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Relationship between Socioeconomic Factors, Health Behaviors, and Mental Health among University Students of Heilongjiang Province in China

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The objective of this study was to explore the association of household income disparity and health risk behaviors with the poor mental health/depression (PMHD) of university students of Heilongjiang Province in China. A stratified cluster sample of 3,189 university students was used in a cross-sectional study. The data were obtained from a self-administered questionnaire, which included questions on sociodemographic characteristics and problem of health areas. The Minnesota Multiphasic Personality Inventory 2 (MMPI-2) was used to determine PMHD of university students. Chi-square test and Cochran-Armitage trend test were used for the categorical data analysis. The associated factors for depression were examined using a logistic regression analysis. The low household income and health risk behaviors in university students were in general related to PMHD. The depression prevalence of low household income university students (29.4%) is higher than that of high household income students. Low household income, smoking habit, and engaging in premarital sex are all major associated factors of depression. For the interaction of these three associated factors, the odds ratio of depression was 3.08 (95% CI 1.11~8.58). Furthermore, the association of depression and other poor mental health has statistical significance. This study confirms that poor mental health was associated with household income disparity and with health risk behaviors among university students of Heilongjiang Province in China.

Keywords: household income disparity, mental health, health risk behavior, interaction, prevention

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1. Introduction

Scholars from many countries have reported that increases in the number of mental diseases and death are strongly associated with the socioeconomic status (Lynch, et al., 2000; Anderson, et al., 1997; Kawachi and Kennedy, et al., 1999). With the development of Chinese economic reform, the disparity in household income has also rapidly increased. The changes in the social structure have a strong impact on the health behavior and mental health of university students. According to the investigation by China's state education commission in 1989, the rate of poorer mental health of university students is 20.2%, and for university students with low household income it is 27.3%. However, a recent survey shows that the rate of poorer mental health of university students with low household income has already climbed to 59.0% (Zhang, et al., 2006; Song and Zhu, 2005).

The reported poorer mental health has many patterns. Depression is a significant problem among young people (PMHD) (Weitzman, 2004) and is the main reason for suicide. According to the WHO report, every year nearly 1,000,000 people die of suicide throughout the world and among them over 200,000 are Chinese; the number of university students who commit suicide is 2-4 times that of their peers (Zhai, 1997; Zhong, et al., 2003). The number of university students who suspend their schooling, quit school, and attempt or commit suicide due to

poorer mental health is increasing quickly as well (Weissman, et al., 1999; Zheng, 2005). Previous studies have consistently shown a significant association between socioeconomic factors and depression (Roland and Carole, 2002; Mehmet, et al., 2005). In China there is some research on the prevalence of poorer mental health in university students with low household income, but most of the studies are restricted to the manifestations of the poorer mental health of university students with low household income. We have not found any research on the key household income associated factors and health behavior associated factors relative to the prevalence of depression in university students. The aim of this research is to explore the important influence of household income disparity on the mental health of university students and to further probe the influence of the interaction of low household income as well as health risk behaviors and socioeconomic discrepancy on the onset of depression. This study will also investigate the preventive measures regarding depression in university students from a public health perspective.

2. Methods

2.1. Description of the samples

The study was conducted from October to November 2006 at a comprehensive university for 23,264 students of 26 subjects in Heilongjiang province, China. A stratified cluster sample design was used to produce a sample in grades 1-4. We took advantage of teaching time to obtain a self-administered questionnaire on 4,000 university students. Regarding extramural research students, the questionnaires were distributed through an indwelling questionnaire method. Among the 3,945 responders, the valid number of responses was 3,189 (response rate of 80.8%).

2.2. Questionnaire

The questionnaire is divided into 3 parts and is made up of 146 questions. The general condition portion includes 11 questions; health risk behavior includes 20 questions; the mental health test includes 4 measuring scales and 115 questions.

2.3. Measures

Mental health was measured with the 4 measuring scales of the Minnesota Multiphasic Personality Inventory 2 (MMPI-2) (Friedman, et al., 1989). The items of the questionnaire were translated from English into Chinese using translation and examined the validity of the measuring scale. We herein used a 2-point scoring method, rating a problem as absent (0) or present (1) according to the method recommended by the developers of the questionnaire. The raw scores of each scale are converted to the linear T-score or uniform T-score according to the transformation rule, Responses were summed, and those with T-score >=65 were classified as having poor mental health. (Ji, et al., 2004).

