Research of the Influencing Factors of Mental Health Status of Students in Leeds-based on the 2019-20 Student Health and Well-being Survey

Jianming Wang *

Department of biology science, Fudan University, Shanghai, China

* Corresponding Author Email: 20300220006@fudan.edu.cn

Abstract. The mental health of teenagers is an important topic in public health, and it is necessary to pay attention to the mental health of students in school. This paper is based on the results of the 2019-20 school student health and well-being survey in Leeds, UK, aiming to explore the potential factors affecting the mental health and life attitudes of school students. The survey involved 5,307 students from 37 different schools in Leeds, of which 4,297 of them were valid. Set 80% of the valid survey results as the training set and the other 20% as the test set for multivariate logistic regression analysis (MLR) and model construction, and try to predict students' life attitude with the model to reflect their mental health status. The variables involved mixed aspects of sexual orientation, grade, alcohol consumption, drug use, smoking, self-harm behavior, participation in physical education courses, sexual behavior and so on. The results showed that daily drinking (OR: 4.498, 95% CI: 1.53-13.226) and self-harm (positive OR: 0.446, 95%CI: 0.381-0.522; negative OR: 1.252, 95% CI: 1.023-1.533) seriously harm students' mental health. Physical activity (positive OR: 1.422, 95% CI: 1.234-1.638; negative OR: 0.625, 95% CI: 0.509-0.768) and no smoking (positive OR: 1.374, 95% CI: 1.128-1.675) are conducive to maintaining a positive attitude towards life. Senior students are more likely to have a negative attitude towards life, and heterosexual (positive OR: 1.515, 95% CI: 1.113-2.061) students tend to hold a positive attitude towards life.

Keywords: Student mental health; adolescent; mixed linear regression; random forest.

1. Introduction

Adolescence is a key life-course period. Intervention in adolescent growth during this period will help them to form a healthy life trajectory. School is the main place of youth activities and life, and students spend most of their time in the classroom. Therefore, schools play a key role in affecting the quality of life and promoting their physical and mental health [1]. There is increasing evidence that health and education are synergistic rather than competing goals [2], and that schools should focus equally on the realization of student health and well-being while ensuring the quality of teaching. With the growing number of students, guaranteeing the health and well-being of students has become a necessary public topic. Drug use, alcohol addiction, self-harm, suicide, school bullying and other problems are very frequent among students, and the overall psychological situation of school students is worrying. Adolescents have a higher risk of psychological disorders, for example, anxiety and depression compared to children and adults [3]. On the other hand, high intake of total fat, free sugar and salt, as well as physical inactivity, also contributed to adolescent obesity increasing at an alarming rate [1]. Paying attention to the physical and mental health of students in school and investigating their various bad behaviors can effectively understand the overall health level of students in school, find out different factors affecting the well-being of students in school, and provide help and reference for protecting and guiding the physical and mental development of teenagers.

Existing related studies on adolescent health and well-being have provided many references to schools. A joint survey study of Chinese and German students showed that a healthy lifestyle has important value for mental health and reducing mental health problems [4]. A study of undergraduates in seven ASEAN countries reported that health risk behaviors usually focus on specific health behaviors and mental health, and there are some differences between undergraduates in different countries [5]. And scholars examined the relationship between bullying, cyberbullying, sexting,

alcohol and drug use and adolescent emotional and physical dating and relationship violence (DRV) victimization and implementation, as well as the differences between these relationships in the gender, emphasizing the importance of seeking a healthy school environment in the school environment and peer-to-peer relationship of prevention and intervention programs [6]. Some studies aimed at the medical student group, investigated the risk factors that may induce suicidal ideation, pointed out the serious negative effects of stress, burnout, depression and comorbid mental illness, and called for medical schools to establish an effective suicide prevention program [7]. In addition, a study focused on online social interaction and found that friendship in virtual environment was related to lower levels of mental health [8]. A study of 94 four-year universities in the United States also showed social importance on mental health, and also showed the weak effects of intense physical activity and perceived stress on mental health [9]. However, the association between different factors affecting students' health and well-being is not clear, and studies on different student groups, such as different grades and different sexual orientations, are still lacking.

British scholars have investigated the requirements of British university students for well-being and made suggestions for the improvement of students' well-being resources based on the survey results [10], but did not mention how the well-being of primary and secondary students in primary and secondary schools was improved. Based on the results of the school survey of My Health, My School (MHMS) in 2018-2019, this paper tries to analyze the needs and influencing factors of different students from students with different grades and different sexual orientation, and at the same time explore the connection between different factors and health condition, so as to provide reference for schools to develop personalized adolescent health intervention programs.

