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# **Student Sleep Patterns and Mental Health: Evidence from Rural China**

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***Selected Poster prepared for presentation at the 2022 Agricultural & Applied Economics Association  
Annual Meeting, Anaheim, CA; July 31-August 2***

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## Introduction

- \* Many rural Chinese students sleep less than the recommended amount of time and go to bed later than they should.
- \* The relationship between sleep (sleep duration and bedtime) and mental health is not well understood for rural elementary school and junior high school students than for high school and college students, especially in the context of China.
- \* This study aims to fill in this knowledge gap by examining the relationship between sleep and mental health using data from elementary and junior high school students from one of the poorest provinces in northwest China.

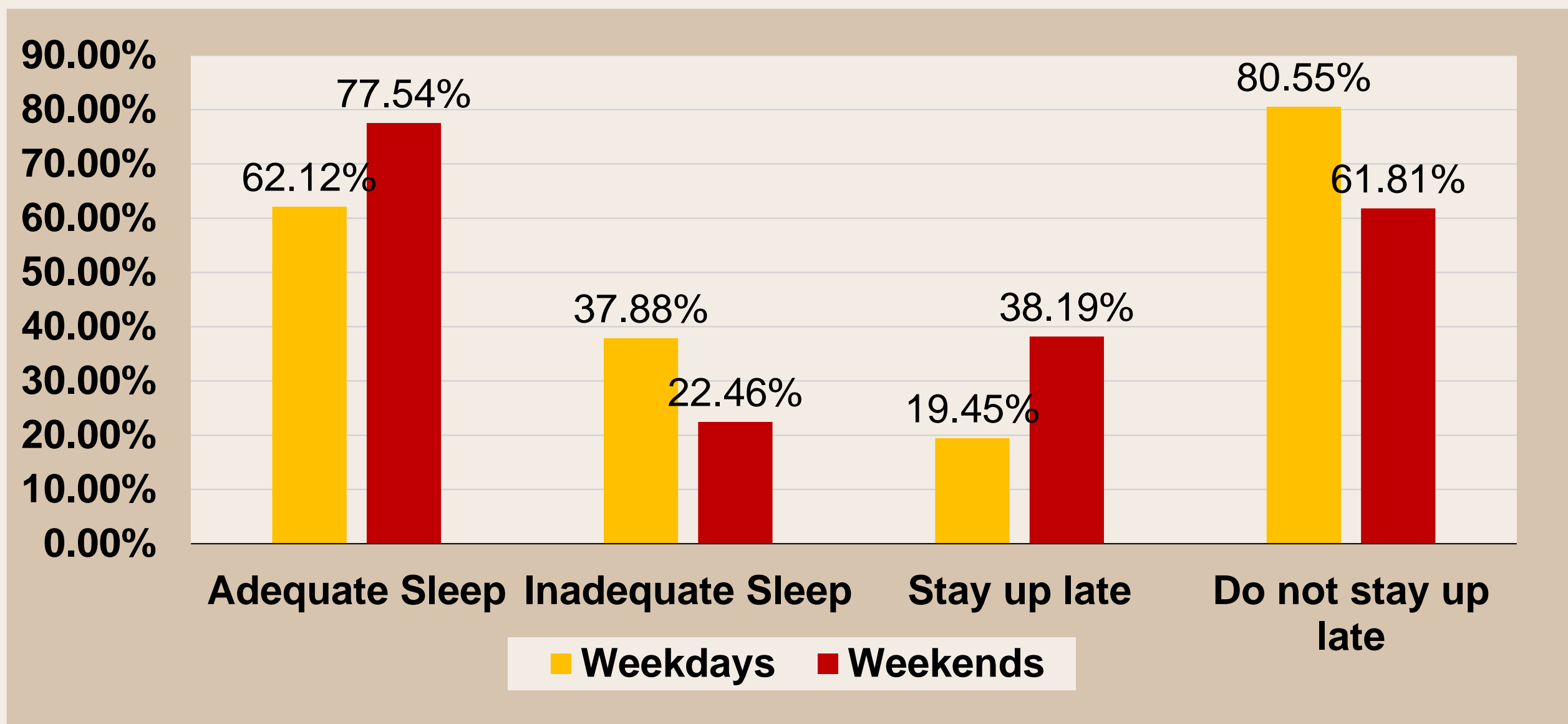


Figure 1. Students' sleep patterns differ between weekdays and weekends.