2.4. Statistical analyses

It was carried out through the following 3 steps.

2.4.1. The contrast of Categorical variables.

The general variables include: sex, area, household size, household income, father educational, mother educational, self-consumption and Year at University. The variables of health risk behaviors include: smoking habit, drinking habit, engaging in premarital sex. The mental health scale includes: Depressiveness Scale (DEP), College Maladjustment Scale (Mt), Social Discomfort Scale (SOD), and Overcontrolled Hostility Scale (O-H).

We compared the Binary variables using the Chi-square test. Regarding comparisons with the ordinal variables, such as household income, father's educational background, mother's educational background, self-consumption, and year at University, we used the partitions of Chi-square method, and further utilized the Cochran-Armitage trend test to perform the trend test on the variables.

2.4.2. To assess the associated factors of depression

We used a single factor unconditioned Logistic regression analysis on the general variables and health risk behavior variables, and then by the stepwise method, we carried out a multi-factor unconditioned Logistic regression analysis on the significant variables through single factor analysis, and not only assessed the associated factors of depression but also examined the association of depression and other poor mental health.

Table 1 Self-reported health risk behaviors by general variables

	No (%) of participants			
		Smoking habit	Alcohol habit	Engaging in premarital sex
Sex				
Men	1906(59.77)	317(16.63)**	1082(56.77)**	274(14.38)**
Women	1283(40.23)	33(2.57)	306(23.85)	80(6.24)
Area				
Urban	1791(56.16)	207(11.56)	760(42.43)	243(13.57)**
Rural	1398(43.84)	143(10.23)	628(44.92)	111(7.94)
Household size				
Parent	3020(94.70)	324(10.73)	1304(43.18)	321(10.63)**
Sing-parent	169(5.30)	26(15.38)	84(49.70)	33(19.53)
Household income				
Low	623(19.54)	60(9.63)**	289(46.39)	42(6.74)**
Middle	1472((46.16)	144(9.78) § §	610(41.44)	135(9.17) § §
High	1094(34.31)	146(13.35)	489(44.70)	177(16.18)
Father education				
>=13 years	528(16.56)	85(16.10)**	232(43.94)**	100(18.94)**
10~12 years	852(26.72)	79(9.27) § §	333(39.08)	111(13.03) § §
<=9 years	1809(56.73)	186(10.28)	823(45.49)	143(7.90)
Mother education				
>=13 years	328(10.19)	57(17.38)**	137(41.77)**	78(23.78)**
10~12 years	762(23.89)	72(9.45) §	297(38.98) §	91(11.94) § §
<=9 years	2099(65.82)	221(10.53)	954(45.45)	185(8.81)
Self-consumption				
Low	749(23.49)	68(9.08)**	283(37.78)**	45(6.01)**
Middle	1694(53.12)	143(8.44) § §	723(42.68) § §	144(8.50) § §
High	746(23.39)	139(18.63)	352(51.21)	165(22.12)
Year at University				
1st	875(27.44)	64(7.31)**	354(40.46)	61(6.97)**
2nd	803(25.18)	83(10.34) § §	374(46.58)	75(9.34) § §
3rd	817(25.62)	116(14.20)	362(44.31)	165(12.85)
4th	694(21.76)	87(12.54)	298(42.94)	113(16.28)

*: χ^2 test $P<.05$ §: trend test $P<.05$
**: χ^2 test $P<.01$ §§: trend test $P<.01$

2.4.3. To examine the interaction among the main associated factors for depression

The multi-factor unconditioned Logistic regression analysis results show that: a low household income, smoking habit, and engaging in premarital sex are the main associated factors for depression. We took the interaction addition model as the basis and adopted the Mantel-Haenszel logit model to carry out an investigation on the interaction of the associated factors of depression —low household income, smoking habit, and engaging in premarital sex. In addition, we assessed the interaction of these three factors after we analyzed the multi-factors using the Logistic regression model. Suppose that the relative risk of A factor and B factor are marked as OR (AB), the OR of A factor is OR (A) and the OR of B factor is OR (B); then I (AB)=OR (AB)-OR (A)-OR (B)+1, I (AB) indicates the effectiveness measure of the interaction. All the statistical analyses are made by use of the statistical software SAS8.2 (Statistical Analysis System version 8.2).

