory, and health related literature are introduced.

A. Social capital concept

In the past two decades, social capital in its various forms and contexts has emerged as one of the most salient forms of capital [13]. The concept of social capital has developed in areas such as sociology, education, and political economy and drawn on by public health researchers to discuss social effects on inequalities in health. In a brief review [14], the authors depicted three sources of the history of the term social capital, Pierre Bourdieu, James Coleman and Robert Putnam. Bourdieu [15] sees social capital as "made up of social obligations or connections". It is the aggregation of actual or potential resources which are linked to possession of a durable network of institutionalized relationships of mutual acquaintance and recognition, or in other words, to membership in a group [3]. For Coleman [16], social capital consists of two elements: it is an aspect of a social structure, and it facilitates certain actions of individuals with the structure. Thus, for Coleman and Bourdieu, dense or closed networks are seen as the means by which collective capital can be maintained and reproduction of the group can be achieved [3]. Putnam's [17] conceptualization of social capital is "features of social organization, such as civic participation, norm of reciprocity, and trust in others". Putnam argues that social associations and the degree of participation indicate the

extent of social capital in a society. These associations and participation promote and enhance collective norms and trust, which are central to the production and maintenance of the collective well-being.

However, Baum [18] indicated that the confusion of terminology and lacking theoretical rigor would give the complexity and subjectivity of the fundamental building blocks of social such as participation, trust, networks, and cooperation. Baum [16] also mentioned that some literature on social capital and health presents a romantic view that close knit communities are necessarily healthy, while it is possible that they can be exclusionary and distrustful of outsiders, and may not be healthy for those who are not part of them or those within them who disagree with the majority. In a national multilevel cohort study, Blakely, Atkinson, Ivory, Collings, Wilton, Howden-Chapman [19] concluded that there was no statistically independent association of a structural measure of neighborhood social capital with mortality. Lochner, Kawachi, Kenndy [20] concluded that insufficient theoretical and empirical work has been carried out to offer a definitive guide to the measurement of social capital after a review of the concept of social capital and related constructs. Hawe and Shiell [14] also suggested that the concept of social capital is too broad, and the science of social capital is relatively weak to explain health.

B. Lin's social capital theory

Lin's theory is grounded in the classic tradition of capital theories 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 which are accessed and/or mobilized in purposive actions' [3]. Thus, social capital contains three elements: resources embedded in a social structure; accessibility to such social resources by individuals; and use or mobilization of such social resources by individuals in purposive actions.

In Chinese society, individual ties that people build and maintain among themselves through various connections such as family, clan, clique, friends, classmate, and colleagues, are termed in Chinese as 'Guanxi' [21]. Guanxi, or interpersonal connections is the social structure for fulfilling moral and ethical obligations to one's family and pseudofamily. This kind of resources has been termed 'face' (mian zi) [22]. Face giving from friends and neighbors is important when the men had to rely on popular support for carrying out their duties in public domains. Face giving of this sort was also important when the men tried to mobilize tangible resources from the friends and neighbors on behalf of their families or pseudofamilies. In this sense, having face means having quanxi capital, or the capacity to mobilize social resources from guanxi networks; and losing face means lacking guanxi capital, or the incapacity to mobilize resources through guanxi networks.

The social capital theory has specifically proposed that access to and use of social resources embedded in social networks can have two types of outcomes, instrumental and expressive returns. For instrumental action, there are three possible returns: economic, political, and social. For expressive action, social capital is a means to consolidate resources and to defend against possible resource losses. Three types of return may be specified: physical health, mental health, and life satisfaction.

Chinese guanxi practices become into a flexible tool which allowed people to create trustworthy networks. Through guanxi practices, a broad scope of particularistic ties is formed that are maintained and mobilized for combination of instrumental and affective purposes [23].

There are two methodologies used to measure access to social capital, name generators and position generators. Position generator was proposed by Lin and associates [24]. This measurement samples positions in a hierarchical structure, rather than sampling ego-centered interpersonal ties. To the extent that social capital reflects embedded resources in the structure, then this approach should yield meaningful information regarding ego's access to such structurally embedded resources. From the responses, it becomes possible to construct three indicators. Range is the distance between the highest and lowest accessed positions, and it represents the accessibility to different hierarchical positions in the society. Extensity is the number of positions accessed and it indicates the heterogeneity of accessibility to different positions. Upper reachability indicates the prestige or status of the highest position accessed.

C. Social capital and health

The association between social capital and health is well demonstrated. Differences in the way that social capital is conceptualized leads to discrepancies in how it is measured [25, 26]. Some researchers take the position that social capital should be measured at community level, while several other researchers are in favor of an individual level analysis.

