

Socioeconomic and Geographic Inequalities of Internet Addiction in Korean Adolescents

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The aim of this study was to evaluate the social economic and geographic influences on Internet addiction in Korean youth using the Korean Youth Risk Behavior Web-Based Survey. Middle and high school students (n=73,238) were randomly selected from the respondents to a web-based survey using two-stage stratified complex sampling. A Geographical Information System was used to generate a Korean map of the level of Internet addiction for each province and complex sampling lower case logistic regression was used to investigate the relationship between social economic status (SES) and Internet addiction. Gyeonggi-do and Gyeongsang-namdo provinces have a higher total scores of Internet addiction. There were associations between Internet addiction and low SES (OR=1.504, 95% CI 1.156–1.956, p<0.01). There may need to be a multilevel approach which recognizes the different levels of need in provinces as well as trying to understand why the differences arise at an individual level.

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Key Words Internet addiction, Inequalities.

INTRODUCTION

The number of Internet users has increased rapidly in South Korea in recent years. Now 99.9% of Korean teenagers use the Internet through high speed cables and smart phones in 2011.¹ Although the Internet plays an important role in modern living, it may lead to problems such as Internet addiction.² The American Psychiatric Association considers Internet gaming disorder to be a condition for future study in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders.³ The Internet addiction is starting to be officially considered a type of psychiatric disorder.

Risk factors for addiction may include individual attributes, such as biological and psychological factors as well as environmental factors.⁴ While most studies on the causes of Internet addiction have focused on the biological and psychological levels, there is little understanding of the social and geographic

views of Internet addiction. Previous reports were just related with psychosocial factors of internet addiction such like that poor family cohesion, adaptability and exposure to the internet at an early age in terms of environmental factors of internet addiction.⁵ Geographic patterns and socioeconomic factors of Internet addiction can provide useful information for designing appropriate community-based intervention programs and developing policies to decrease and prevent Internet addiction. Therefore, the aim of this study was to illustrate geographic variation in Internet addiction among adolescents and to evaluate the inequalities of social economic factors that influence Internet addiction in Korean youth using a national representative dataset.

METHODS

This study was conducted using data from the 2010 Korean Youth Risk Behavior Web-Based Survey (KYRBWS). The KWRBWS was administered to a nationally representative sample of middle and high school students, using a complex sampling design. This web-based survey consisted of 128 questions and 14 areas of health-related behaviors. Ethical approval was not required for this secondary data analysis because the 2010 KWRBWS for the analysis did not collect any personal information and was already conducted with the approval

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al of the research ethical review board of the Korean Centers for Disease Control and Prevention.

Socio-demographic variables

Individual variables included age, gender, region of residence, type of school, and perceived academic performance. Self-rated academic performance was a five-category variable that ranged from very high to very low. The perceived family economic status and the family affluence scale (FAS) were used to assess the socioeconomic status. The FAS, which was developed by the European Health Behavior in School-Aged Children study, was adapted to measure the family economic status, which cannot be estimated accurately by children and adolescents. The FAS is based on four questions about having one's own bedroom, the number of family trips per year, the total number of computers at home, and the number of vehicles owned by the family.

Internet addiction

The Korean Internet Addiction Proneness Scale for Youth-Short Form with self report (KS Scale) was used to assess experiences of Internet addiction at ordinary times. The KS Scale was developed by the Korean National Information Society Agency. Each question was scored on a four-point scale, with higher points indicating a higher risk of Internet addiction. The KS Scale consists of 20 questions for each of the following six categories: tolerance, withdrawal, addictive automatic thoughts, disturbance in adaptive function, deviant behaviors, and virtual interpersonal relationships. The total scores were used as a continuous variable in this study. The 'high risk group for internet addiction' was defined as a total score of 53 points (standardized total score of 70) or higher among Korean adolescents. The KS Scale for middle school students was validated, and the Cronbach's alpha score was 0.909 at the time of development.⁶

Depressive mood and suicidal ideation

Depressive mood was assessed from responses to the question, "In the recent 12 months, have you experienced sadness or despair that significantly influenced on your everyday life throughout two weeks?" An answer of yes or no to this single question was coded. Although this question may not apply for the clinical diagnosis of depression, it is equivalent to the method used in screening depression in primary medical care.⁷ In terms of suicidal ideation, respondents were asked whether they had thought of suicide over the last year, to which they responded 'yes' or 'no'.