3. Results

3.1. Self-reported health risk behaviors and poor mental health among university students

Overall, except for the SOD, the number of males was higher than the number of females for self-reported health risk behaviors and poor mental health. The DEP, Mt, SOD of students from rural areas is higher and their tendency to engage in premarital sex is lower than that of students from urban areas. The prevalence of depression and engaging in premarital sex of students from single-parent families is higher than that from two-parent families.

Ordinal variables Cochran-Armitate trend test results show that the DEP, Mt, SOD of students from low household income is high and the smoking rate is relatively low. While the higher the parental educational level, the higher the smoking habit and engaging in premarital sex. In addition, the low parental educational level indicates the high prevalence of SOD and the drinking habit of students. The smoking habit, drinking habit, and engaging in premarital sex of high self-consumption students tends to be higher than low self-consumption ones. The SOD prevalence of low household income students is high. As the year at university increases (i.e. first year, second year, etc.), the prevalence of depression, smoking habit, and engaging in premarital sexual tends to increase as well (**Table 1-2**).

3.2. The relevance of depression and other poor mental health

The unconditioned Logistic multi-factor analysis

Table 2 Self-reported poor mental health by general variables

	No (%) of participants			
	DEP	Mt	SOD	O-H
Sex				
Men	608(31.90)**	422(22.14)**	293(15.37)	81(4.25)**
Women	223(17.38)	214(16.68)	220(17.15)	18(1.40)
Area				
Urban	433(24.18)**	329(18.37)*	243(13.57)**	58(3.24)
Rural	398(28.47)	307(21.96)	270(19.31)	41(2.93)
Household size				
Parent	776(25.70)*	596(19.74)	484(16.03)	96(3.18)
Sing-parent	55(32.54)	40(23.67)	29(17.16)	3(1.78)
Household income				
Low	183(29.37)*	143(22.95)*	139(22.31)**	15(2.41)*
Middle	387(26.29)§	301(20.45)§§	220(14.95)§§	37(2.51)§
High	261(23.86)	192(17.55)	154(14.08)	47(4.30)
Father education				
>=13 years	154(29.17)	102(19.32)	74(14.02)**	23(4.36)
10~12 years	206(24.18)	162(19.01)	114(13.38)§§	23(2.70)
<=9 years	471(26.04)	372(20.56)	325(17.97)	53(2.93)
Mother education				
>=13 years	90(27.44)	59(17.99)	43(13.11)**	12(3.66)
10~12 years	203(26.64)	142(18.64)	98(12.86)§§	27(3.54)
<=9 years	538(25.63)	435(20.72)	372(17.72)	60(2.86)
Self-consumption				
Low	197(26.30)	143(19.09)	158(21.09)**	18(2.40)
Middle	418(24.68)	343(20.25)	257(15.17)§§	58(3.41)
High	216(28.95)	150(20.11)	98(13.14)	23(3.08)
Year at University				
1st	183(20.91)**	150(17.14)	129(14.74)**	32(3.66)
2nd	210(26.15)§§	179(22.29)	161(20.05)	19(2.37)
3rd	235(28.76)	166(20.32)	101(12.36)	20(2.45)
4th	203(29.25)	141(20.32)	122(17.58)	28(4.03)

*: χ^2 test $P<.05$ §: trend test $P<.05$
**: χ^2 test $P<.01$ §§: trend test $P<.01$

Table 3 Self-reported poor mental health by general variables

	Univariate analysis		Multivariate analysis*		
Associated factor	OR	95%CI	OR	95%CI	P value
Household income	1.15	(1.03-1.28)	1.18	(1.06-1.33)	0.0036
Sex	2.23	(1.87-2.65)	1.96	(1.64-2.34)	<.0001
Year of University	1.16	(1.08-1.25)	1.12	(1.04-1.20)	0.0038
Smoking habit	2.28	(1.81-2.87)	1.59	(1.24-2.03)	0.0002
Engaging in premarital sex	2.26	(1.80-2.84)	1.81	(1.42-2.31)	<.0001
Alcohol habit	1.96	(1.35-2.84)			
Area	1.25	(1.07-1.46)			
Sing-parent	1.40	(1.01-1.95)			

*: Adjusted for alcohol habit, household income, area, household size.