Nyqvist, et al. [27] demonstrated a positive association between individual-level social capital and self-reported health. Oksanen, et al. [28] analyzed a longitudinal data and found the social capital at work was a good predictor of employees' health. Baron-Epel, et al. [29] compared two communities and concluded that social capital factors may be associated with health to a higher extent in affluent populations with relatively high social capital and less so in low social capital and more traditional communities. Holtgrave and Crosby [30] found that 10% of the variance in obesity and 44% of the variance in diabetes was explained by social capital. Sundquist and Yang [31] analyzed data of 11,175 participants and construct the association between neighbourhood linking social capital and self-rated health. Litwin's study [35] on the elderly revealed that the more resourceful diversified and friend and neighbor network types were consistently associated with better scores on measures of basic and instrumental activities of daily living, and self-rated health.

There are also negative research findings. Kennelly [36] did not find any strong positive relation between the indicators of

social capital and population health. Hyyppa and Maki [37] showed that most participating activities do not associate with self-rated health. Veestra [38] found that civic participation is unrelated to health.

In spite of the above studies, Carpiano [32] found that the specific social capital forms were directly associated with both positive and negative health outcomes. And suggested that future studies should consider social capital resources and the role of differential access to such resources for promoting or compromising health. A given form of social capital may be useful in one context, but ineffective in another [33]. Poortinga [34] found that personal levels of social support contribute to a better self-reported health status.

III. Method

The sampling frame was island-wide and composed of a stratified (by administrative district) probability sample of over 15 years old persons including outlying islands and mountain townships. The over-all criterion that shoud be applied in choosing a sampling design is to so design the sample that it will yield the desired information with the reliability required at a minimum cost; or, conversely, that at a fixed cost it will yield estimates of the statistics desired with the maximum reliability possible [39].

Table 1. Area Sampling

Area	population	sample	ratio
Taipei County	**3,882,039**	**184**	**0.00004740**
Yilan County	**461,783**	**22**	**0.00004764**
Taoyuan County	**1,982,961**	**95**	**0.00004791**
Hsinchu County	**511,852**	**24**	**0.00004689**
Miaoli County	**561,622**	**27**	**0.00004808**
Taichung County	**1,562,657**	**74**	**0.00004736**
Changhua County	**1,311,701**	**62**	**0.00004727**
Nantou County	**530,198**	**26**	**0.00004904**
Yunlin County	**721,784**	**34**	**0.00004711**
Chiayi County	**546,901**	**26**	**0.00004754**
Tainan County	**1,103,517**	**52**	**0.00004712**
Kaohsiung County	**1,242,985**	**59**	**0.00004747**
Pingtung County	**881,385**	**42**	**0.00004765**
Taitung County	**232,688**	**11**	**0.00004727**
Hualien County	**340,794**	**17**	**0.00004988**
Penghu County	**96,459**	**4**	**0.00004147**
Keelung City	**387,624**	**19**	**0.00004902**
Hsinchu City	**412,850**	**19**	**0.00004602**
Taichung City	**1,076,161**	**51**	**0.00004739**
Chiayi City	**273,717**	**13**	**0.00004749**
Tainan City	**771,648**	**37**	**0.00004795**
Taipei City	**2,604,744**	**124**	**0.00004761**
Kaohsiung City	**1,528,306**	**73**	**0.00004777**
Kinmen County	**94,701**	**4**	**0.00004224**
Matsu	**10,016**	**1**	**0.00009984**
Total	**23,131,093**	**1100**	**0.00004756**

Because a complete frame of reference was not available, area sampling method was adopted. An area sampling is a method in which the area to be sampled is subdivided into smaller blocks which are selected at random and then subsampled or fully surveyed. All the 1100 sample came from 17 counties, 7 cities and 1 island. There were 2 respondents who

did not complete the questionnaire.

The questionnaire for generating social capital was adopted from Lin, Fu, and Hsung [40]. The respondents were asked 'among your relatives, friends, or acquaintances, are there people who have the following jobs?'. Following the questions were fifteen 'job' positions sampled from two structural dimensions: occupational prestige and class. Three indexes were constructed from the three position-generator items, extensity, upper reachability, and range. These three measures of position data were highly correlated, a composite variable was constructed. A factor score, as table 2, was computed for both male and female respondents as a weighed sum of the three measures (.02 extensity+.50 range +.51 upper reachability). Both range and upper reachability carried much more weight then extensity. This composite variable was social capital in this study.

The respondents made an assessment of their current health by rating the level of their physical, psychological, and social health on a line from 0 to 100.