## Objectives

- \* Present new evidence on sleep pattern (sleep duration and bedtime) of elementary and junior high school students in rural China, and their mental health condition using a standardized, internationally validated scale (DASS).
- \* Estimate the association between sleep patterns (sleep duration and bedtime) and mental health of rural elementary and junior high school students.
- \* Explore whether there exists a non-linear relationship between sleep duration and mental health.

## Empirical Methods

$$Y_{ij} = \alpha + \beta_1 \text{sleep}_{ij} + \gamma X_{ij} + \sigma_{ij} + \varepsilon_{ij}$$

$$Y_{ij} = \alpha + \beta_1 \text{sleep}_{ij} + \beta_2 \text{sleep}_{ij}^2 + \gamma X_{ij} + \sigma_{ij} + \varepsilon_{ij}$$

- \*  $Y_{ij}$ : Student  $i$ 's mental health in class  $j$
- \*  $\text{sleep}_{ij}$ : Student  $i$ 's sleep duration and bedtime in class  $j$
- \*  $\beta_1 \beta_2$ : The coefficients of interest
- \*  $X_{ij}$ : A set of students' and families' characteristics
- \*  $\sigma_{ij}$ : Class fixed effects
- \*  $\varepsilon_{ij}$ : Error term

Measured by Depression Anxiety and Stress Scale (DASS)

## Results

Table 1. OLS regression of students' sleep patterns and mental health

	Depression (mild)	Stress (mild)	Anxiety (mild)
Panel A: Sleep later than the recommended time on weekdays (Yes = 1)	0.057*** (2.889)	0.055** (2.144)	0.068** (2.377)
Panel B: Sleep later than the recommended time on weekdays (Yes = 1)	0.090*** (3.263)	0.086*** (3.409)	0.095*** (3.668)
Panel C: Have an adequate sleep on weekdays (Yes = 1)	-0.086** (-2.630)	-0.108** (-2.729)	-0.073*** (-2.250)
Panel D: Have an adequate sleep on weekends (Yes = 1)	-0.015 (-0.464)	-0.037 (-1.098)	-0.028 (-1.878)
Control Variables	Y	Y	Y
Class FE	Y	Y	Y
N	1601	1601	1601

Notes: The dependent variables are mild mental health symptoms in columns (1)-(3). All regressions include dummies for class. Standard errors clustered at the school level.  $T$ -statistics are reported in parentheses. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