2. Methods

2.1. Dataset

The data used in this paper are derived from the results of the annual “My Health, My School (MHMS)” School Student Survey of year 2019-20, which is a free pupil research available for pupils from Year 5 to Year 11, pupils attending any of the Specialist Inclusive Learning Centers (SILCs) and post-16 settings in Leeds, Britain. The survey collects numerous student perception data to provide schools with immediate data on a range of important aspects of student health behavior, including physical activity, sports, drugs, alcohol and tobacco, sexual health, mental health, safety and bullying.

Due to the outbreak of COVID-19 in 2020, the data of this survey are limited and affected to some extent. Totally 5,307 responses were received from 56 different schools and colleges. There exist blank sections in that table, because some problems are for students in different grade groups. In this paper, the variables are all named as the corresponding questions in the questionnaire.

2.2. Measures

In this paper, the columns of the original table were screened, and the basic information of the participating students and health-related information such as smoking, alcohol consumption, physical exercise, drug use and bullying were selected for correlation analysis. As for the criteria for judging students' mental health, this paper uses the statistical results of questions in the questionnaire that how much they agree or disagree with the statement "I enjoy my life" (variable X18), as a measure of the students' basic mental health indicators.

About the basic information of students, this paper statistics the students' school, grade, gender cognition, sexual orientation, race and residence. Students are from different schools (variable X1 for school name, variable X2 for school classification) in Leeds (variable X3), with nine different options (variable X4): year5, year6, year7, year9, year11, year12 year13, SEND and SEND plus. Students' gender perception (variable X5) includes five options: "Female", "some other gender", "prefer not to say", "Male", and "Trans", Sexual identity (variable X6) includes the term "Bi", which means Bisexuals, "Gay / Lesbian", "Heterosexual" and "describe in some other way" [11]. Student ethnic

selection (variable X7) includes "Asian", "Black", "Don't know / Prefer not to say", "Mixed", "Other Ethnic Group" and "White" [12]. As for living conditions, the questionnaire mainly focused mainly on the co-resident members of the students (variable X8), including "live independently", "live in a children's home" and live with "foster carers", "parent (s)", "carrier (s)", "other family members" or "someone else".

Among the possible covariates, this paper also collected several factors related to students' mental health. In terms of physical exercise, the questionnaire examined students' love and participation in physical education (variable X9), smoking (variable X10), active (variable X15) or forced (variable X14) willingness to have sex, drugs using (variable X13) and self-harm (variable X17). These questions were answered with "Yes" or "No". In addition, the questionnaire also examined whether students used e-cigarettes (variable X11), frequency of drinking (variable X12), frequency of being bullied (variable X16). Cases of e-cigarette use include the descriptions "No, never", "Have tried an electronic cigarette", "Use daily " and " Use weekly ". Responses for alcohol drinking frequency include "Drink 2 to 3 times a week", "Drink every day", "Drink once a week", "Drink only at certain times with family", "Never had a drink", "Have tried once or twice without family knowing", "Sometimes, but less than once a month", "Sometimes, but less than once a week". The frequencies of bullying situations are also documented.

2.3. Data Analyses

The baseline characteristics of the study students were presented as percentages according to the variable X18. Mixed Logistic Regression (MLR) models were used to evaluate the relationship between these above potential factors and the general mental conditions of students. Random forest graphs are drawn, the most significant factors are identified. Also, the research tried some prediction methods to evaluate the possible mental health condition of a student based on the MLR model and CART algorithm. The R software 4.2.2 was applied for data analysis. A p value < 0.05 was considered as statistically significant.

3. Result and Discussion

3.1. The Baseline Characteristics of Study Students

Characteristics of the study students were presented in Table 1, according to the answers to the question that how much they agree or disagree with the statement “enjoy my life” (variable X18). Baseline characteristics of the distribution of population variables are shown in the supplement Table 1. In the 5307 students, 1010 answers are lost, 4297 study students are included. 34.0% of the participating students held “Agree”, 41.0% “Strongly Agree”, 4.8% “Disagree”, 3.9% “Strongly Disagree” and 16.3% “Not Sure”. Some variables have blank rows in the statistics, because the corresponding questions of these variables are aimed at some students, such as the variable corresponding to sexual identity, variable X6, the answers of students of lower grades are not collected. In addition, some study students answered the questions selectively, which will also partly lead to the lack of some question answers.