Table 4 Self-reported poor mental health by general variables

	DEP	No.of subjects	OR	95%CI	P Value
Mt	476	636	18.42	(14.91-22.75)	<.0001
SOD	242	513	3.46	(2.82-4.24)	<.0001
O-H	14	99	0.39	(0.22-0.69)	0.0012

*: Adjusted for sex, household income, year of University, smoking habit, engaging in premarital sex.

results show that low household income, smoking habit, engaging in premarital sex, the year at University and sex factors are associated factors of university students for depression (**Table 3**). Depression and its relationship with other poor mental health (Mt, SOD, O-H) demonstrated statistical significance (**Table 4**).

3.3. Through the evaluation of the interaction of low household income, smoking habit, and engaging in premarital sex, we evaluated the effect of measures to prevent depression among university students.

According to the results of a multi-factor interaction analysis on the basis of the Logistic regression model, under the interaction effects of low household income and smoking habit, the odds ratio of depression is significantly higher, OR=2.42. (95%CI=1.32~4.41). Under the interaction effects of low household income and engaging in premarital sex, OR=2.74 (95%CI=1.26~5.97). Then under the interaction effects of low household income, smoking habit, and engaging in premarital sex, the OR depression is 3.08 (95%CI=1.11~8.58) (**Table 5**).

4. Discussion

Since China implemented economic reforms from 1978, along with rapid economic development, the living style of Chinese people has thus changed dramatically. The introduction of market economy and the intense competition of the various aspects of society all promote

Table 5 Interaction of low household, smoking habit and engaging in premarital sex for depression

Low household income	Smoking habit	Engaging in premarital sex	DEP	ALL	OR(95%CI)	OR(95%CI)	P value
					M-H†	Logistic††	
−	−	−	449	2070	1.00	1.00	
+	−	−	142	536	1.23(1.01-1.49)	1.25(1.01-1.56)	0.0475
−	+	−	71	184	2.28(1.81-2.87)	1.79(1.30-2.46)	0.0004
+	−	+	81	206	2.26(1.80-2.84)	2.02(1.49-2.74)	<.0001
+	+	−	21	45	3.08(1.84-5.16)	2.42(1.32-4.41)	0.004
+	−	+	12	27	3.03(1.64-5.60)	2.74(1.26-5.97)	0.011
+	+	+	8	15	4.12(1.49-11.44)	3.08(1.11-8.58)	0.0311

†: Mantel-Haenszel logit model
††: Logistic regression model

the appearance of differences in career paths and income. In 1994 in China's urban area, the income of high income people (1/5 of the total population) took 50.14% of the income of the total population, while the income of the low income people (1/5 of the total population) comprised only 4.27% of the income of the total population. The high income class now earns 12 times more money than the low income class. This phenomenon also influences the special social group of university students (Barry, 1996; Sheying, 2002). Based on the verification of this research, the dramatic changes in the socioeconomic structures has already seriously threatened the health of university students. The depression of university students from low household income is 29.4%, the Mt is 23.0%, the SOC is 22.3%, and all prevalence are higher than in the students from a non-low household income. The research of Peter and Allison shows that 43% of individuals with depression are also associated with poor mental health, 41% of them attempt to commit suicide. This research also shows that depression has significant association with university student's Mt, SOD, and O-H. The above research results indicate that adopting depression prevention measures on the university student group with the existing socioeconomic discrepancy has significance for the health of university students (Peter, et al., 1998).

From a sociological perspective, reducing socioeconomic differences is thus considered to be an effective measure for reducing the depression caused by low household income. Although social disparities exist in every country, the socioeconomic disparities that have arisen along with China' s economical reform are comparatively rapid and dramatic. According to the United Nations "human development report in 2005", at present the Gini coefficient of China is 0.45. Meanwhile, some experts have pointed out that the rising speed of the Gini coefficient of China is now the highest in the world, and it is expected to continue to increase in the near future. As a result, it is necessary to establish some precautionary countermeasures from the perspective of public health (Kevin, et al., 2005).

A lot of research has already reported that smoking, drinking, and drug abuse all have a positive correlation with depression. The risk of smokers suffering from depression will increase and the risk of people suffering from depression addicted to nicotine will increase as well (Klerman, et al., 1996; Breslau, et al., 1998). In this research, the smoking habit was significantly associated with depression, OR=2.28 (95%CI 1.81~2.87). In a single-factor analysis, which compared people who drink excessively and those who do not, the OR of depression is 1.96 (95%CI 1.35~2.84). In a multi-factors Logistic regression analysis, no significant difference was observed regarding drinking excessively and not drinking (Neff and Husaini, 1982; Pandima and Schuele, 1983).