Statistical analysis

In the 2010 KYRBWS, adjusted weights were applied to the

data to obtain a representative sample of the Korean population. A complex sample analysis was performed based on an analysis plan file in which weights, stratification variables, and primary sampling units were designated. Missing data were included in the complex sample analysis to produce results. A complex sample logistic regression was used to determine the relationship between the social economic status and Internet addiction. The collected data were analyzed using PASW Statistics version 18.0 (SPSS Inc., Chicago, IL, USA). A p-value less than 0.05 was considered statistically significant. Additionally, maps showing which area is risk in Internet addiction among 16 geographical regions of South Korea were made using Geographic Information Systems (GIS) software. The Quantum GIS 2.0 (<http://www.qgis.org/>), which is a free and open-source desktop GIS application, was used to create maps. The pattern of Internet addiction according to the total scores was represented as the choropleth map that uses differences in shading, coloring, or the placing of symbols within predefined areas to indicated the average value of a quantity per basic unit in those areas. A geographical boundary data file was obtained from the Statistical Geographic Information Service of the Korea National Statistics to match the KYRBWS data with geographic regions. These two data were merged into the single data for GIS that was aggregated by geographic regions.

RESULTS

The response rate was 97.7%, and 73,238 students participated in the survey. The map show the geographic pattern according to the total score of the Internet addiction scale. The Gyeongsang-namdo and Gyeonggi-do were shown in Figure 1 as a high-risk area and potential risk area of Internet addic-

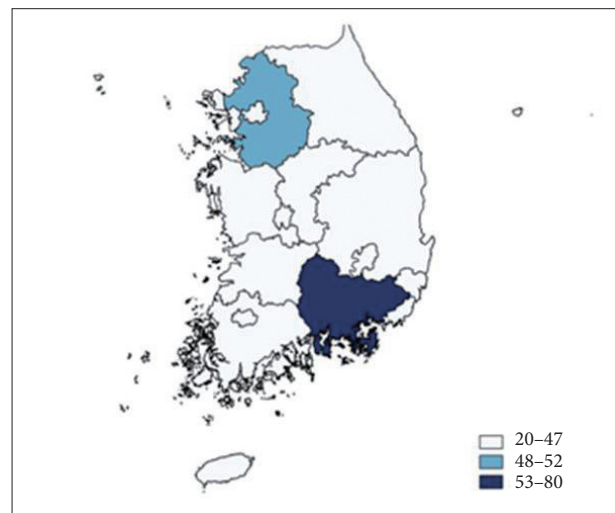


Figure 1. Geographic pattern of Internet addiction risk groups according to the total score of The Korean Internet Addiction Proneness Scale (high risk group ≥ 53 , $52 \geq$ potential risk group ≥ 48).

Table 1. Demographic characteristics of the participants in the Korean Youth Risk Behavior Web-Based Survey 2010 (N=73,238)

Characteristics	N (weighted %) or mean (standard error)
Age	15.10 (0.03)
Gender	
Male	38,391 (52.8)
Female	34,847 (47.2)
School	
Middle school	37,570 (50.1)
Academic high school	26,845 (38.0)
Vocational high school	8,823 (11.8)
Living area	
Metropolis	38,116 (54.1)
City	26,066 (40.5)
Rural area	9,056 (5.4)

tion. Basic demographic data are shown Table 1. There were increased odds of reporting a subjective low SES (OR=1.504, 95% CI 1.156–1.956, $p<0.01$), which was higher than depressed mood (OR=1.313, 95% CI 1.170–1.474, $p<0.01$) and smaller than suicidal ideation (OR=1.820, 95% CI 1.536–2.157, $p<0.01$) after adjusting for age, sex, parents' academic history and experience with alcohol and smoking (Table 2).