Table 2. Factor structures of access to social capital

	Sample (N=1098)	Male (N=529)	Female (N=569)
Factor eigenvalues			
I	2.42	2.46	2.39
II	0.19	0.20	0.18
III	0.39	0.35	0.43
Factor loading			
Extensity	0.73	0.75	0.71
Range	0.97	0.97	0.97
Upper reachability	0.97	0.98	0.97
Factor scoring			
Extensity	0.02	0.02	0.02
Range	0.50	0.48	0.51
Upper reachability	0.52	0.53	0.51

IV. Result

Of all the 1098 respondents, there were more females (51.8%) than males (48.2%), as table 3. Over half of the respondents graduated from university. The means of physical, psychological, and social health were 67.30, 73.40 and 72.26 respectively. The average social capital was 55.70. Three indexes of social capital, following Lin, Fu, and Hsung [37], were constructed from the position-generator items: (1) extensity, (2) upper reachability, (3) range of prestige scores accessed. The description of social capital and its relation to health are shown as bellow.

A. Social capital

The respondents accessed 6 to 7 positions averagely, the highest prestige score of accessed position was 67, and the range of prestige scores of the highest and lowest positions was 42 points, as table 4. There was no significant difference between males and females for all the three indicators.

Table 3. Description of subjects

Variables	N	%
Gender		
Male	529	48.2
Female	569	51.8
Education		
Junior high school	96	8.7
Senior high school	312	28.4
University	690	62.8
Health	Mean	SD
Physical health (10-100)	67.30	15.77
Psychological health (0-100)	73.40	15.24
Social health (10-100)	72.26	14.65
Social capital (0-68.86)	55.70	17.23

As the detailed data on accessibility to each of the sampled positions, as shown in table 4, the most accessible positions included office workman/guard, nurse, electrician, police, physician, owner of small factory/firm, and high school teachers. These seven positions were accessed by more than half of the respondents. The least accessible positions included reporter, assemblymen/women, owner of large factory/firm, lawyer, and division head. These five positions were accessed by less than 30% of the respondents.

Comparing between male and female respondents, it was showed that males were more likely to access assemblymen/women, reporter, owner of large factory/firm, electrician, and truck driver; while females were more likely to access nurse. Because the physicians, lawyers of high prestige and the housemaids, workers of low prestige were equally accessed by males and females, there were no difference between males and females on upper reachability and range.

B. Social capital and health

Regression was applied to construct models for predicting physical, psychological, and social health. As table 5, social capital is a good predictor for all these three dimensions of health. Gender has significant negative effect on physical health. Obviously, females' physical health is not as good as males'.

Table 4. Summary of position-generated variables

Variables	Mean or Percent			Gender
	Sample	Males	Females	significance
Extensity	6.60	6.82	6.40	.066
Upper reachability	66.79	66.32	67.23	.386
Range of prestige	41.67	41.39	41.93	.601
Accessed positions				
Physician (78)	53.1%	51.8%	54.3%	.432
Lawyer (73)	26.5	26.1	26.9	.785
Owner of large factory/firm (70)	25.5	28.0	23.2	.072
Assemblymen/women (69)	23.6	27.0	20.4	.010
Manger of large factory/firm (62)	36.6	38.4	35.0	.259
High school teachers (60)	50.1	52.4	48.0	.148
Division head (55)	29.2	30.6	27.9	.353
Reporter (55)	21.4	24.4	18.6	.022
Nurse (54)	65.6	57.5	73.1	.000
Owner of small factory/firm (48)	52.9	57.3	48.9	.005
Police (40)	54.4	54.1	54.7	.856
Electrician (36)	55.8	61.8	50.3	.000
Truck driver (31)	37.6	45.0	30.8	.000
Office workman/guard (26)	82.7	83.7	81.7	.381
Housemaid, cleaning worker (22)	45.2	43.9	46.4	.430

Table 5. Regression of physical, psychological, and social health on gender, education and social capital

Variable	Physical health		Psychological health		Social health	
	B (SD)	t	B (SD)	t	B (SD)	t
Gender						
Female/Male	-2.04(0.95)	-2.14*	-1.33(0.91)	-1.46	0.27(0.87)	0.31
Education						
Senior high/Junior high	-0.92(1.84)	-0.50	0.81(1.77)	0.46	1.53(1.69)	0.91
University/Junior high	-0.07(1.73)	-0.04	1.32(1.66)	0.79	2.55(1.59)	1.61
Social capital	0.08(0.03)	2.96**	0.13(0.03)	4.92***	0.16(0.03)	6.17***
Constant	66.08(2.57)		67.01(2.47)		61.02(2.35)	
R	0.11		0.16		0.20	
R square	0.01		0.03		0.04	

V. Discussion and Conclusion

The aim of this study was to articulate the social capital and its relationship to health. A nationwide data was collected, and position generator was used to measure social capital. The results supported the theory of social capital that a high level of social capital is associated with physical, psychological, and social health. Social capital theory, position-generator, and health will be discussed below.

