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The effects of social structure and social capital on changes in smoking status from 8th to 9th grade: Results of the Child and Adolescent Behaviors in Long-term Evolution (CABLE) study☆

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ABSTRACT

Objective. Social structure and social capital are important variables for public health strategies seeking to prevent smoking among adolescents. The purpose of this study was to examine the relationships between social structure, social capital and changes in smoking status from the 8th to 9th grade in Taiwan.

Methods. Data were obtained from the Child and Adolescent Behaviors in Long-term Evolution (CABLE) project. The study analyzed a final sample of 1937 students (50.7% female).

Results. Each layer of social structure was associated with a particular form of social capital. Students whose parents were married and living together had higher family social capital. After controlling for background variables, the social structure variable of friends who smoke was significantly associated with changes in smoking status. Students reporting more school attachment were less likely to start smoking. Students with higher parental supervision was associated with less chance of being a consistent smoker, whereas participation of social organization outside of school was associated with continued smoking. Attending school club was associated with higher probability of smoking cessation.

Conclusion. Smoking prevention and intervention strategies aimed at junior high school students should be tailored to the particular form of social capital important for each type of smoking status.

Introduction

Every year, approximately 6 million people die from smoking-related diseases worldwide, resulting in estimated economic losses in hundreds of billions of dollars (World Health Organization, 2011). This annual number of deaths is predicted to surpass 8.3 million by 2030 (World Health Organization Media Centre, 2011). In Taiwan, there are estimated 3.6 million smokers, approximately 18,800 of whom die each year (Bureau of Health Promotion, D.O.H., 2011).

Many smokers first experience tobacco use during adolescence (Karp et al., 2005; Kelder et al., 1994; Park et al., 2009). The prevalence of smoking among Taiwanese junior high school students increased from 6.6% in 2004 to 8.0% in 2010. Among senior high school students the smoking rate was 15.2% in 2005 and 14.8% in 2009 (Bureau of Health Promotion, D.O.H., 2011). Therefore, smoking in junior high school students has increased slightly, whereas in senior high school students, it appears to be stable despite the passage of the Tobacco Hazards Prevention Act in 1997. This law aims to prohibit persons under the age of eighteen from smoking and includes regulation of tobacco products and smoking bans in public places.

The earlier an adolescent initiates smoking the more likely it is that he or she will become an established smoker (Maggi, 2008). Behavioral models and influential factors for adolescent smoking are more complex than those for adult smoking and are important aspects to consider in research studies (Ajdacic-Gross et al., 2009; Nguyen et al., 2012). Building social capital is a strategy that has greater potential to prevent smoking than making changes in social structure (e.g., peer group structure) (Giordano and Lindström, 2011; Sapag et al., 2010). Social structure can be described in terms of economic and demographic characteristics, such as family composition and formal institutional structure. Social capital refers to the social ties and norms that shape social interactions, such as parental social closure, peer relationships and adolescent involvement in community activities (Thorlindsson et al., 2012).

Social capital is embedded within and influenced by social structure (Ravanera and Rajulton, 2010). Social structure and social capital both affect adolescent smoking behavior (Thorlindsson et al., 2012). Social structure can help identify those at high risk of smoking (Lakon and Valente, 2012). Social capital is a potentially modifiable intervening

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variable that is important to public health interventions seeking to prevent smoking or to promote the intention to quit.

Studies have confirmed that certain dimensions of social capital, such as trust, social participation and neighborhood closeness, can decrease the risk of smoking and other substance-use behaviors (Chuang and Chuang, 2008; Lindström, 2008; Lundborg, 2005). However, Li and Delva (2012) found that family cohesion among Asian–American men was related to increased tobacco use, suggesting that social capital may have negative effects in specific socio-cultural contexts. To date, little research has simultaneously investigated the relationship between social structure and social capital and changes in adolescent smoking status in Asians.

The importance of social capital is tied to its potential positive effect on smoking prevention (Kawachi and Berkman, 2000). We have already observed a sharp increase in experimental smoking in the 8th grade in Taiwan (Chang et al., 2011). We wish to investigate the effects of different forms of social capital and social structure on changes in smoking status between the 8th and 9th grade.

Methods

The data for this study are from the Child and Adolescent Behaviors in Long-term Evolution (CABLE) project. This project commenced in 2001 and was aimed at investigating the development of health behaviors and physical and mental health over different stages during childhood. In 2000, there were 152 primary schools in Taipei City and 79 in Hsinchu County. Based on the number of 1st grade students, the schools were categorized as small (50–199 students), medium (200–399 students) or large (more than 400 students). To ensure that the number of children chosen from each type of school was approximately equal, it was determined to select six small schools, two medium schools and one large school from each location. In each school, all of the students in grades one and four (referred to as cohorts 1 and 2, respectively) and their parents were selected as the sample. Signed consent was obtained from either the child's parent or guardian (Yen et al., 2002).