The variable X7 collected the ethnic distribution of the study students, whose p value = $0.53 > 0.05$, indicating that students' attitudes towards life were not significantly different between races.

Observing the distribution of the variable X17, students who have done self-harm and answered “Yes” are more likely to think that they do not enjoy their life and have a negative attitude towards life. Students who were not asked (not-asked students were not shown in the table) whether or not having sex (variable X14, X15) tended to strongly agree that they enjoy life. These students are generally younger, indicating that students of lower grades are more likely to have a positive attitude towards life.

Table 1. Characteristics od students by life attitudes

Characteristics	Agree	Disagree	Not sure	Strongly agree	Strongly disagree	p
n	1463(34.0)	206(4.8)	699(16.3)	1760(41.0)	169(3.9)	
X6 (%)						<0.001
Bi	29 (2.0)	15 (7.3)	33 (4.7)	9 (0.5)	12 (7.1)	
Gay/Lesbian	13 (0.9)	6 (2.9)	9 (1.3)	14 (0.8)	10 (5.9)	
Heterosexual	623 (42.6)	63 (30.6)	245 (35.1)	486 (27.6)	58 (34.3)	
other way	22 (1.5)	8 (3.9)	25 (3.6)	33 (1.9)	13 (7.7)	
X7 (%)						0.53
Asian	166 (11.3)	19 (9.2)	76 (10.9)	199 (11.3)	24 (14.2)	
Black	129 (8.8)	13 (6.3)	54 (7.7)	165 (9.4)	12 (7.1)	
Don’t know	92 (6.3)	25 (12.1)	58 (8.3)	144 (8.2)	15 (8.9)	
Mixed	87 (5.9)	13 (6.3)	50 (7.2)	101 (5.7)	9 (5.3)	
Other Ethnic Group	32 (2.2)	5 (2.4)	15 (2.1)	33 (1.9)	3 (1.8)	
White	957 (65.4)	131 (63.6)	446 (63.8)	1118 (63.5)	106 (62.7)	
X9 (%)						<0.001
No	161 (11.0)	65 (31.6)	124 (17.7)	131 (7.4)	58 (34.3)	
Yes	955 (65.3)	107 (51.9)	436 (62.4)	1375 (78.1)	69 (40.8)	
X14(%)						<0.001
No	643 (44.0)	83 (40.3)	279 (39.9)	508 (28.9)	70 (41.4)	
Yes	44 (3.0)	9 (4.4)	33 (4.7)	34 (1.9)	23 (13.6)	
X15(%)						<0.001
No	478 (32.7)	73 (35.4)	218 (31.2)	404 (23.0)	61 (36.1)	
Yes	209 (14.3)	19 (9.2)	94 (13.4)	138 (7.8)	32 (18.9)	
X17(%)						<0.001
No	766 (52.4)	55 (26.7)	244 (34.9)	741 (42.1)	42 (24.9)	
Yes	138 (9.4)	65 (31.6)	164 (23.5)	64 (3.6)	73 (43.2)	

3.2. MLR Results shown as Forest Graphs

All student samples were randomly divided into two subsets, one with 80% samples, treated as training set and one with 20% samples, treated as test set. As shown in Fig.1, based on training set, random forest analysis was done on all potential covariates and importance plot was drawn. Variables X1, X2, X4, X6, X9, X10, X11, X12, X13, X14, X15 and X17 are relatively of greater importance than the others. The MLR is based on these more important variables.

When the mixed linear regression (MLR) was performed, options "Agree" and "Strongly Agree" are merged into "positive", options "Disagree" and "Strongly disagree" are merged into "negative",

and option "Not sure" is regarded as "Neutral", which is the reference term of mixed linear regression (MLR).