In China, the number of youths who abuse drugs is less than in developed countries, so this factor was not considered in this study. In this survey, engaging in premarital sex was found to be a major associated factor for depression as well OR=1.81 (95%CI 1.42~2.31). Before the modification of the Marriage Law in 2003, university students were not allowed to marry while still attending school, and due to strict school rules people who engaged in premarital sex were either expelled or severely penalized. After the modification of the Marriage Law in 2003, along with the dramatic economic development, ideas regarding engaging in premarital sex have also drastically changed as well. A recent investigation carried out by the Chinese Sexual Health Education Center at 30 universities nationwide reported that 15.7% of male students and 5.0% of female students engaged in premarital sex, and those findings also correlated with out research results. This shows

that the Chinese traditional chastity moral concept is still the mainstream belief; namely, engaging in premarital sex tends to still be strongly frowned upon by society at large. Since university students still do not have socioeconomic responsibility, in the event that an unwed female becomes pregnant, the body and mind of both sides may thus be harmed, and such experiences can have a life-long effect on such individuals.

In this research, we also investigated some other associated factors. In the single-factor analysis results, prevalence of depression among University student coming from both single-parental family and the rural areas is higher than others. According to the Japanese Population Census, single-parental families tend to be classified into the low income class; here we can also treat students from the single-parental family and rural areas as low income families.

Not only many researchers have reported that the prevalence of depression is higher in males, but also in our research, the number of males was intentionally higher than the number of females.

After the Second World War, depression has increased throughout the world. The onset of illness age is very young and the number of young males is gradually increasing, which is identical to the comparative research results from such developed countries as America, Switzerland, Germany, Canada, and England based on the findings of such scholars as Gerald. Along with China's rapid economic development, various discrepancies have appeared which include male and female discrepancies. In the economic society with intense competition, men bear more pressure, together with the influence of China' s unique single child policy, men encounter much higher expectations by both their families and society, and therefore they tend to carry a much heavier mental burden (Gerald and Myrna, 1989; Wei, et al., 2002). When considering the influence of the year at university (i.e., first year, second year, etc.) as a factor, we found that the prevalence of depression tended to gradually increase as the number of years spent at the university increased, and the difference was statistically significant. On the one hand, as the number of years at the university increases, the tendency to smoke and engage in premarital sex also increases. On the other hand, as the years pass at university and students prepare to enter society, the pressure to study and get a good job also steadily increase as well. The statistical data of the Chinese Ministry of Education shows that the number of university students was 15 percent that of their peers (18-22 years old) in 2002, and the overall student enrollment in China was 12,300,000 in 2000 and it expanded to 23,000,000 in 2005. University students in Heilongjiang Province is 584,000 in 2006.This indicates that getting a good job will become steadily more difficult due to the increased number of university graduates.

There are several limitations associated with this study. Because it is a cross-sectional study, making causal relationship conclusions is difficult. Although in the aim group, our findings regarding the relationship between smoking and depression correlated with the conclusions of scholars like Breslau, the causal relationship between depression and other mental health problems still remains to be investigated and elucidated. The self- administered questionnaire used in this study is also liable to provide biased answers. In addition, the answering rate of general questions and poor mental health testing questions was 95.0%, while the answering rate of premarital sexual behavior is low, only 11% of the responders reported to have engaged in premarital sex, including 14.4% of males and 6.2% of females. Moreover, according to the formation research of Fiscella etc, the disparity of household income is related to death, but it is not a direct reason for death. However, it is considered to influence the subjective health feelings and mental mechanisms that eventually lead to death, while not affecting the biological factors related to death. I would like to evaluate such aspects in future studies (Kevin and Peter 1999).

This study used university students from Heilongjiang province as the targets, and we investigated the relationships among such factors as socioeconomic discrepancies, health risk behaviors, and poor mental health. Socioeconomic discrepancies have dramatically increased nationwide in China over the last 25 years. These discrepancies appear to be more obvious than those observed in other rapidly developing regions. As a result, the influence of such factors on the mental health of university students is therefore considered to also be greater than in other developing countries. The findings of this study are therefore considered to be representative of all China and are therefore considered to be of practical significance.

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