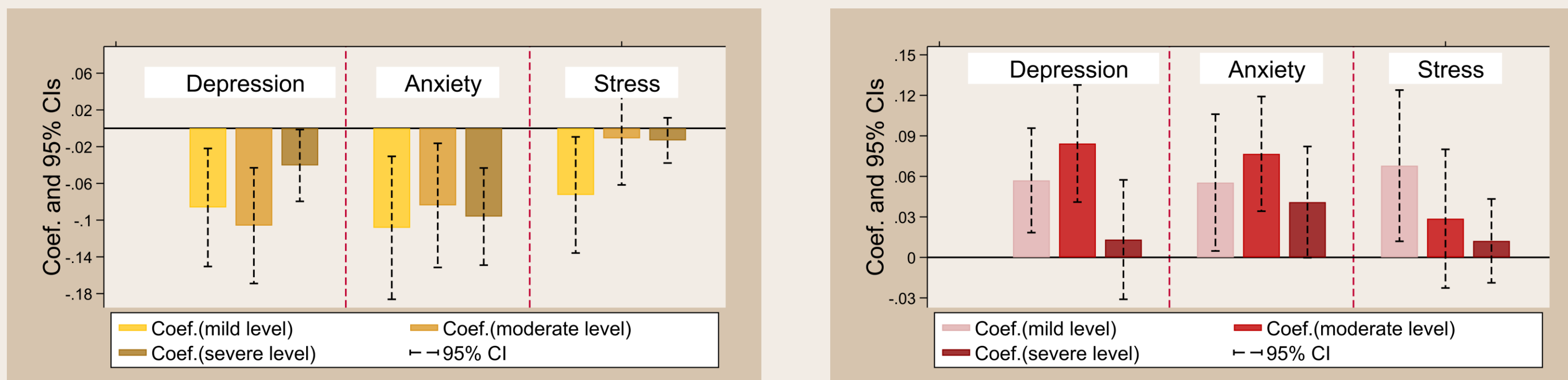


Figure 2. OLS regression coefficients and confidence intervals.

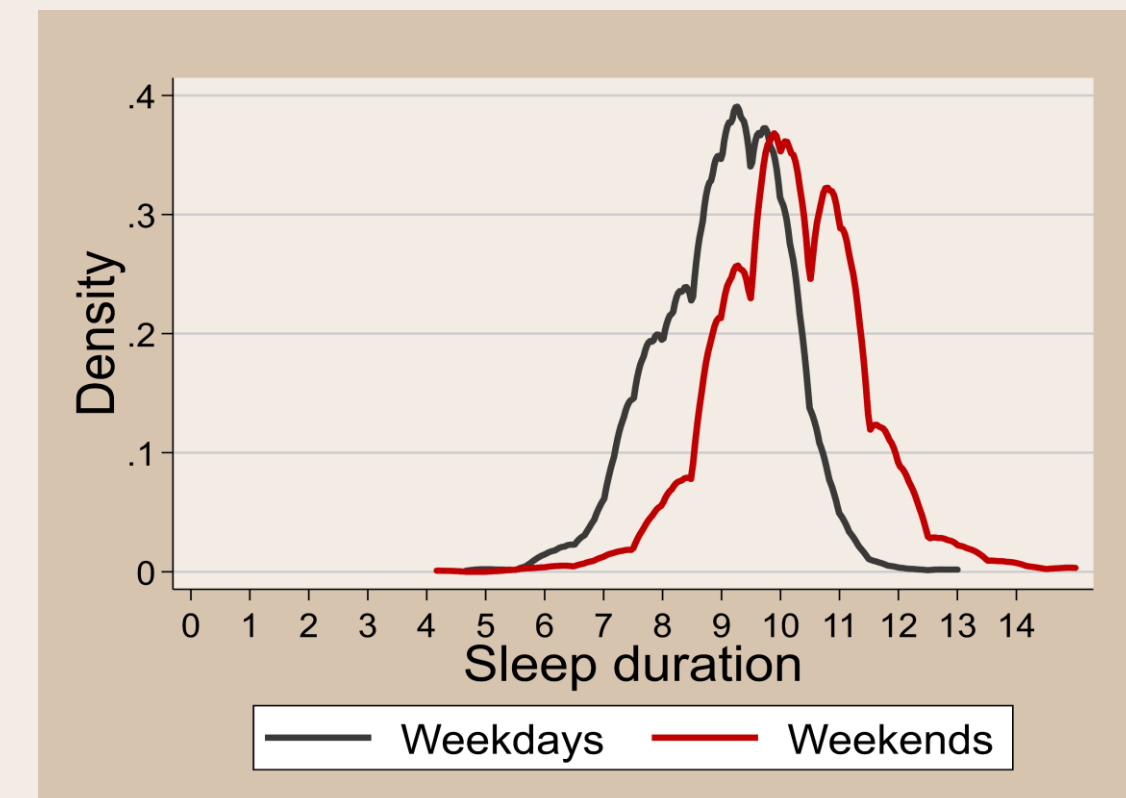


Figure 3. Distribution of students' sleep duration on weekdays and weekends.