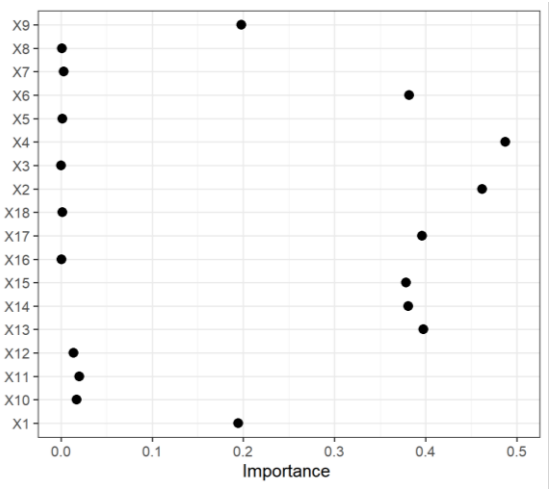


Fig 1. Importance forest plot of random forest analyses for the whole data

As shown in Fig. 2 and 3, all significant variables are drawn in the forest plots. Typically, daily e-cigarette use (X11; positive OR: 2.713, 95% CI: 1.159-6.35; negative OR: 3.784, 95% CI: 1.446-9.903) is significantly associated with both positive and negative attitudes towards life, which to some extent means that e-cigarette use will lead to students' psychological bias of both positive and negative to some extent. Students with heterosexual sexual identity (X6Heterosexual; OR: 1.515, 95% CI: 1.113-2.061) are more likely to hold a positive attitude towards life. Enjoying physical exercise (X9Yes; positive OR: 1.422, 95% CI: 1.234-1.638; negative OR: 0.625, 95% CI: 0.509-0.768) and no self-harm behavior (X17No; positive OR: 2.366, 95% CI: 2.026-2.763; negative OR: 0.772, 95% CI: 0.617-0.965) are conducive to students to form a positive attitude, and at the same time have a positive effect on suppressing the negative attitude. Not smoking (X10No; OR: 1.374, 95% CI: 1.128-1.675) is also conducive to students to form a positive attitude towards life. Conversely, disliking physical exercise (X9No; positive OR: 0.67, 95% CI: 0.567-0.793; negative OR: 1.468, 95% CI: 1.189-1.811) and self-harm behavior (X17Yes; positive OR: 0.446, 95%CI: 0.381-0.522; negative OR: 1.252, 95% CI: 1.023-1.533) were associated with negative attitudes while being detrimental to the formation of positive attitudes. In addition, daily drinking (X12; OR: 4.498, 95% CI: 1.53-13.226) was significantly associated with the formation of negative attitudes, while moderate drinking suppressed it. In particular, students who have not had sexual contact (X15No; OR: 1.358, 95% CI: 1.004-1.836) are more likely to have a negative mindset.