DISCUSSION

The aims of the study were to identify differences in Internet addiction between provinces and to examine the association between social economic status and Internet addiction. To the best of our knowledge, this study is the first to report maps of Internet addiction in Korea using GIS. We created maps showing which provinces are influenced by Internet addiction and found that the subjective SES had an effect on Internet addiction.

GIS is an innovative type of information system based on geographic locations, and it enhances the utilization of both spatial information and connected non-spatial information.⁸ Patterns of Internet addiction using GIS can provide researchers, community organizers, and policy makers with information on the status of Internet addiction at a community level, helping them to design appropriate community-based intervention programs.⁹ Adolescents may be at greater risk for initiating addiction as a result of a complex interplay between individual psychological and social factors, combined with living in and spending time in certain places that can be categorized as risky or safe environments.¹⁰ This study shows that some provinces, such as Gyeonggi-do and Gyeongsangnam-do, have major Internet addiction problems based on the map. Though complex causes and moderators could be involved in

Table 2. Individual and environmental risk factors of Internet addiction in Korean adolescents using the complex sample logistic regression and Korea representative data (total N=73,238) after adjusting for age, sex, parents' academic history, experience of alcohol and smoking

Factors	Odds ratio	95% confidence interval
Individual factors		
Depressed mood in past12 months		
No	1	
Yes	1.313*	1.170–1.474
Suicidal ideation in past12 months		
No	1	
Yes	1.820*	1.536–2.157
Academic performance		
Upper	1	
Middle-upper	1.008	0.826–1.230
Middle	0.934	0.760–1.147
Middle-low	1.202	0.977–1.480
Low	1.682*	1.354–2.089
Environmental factors		
Scale of city		
Rural area	1	
Metropolis	0.921	0.797–1.065
City	0.935	0.799–1.094
Type of school		
Academic high school	1	
Middle school	1.180	0.962–1.448
Vocational high school	0.887	0.738–1.067
Social economic state		
Upper	1	
Middle upper	0.877	0.691–1.113
Middle	0.949	0.765–1.178
Middle low	1.067	0.839–1.357
Low	1.504*	1.156–1.956
Familial affluence score		
	1.018	0.987–1.051

these results, the characteristics of geography in these provinces include many small cities compared to other provinces. It may be that small cities provide as good environment for Internet use as metropolis in Korea, but poorer parents in small cities tend to have less time to supervise their children in good internet environment spending time in commute or focusing on making money. There is a link between physical activities associated job and commute and socioeconomic status in developing countries that can be connected with supervision of children.¹¹ Our results may help health services to target the areas of greatest need for Internet addiction intervention programs.

There is substantial evidence in support of the relationship between SES and mental illness, such as depression, suicide and substance abuse. A meta-analysis suggested that low SES slightly increases the risk of developing depression.¹² Adults and adolescents with low SES are at an increased risk of developing depressive and anxiety disorders, alcohol abuse and dependence.¹³ Additionally, SES confers a relative risk for the development of schizophrenia that is 2–3 times greater than the general population.¹⁴ A previous study of the relationship between socioeconomic determinants of Internet addiction disorder considered social welfare.¹⁵ This study also showed a significant relationship, but the authors did not consider individual factors. Our results are in agreement with this study, supporting the idea that Internet addiction could be influenced by SES via many comorbidities, such as depression and suicidal ideation. Additionally, we also found that internet addiction related with poor academic performance that also mediated with these comorbidities including depression. Previous other report that severe internet addiction showed problems with adjusting to school life and low self-efficacy¹⁶ which are similar with our results.

This study has some limitations. First, only a self-rating scale was used as a measure of Internet addiction, posing a limitation to the interpretation of the study results. Second, the cross-sectional nature of the dataset limits the testing of causal paths. Third, the question for depression was single question. It also was definite limit to evaluate the history about depression though it was used for clinical situation. Despite these limitations, the results of this study can be generalized to Korean adolescents due to the use of nationally representative data. Additionally, the findings from this study can suggest which provinces in South Korea require intervention programs for Internet addiction from a clinical perspective and can guide policy makers in decreasing socioeconomic inequalities. In the future, longitudinal data analysis to evaluate the causality in the relationship between environmental factors and Internet addiction is required.

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