This study only analyzed cohort 2 data from 2005 (8th grade) to 2006 (9th grade). Participants with missing data or illogical responses were excluded from the analysis, which resulted in a final sample of 1937 students (72.7% of the baseline sample). Cohort 2 had 2029 respondents in 2005, which decreased to 1957 in 2006. The attrition rate was 3.6% (Luh et al., 2013). We hypothesized that social structure and social capital are associated with changes in smoking status.

The dependent variable was change in smoking status from the 8th to 9th grade. The participants were asked, "Have you ever smoked a cigarette (even one puff)?" each year for the duration of the study. Responses included (1) never, (2) yes, but not in the past year, (3) yes, in the past year but not in the past month, (4) once or twice in the past month, (5) many times in the past month and (6) every day in the past month. Based on these responses over the two years of the study, the smoking status of the participants was additionally categorized as follows: consistent non-smoker (not using tobacco in 2005 or 2006), non-smoker who became a smoker (not using tobacco in 2005 but using tobacco in 2006), consistent smoker (using tobacco in 2005 and 2006) or smoker who stopped smoking (using tobacco in 2005 but not using tobacco in 2006).

In this study, we used the definition of Thorlindsson et al. (2012) for social structure and social capital. The variables were taken from the student responses to the 2005 survey and included parents' marital status, number of individuals living at home, and friends who smoke and population density in residential area. The school student-teach ratio and population density in residential area were taken from the Department of Education and the Ministry of the Interior, respectively. The details of the questions can be found in Appendix 1.

Social capital variables included family interactions, parental support, parental supervision, peer relationships, school attachment, school club participation, neighborhood relationships, community satisfaction, community activity participation and social organization participation. The Cronbach's alpha reliability coefficients of all of the scales ranged between 0.65 and 0.90. The details of the questions can be found in Appendix 1. Demographic characteristics included gender, academic performance, pocket money availability, weight satisfaction, parents' education level and parents' smoking behavior. We used SPSS 18.0 statistical software (IBM SPSS Statistics, USA) for the data analysis. Before conducting the analysis, we checked for data errors and performed multiple imputations (Markov Chain Monte Carlo Method) for missing continuous variables. Chi-square tests, independent two-sample t-tests and ANOVA were used to compare demographic characteristics, social structure and social capital among the smoking groups and to examine the relationship between social structure and social capital. Multinomial logistic regression was used to examine the factors associated with changes in smoking status.

Results

The final sample included 1937 individuals. There were slightly more girls (50.7%) than boys (Table 1). The four smoking groups were as follows: consistent non-smoker (86.3%), non-smoker who became a smoker (3.4%), consistent smoker (4.8%) and smoker who stopped smoking (5.5%). Comparisons of demographic characteristics, social structure and social capital among the smoking groups are presented in Table 2. Most of the variables differed significantly among the smoking groups.

Additionally, we performed bivariate analyses to examine the relationship between social structure and social capital. Students with parents who are married and living together had higher family social capital, including family interactions ($p < 0.01$), parental support ($p < 0.01$) and parental supervision ($p < 0.01$). Those students who lived at home with fewer family members had poorer parental support ($p < 0.05$). Students with friends who smoked had poorer family interactions ($p < 0.01$), parental support ($p < 0.01$), parental supervision ($p < 0.01$), peer relationships ($p < 0.05$) and school attachment ($p < 0.01$). Students who resided in low population-density areas had poorer parental supervision ($p < 0.05$) and higher neighborhood relationships ($p < 0.01$).

In the multinomial logistic regression, we used a forward stepwise approach to select demographic characteristics associated with changes in smoking status. We then added social structure and social capital variables to the model. The Nagelkerke R^2 was 30.7%, and the overall predictive accuracy of the model was 86.4% (Table 3). The factors associated with each category of smoking status are described below.

(a) Non-smokers starting smoking
After controlling for demographic characteristics, we found that,

Table 1
Demographic characteristics of the study sample (n = 1937).

Characteristics	n	(%)
Gender		
Male	955	(49.3)
Female	982	(50.7)
Academic performance		
Rank 1–5	319	(16.5)
Rank 6–10	370	(19.1)
Rank 11–20	677	(35.0)
Rank 21+	569	(29.4)
Pocket money availability		
No	332	(17.2)
Yes	1601	(82.8)
Weight satisfaction		
Not satisfied	999	(51.7)
Neutral	285	(14.7)
Satisfied	650	(33.6)
Father's education level		
Junior high school and below	317	(16.5)
Senior high school or vocational school	684	(35.7)
College or above	917	(47.8)
Mother's education level		
Junior high school and below	332	(17.4)
Senior high school or vocational school	939	(49.1)
College or above	642	(33.6)
Father has ever smoked		
No	389	(21.4)
Yes	1425	(78.6)
Mother has ever smoked		
No	1475	(78.0)
Yes	417	(22.0)