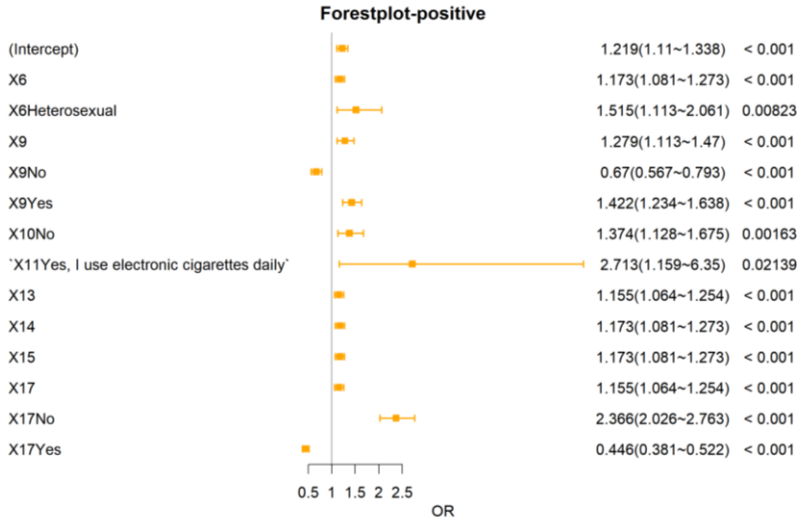


Fig 2. Forest plot of significant variables for option “positive” in MLR

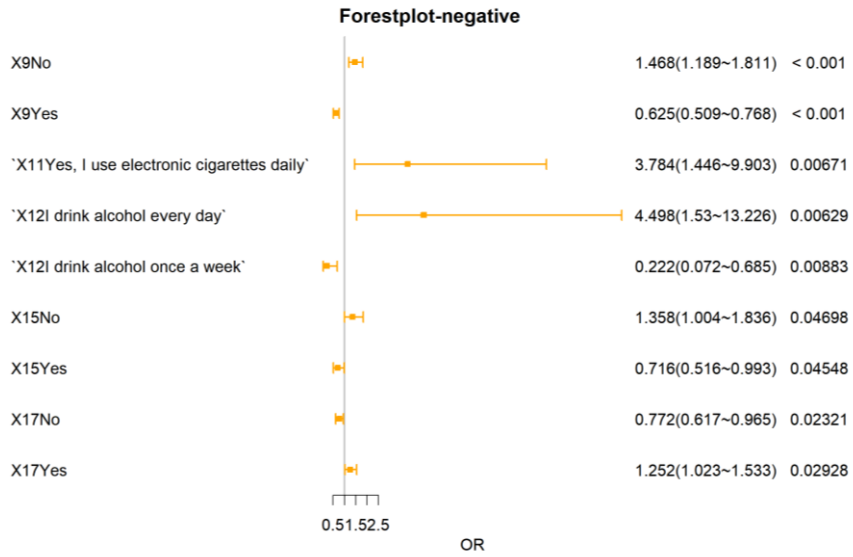


Fig 3. Forest plot of significant variables for option “negative” in MLR

3.3. Prediction

Based on the MLR model obtained from the training set, the data from the test set. Compared with the original results showed an accuracy of 76.05%. This shows that students 'mental health and attitude towards life are affected by many factors. The variables involved in this paper have a certain influence on students' life attitude, but at the same time, there are many factors that affect students' life attitude and mental health not mentioned.

4. Conclusions

Taking the life attitude of school students as a reference, this paper tries to analyze the potential factors affecting adolescent mental health. The study found that the higher the grade, the more likely they were to have negative life attitudes. At the same time, sexual minority students are even more difficult to feel happy. Students who enjoy physical exercise are more inclined to hold a positive attitude towards life, and students with self-harm such as drinking, drinking and smoking are more difficult to face life positively and optimistically. The mixed logistic regression model was used to predict students 'life attitude with an accuracy of 76.05%, indicating that there are other unconsidered factors affecting students' mental health and life attitude, which is also the direction of follow-up research and investigation. The research results also provide reference and hints for the development of school education and the improvement of students' care. Focusing on the well-being of sexual minority students, controlling the frequency of bad behavior of school students, and increasing the mental health counseling of senior students should be included in the work schedule.

References

[1] Pulimeno M, Piscitelli P, Colazzo S, Colao A, Miani A. School as ideal setting to promote health and wellbeing among young people. Health Promot Perspect, 2020, 10(4): 316-324.

[2] Littlecott H J, Long S, Hawkins J, Murphy S, Hewitt G, Eccles G, Fletcher A, Moore G F. Health Improvement and Educational Attainment in Secondary Schools: Complementary or Competing Priorities? Exploratory Analyses From the School Health Research Network in Wales. Health Educ Behav, 2018, 45(4): 635-644.

[3] Leung C H, Pong H K. Cross-sectional study of the relationship between the spiritual wellbeing and psychological health among university Students. PLoS One, 2021, 16(4).

[4] Velten J, et al. Lifestyle choices and mental health: a longitudinal survey with German and Chinese students. BMC Public Health, 2018.

[5] Wattanapisit A, et al. The clusters of health-risk behaviors and mental wellbeing and their sociodemographic correlates: a study of 15,366 ASEAN university students. BMC Public Health, 2022.

[6] Couturiaux D V R, et al. Risk Behaviors Associated with Dating and Relationship Violence among 11–16 Year Olds in Wales: Results from the 2019 Student Health and Wellbeing Survey. Int. J. Environ. Res. Public Health, 2021.

[7] Seo C, Di Carlo C, Dong S X, Fournier K, Haykal K A. Risk factors for suicidal ideation and suicide attempt among medical students: A meta-analysis. PLoS One, 2021, 16(12).

[8] Anthony R, Young H, Hewitt G, Sloan L, Moore G, Murphy S, Cook S. Young people's online communication and its association with mental well-being: results from the 2019 student health and well-being survey. Child Adolesc Ment Health, 2023, 28(1): 4-11.

[9] Vankim N A, Nelson T F. Vigorous physical activity, mental health, perceived stress, and socializing among college students. Am J Health Promot, 2013, 28(1): 7-15.

[10] Remskar M, Atkinson M J, Marks E, Ainsworth B. Understanding university student priorities for mental health and well-being support: A mixed-methods exploration using the person-based approach. Stress Health, 2022, 38(4): 776-789.

[11] Swaab D F, Wolff S E C, Bao A M. Sexual differentiation of the human hypothalamus: Relationship to gender identity and sexual orientation. Handb Clin Neurol, 2021, 181: 427-443.

[12] Williams D R, Lawrence J A, Davis B A. Racism and Health: Evidence and Needed Research. Annu Rev Public Health, 2019, 40: 105-125.