A. Social capital theory

According to Lin's theory, social capital can be defined as resources embedded in a social structure that are accessed

and/or mobilized in purposive actions [5]. By this definition, social capital contains both structural and action-oriented elements. Lin [5] proposed that these two ingredients reflect differential levels of analysis. At the mesostructural level, social capital captures the extent to which individuals have differential accessibility to collective resources. At the microaction level, social capital captures how accessed resources are differentially mobilized by individuals in conjunction with specific actions. Thus, a social capital theory must contain and demonstrate the meso-micro linkage and the dynamic interactive effects between structure and action. The results showed the difference of accessibility to positions between males and females. The positions were sampled from two structural dimensions: occupational prestige and class. Furthermore, the return of different accessibility was positively correlated with individual health which included physical, psychological, and social health. It is concluded that the theory is suitable for explaining health outcome.

The mechanisms that embedded resources in social networks will enhance the health outcomes were proposed by Lin [5]. For one, it facilitates the flow of information. Over half of male and female respondents had 'guanxi' with physician and nurse whose occupations were related to healthcare. They might offer useful health information and it is helpful for increasing health. Second, these social ties may exert influence on the actors. Some social relations, due to their prestige and positions, also carry more resources and exercise greater power of influence. The means of reachability for both male and female respondents were over 67 which were rather high in the occupation hierarchy. Those 'guanxi' would have great influence on the respondents and reinforce their psychological and social health. Third, social resources may be conceived as certifications of the individual's social credentials. Having higher reachability means someone have good 'guanxi', and it will improve one's psychological health. And the last, social relations are expected to reinforce identity and recognition. Being assured of one's worthiness as a member of a social group, the feeling of belongingness will increase psychological health.

B. Position-generator

There are two methodologies commonly used to measure access to social capital: name generators and position generators. The name generator is the more common methodology and has been used extensively in the network literature [41-47]. The general technique is to pose one or more questions about the ego's contacts in certain contexts or situations. In studies [41-45], the students were asked to nominate 3 to 5 best friends. And in studies [46, 47], the nurses were asked to nominate friends and colleagues who could help her while working in hospital.

Name generator tends to be bound with specified content areas, to elicit stronger rather than weaker ties, and to locate access to individuals rather than social positions. Lin [5] argued that name generators fall short on some issues important to the development of social capital as a theory, and proposed the position generators. The position generators use a sample of ordered structural positions salient in a society (occupations, authorities, work units, class or sector) and ask respondents to indicate contacts in each of the positions. From the responses, it becomes possible to construct measures of range of accessibility, extensity, and upper reachability.

The compositions of social capital in this study and in the earlier study [40] are different. In this study, social capital was composed of (.02 extensity+.50 range +.51 upper reachability). The extensity variable carried the least weight, and two other variables were almost eaually weighted. While in the earlier research [40], social capital was composed of (.15 extensity+.65 range+.21 upper reachability). The range variable carried three times more weight than the other two variables. Obviously, the importance of upper reachability variable in social capital had been increased during these years. The reason may due to different study design, subjects, or context. It needs further research.

During the latter half of the 20th century in Taiwan, a rapid expansion of education for all but particularly for women occurred along with the rapid social and economic changes. In this study, 62.8% of the respondents were graduated from university. In Lin's study [40], only 24.0% of the respondents were graduated from college or more. Obviously, the education had been rapidly expanded during these 10 more years. Since education is benefit in accessibility, the rapid expansion of Taiwan's education will have effect on social capital. However, within these three important variables - extensity, upper reachability, and range, only the range variable was increased. But, gender difference was decreased during these years after comparing with the result of the earlier research [40]. There were no significant difference of reachability, extensity, and range between males and females. Yet, females still play the role of keeping household well-being. They were more likely to access nurses, while males were more likely to access assemblymen/women, reporter, owner of small factory/firm, electrician, and truck driver, but not nurses. Such different accessibility also might due to occupation segregation. As Emmerik's study [6] indicated that men were more effective in creating hard social capital which would be useful to accumulate task-oriented resources, males' work related networks facilitated their access to social capital.

C. Health

With chronic illnesses replacing infectious diseases as the leading causes of death, prevention of disease has taken the forefront in public health [48]. There was a shift in the emphasis of public health in preventing people from adopting high-risk lifestyles came into fashion. And a renewed focus from curative to preventive measures has come about through multi-disciplinary enquiry into the mechanisms whereby social support and effective and efficient health care delivery may promote health [49-52]. This study investigated about the associations between social capital and physical, psychological,

and social health which may have possible policy and practice implications.

The theoretical basis is Lin's social capital theory in this study. Son and Lin [53] proposed that there had emerged two research traditions and both traditions clam a common conceptual basis that social networks afford the formation. Since the result showed that individual social capital was the consistent and significant predictor of physical, psychological, and social health, effective health policy and service provision may build or strengthen social capital by building or providing activities to strengthening social networks in communities.

Females' physical health was worse than males' in the finding. Few studies discussed about gender difference in social capital and health. It would be an important issue for further research.

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