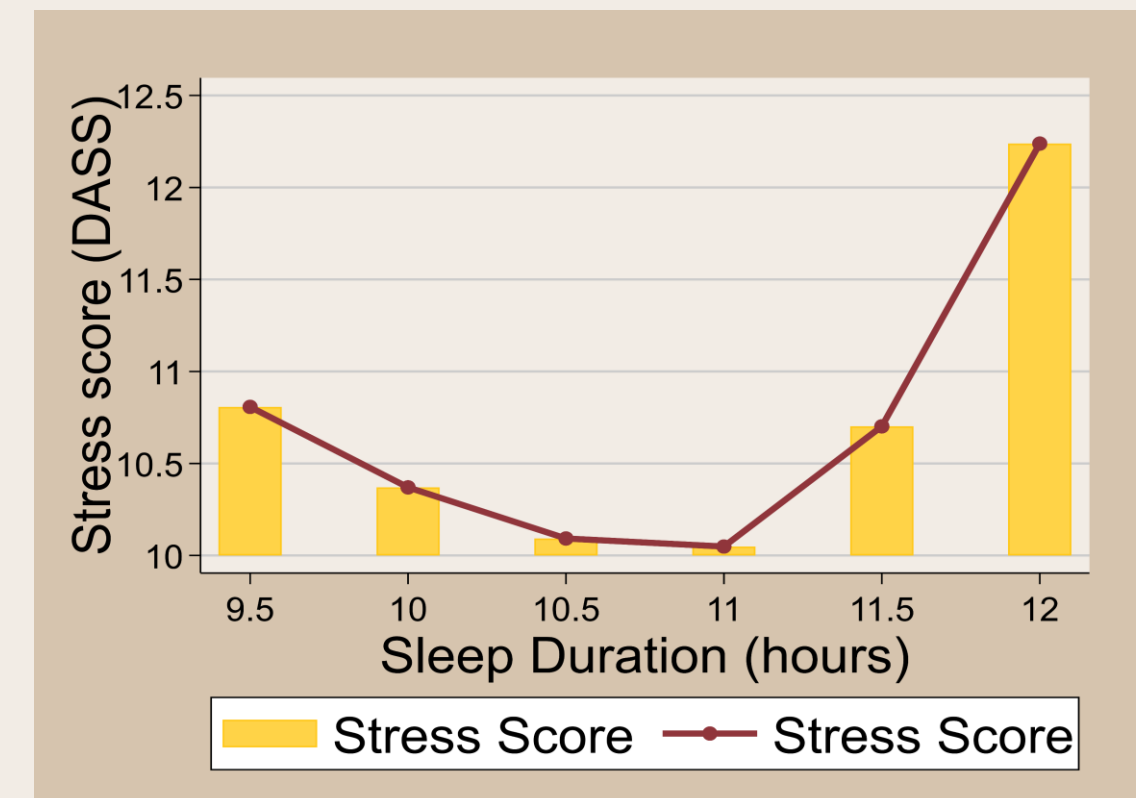


Figure 4. Relationship between sleep duration and stress scores.

Table 2. The "U-shaped" relationship between sleep duration and mental health

	Depression (mild)	Stress (mild)	Anxiety (mild)
Sleep duration (hours)	-4.532*	-5.706***	-4.270**
(Weekend)	(-2.005)	(-3.189)	(-2.609)
Sleep duration <sup>2</sup> (hours)	0.210*	0.269***	0.197**
(Weekend)	(2.014)	(3.154)	(2.530)
U-test (P-value)	0.030	0.003	0.016
Extreme point	10.785	10.599	10.837
Control Variables	Y	Y	Y
Class FE	Y	Y	Y
N	1577	1577	1577

Notes: The dependent variables are mild mental health symptoms in columns (1)-(3). All regressions include dummies for class. Standard errors clustered at the school level.  $T$ -statistics are reported in parentheses. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

## Discussion & Conclusion

- \* A significant portion of elementary or junior high school students do not enjoy the recommended amount of sleep or sleep too late during weekdays.
- \* Students tend to show different sleep patterns between weekdays and weekends in our sample.
- \* The proper bedtime and adequate sleep will reduce the risk of mental illness, including depression, anxiety, and stress.
- \* There is a "U-shaped" relationship between sleep duration on weekends and mental health, implying that either too little sleep or oversleeping during weekends is harmful for student's mental health. Approximately 10 hours of sleep during weekends is adequate.