Dear Editor,

Mental health is a private matter, which refers to an individual’s cognition and emotion; more precisely, it describes the condition of one’s mind. The slogan “no health without mental health” has been proposed by the world health organization (WHO) for a few years (1). According to statistics, almost 450 million people suffer from mental or neurological diseases.

Depression is the leading cause of disability and the fourth major cause of disease burden around the world. What is alarming is that the increasing prevalence of depression, which is speculated to become the second leading cause of disease burden in the following 20 years. In fact, 1 out of 4 people will experience a mental disorder for a certain period in their lifetime. Not only the consequences, but also the socioeconomic burden of these diseases is tremendous for patients (2, 3). Therefore, mental health is receiving more and more attention, and study of mental health and its associated factors, such as diet, is of great significance.

In the past decades, knowledge about the relationship between diet and mental health has been increasing, and various studies have been published in this area (4, 5). However, there is a scarcity of research exploring this relationship in Chinese populations. Accordingly, we conducted this study to determine if there is an association between diet and mental health in North China. The hypothesis is that the psychological status of people with different dietary habits varies significantly. Such studies can provide further information on how to maintain a good mental health status with diet.

The investigation was conducted in July and August, 2012 in Jilin province, China. Jilin province is located in Northeast China on the east longitude 121°38’ - 131°19’ and the north latitude 40°50’ - 46°19’. It has a temperate monsoon climate with cold and long winters. In this location, people usually have more salt and fat intake, compared to other regions in China.

In this survey, multistage stratified cluster sampling was applied, and 32 districts from 9 administrative regions were selected as the study setting. A total of 21,435 Chinese people from Jilin province participated in this survey. The general mental health status of the participants was evaluated, using the 12-item general health questionnaire (GHQ-12). For further information, the methods are fully described in our articles (6, 7).

SPSS version 19.0 was used for statistical analysis. Chi square test was used to compare mental health among people with different diets. Logistic regression analysis was used to compare mental health after adjustment for 9 sociodemographic characteristics. The significance level was set at 0.05 (2-sided).

The Chi square test results showed an association between diet and mental health. After adjustment for age, gender, district, education, marriage, occupation, average monthly household income, smoking, and drinking habits, logistic regression analysis also showed that irregular diets, including high salt intake, breakfast omission, and inadequate fruits, vegetables, and eggs, were positively associated with poor mental health (P < 0.001).

The psychological status of people with regular diets, who incorporated breakfast into their diet and used adequate amounts of salt, fruits, vegetables, and eggs, that better than those who did not. Based on the findings, the difference in dietary patterns was significant, and the psychological status of subjects with balanced diet was high, while vegetarians showed the worst status (χ² = 43.426; P < 0.001).

Use of different staple foods was also a factor, influencing mental health; the difference was mainly related to staple foods, except rice and flour. Moreover, exercise and body mass index (BMI), as 2 major factors related to diet, were associated with mental health. The analysis showed that exercise was effective in good mental health. Compared with normal and overweight individuals, the prevalence of poor mental health was the highest among the underweight (Table 1).

The present study provides evidence on the association...
between diet and mental health. The results suggest that diet influences mental health. The impact was limited but significant in the Chinese population of Northeast China. In this study, subjects with irregular diets and breakfast omission were more likely to have a poor mental health. The reason may be that irregular diet and breakfast omission result in a state of hunger, which reduces the oxygen content of the brain, affecting the release of some endocrine hormones.

Similar to earlier reports (8), this study demonstrated that vegetarians’ mental status is at the lowest level, compared with people with a balanced diet and meat intake. In addition, the psychological status of people using inadequate eggs was unsatisfactory. The reason may be that foods, such as meat and eggs, are rich in protein, while protein deficiency can affect an individual’s psychological sta-

| Variables                | Poor Mental Health (N = 3041) | Good Mental Health (N = 18394) | Prevalence, % | Chi Square Test | Logistic Regression Analysisa |
|--------------------------|-------------------------------|--------------------------------|---------------|----------------|-----------------------------|
| No.                      | %                             | No.                            | %             | χ²            | P value | χ²            | P value | OR          | 95%CI |
| Diet                     |                               |                                |               |               |         |               |         |             |       |
| Regular                  | 244                            | 79.4                           | 1549          | 82.4          | 12.4   | 247.263       | < 0.001 | 2.086       | 1.904–2.287 |
| Irregular                | 900                            | 20.6                           | 3443          | 17.6          | 21.7   | 43.426        | < 0.001 | 1.154       | 1.054–1.264 |
| Diet type                |                               |                                |               |               |         |               |         |             |       |
| Balanced                 | 524                            | 50.2                           | 12448         | 61.2          | 8.9    | 40.203        | < 0.001 | 1.054       | 1.008–1.104 |
| More meat                | 264                            | 49.8                           | 5312          | 38.8          | 8.7    | 24.365        | < 0.001 | 1.054       | 1.008–1.104 |
| More vegetables          | 319                            | 61.8                           | 4813          | 60.5          | 18.0   | 96.666        | < 0.001 | 1.177       | 1.138–1.212 |
| Flavor                   |                               |                                |               |               |         |               |         |             |       |
| Normal                   | 730                            | 55.8                           | 1034          | 62.7          | 13.4   | 144.703       | < 0.001 | 1.167       | 1.123–1.214 |
| Salty                    | 1252                           | 44.2                           | 8660          | 37.3          | 15.4   | 278.927       | < 0.001 | 1.192       | 1.158–1.229 |
| Breakfast                |                               |                                |               |               |         |               |         |             |       |
| No                       | 2348                           | 77.1                           | 15460         | 94.1          | 13.2   | 45.502        | < 0.001 | 1.194       | 1.146–1.244 |
| Yes                      | 955                            | 22.9                           | 2526          | 5.9           | 19.2   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| Fruit                    |                               |                                |               |               |         |               |         |             |       |
| Normal                   | 136                            | 39.0                           | 988           | 53.8          | 10.7   | 208.700       | < 0.001 | 1.192       | 1.146–1.244 |
| Salty                    | 874                            | 61.0                           | 5753          | 46.2          | 15.8   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| Never or rarely          | 280                            | 29.0                           | 3330          | 21.1          | 19.2   | 3330          | 14.1    | 20.9        |       |
| Vegetables               |                               |                                |               |               |         |               |         |             |       |
| Normal                   | 1003                           | 36.3                           | 11134         | 51.7          | 10.4   | 208.407       | < 0.001 | 1.185       | 1.167–1.207 |
| Salty                    | 1938                           | 63.7                           | 8878          | 48.3          | 17.9   | 10.040        | < 0.001 | 1.192       | 1.146–1.244 |
| Adequate eggs            |                               |                                |               |               |         |               |         |             |       |
| Normal                   | 1210                           | 85.5                           | 16347         | 96.4          | 13.5   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| Salty                    | 40                             | 15.5                           | 1577          | 6.6           | 20.7   | 7.895         | 0.004   | 1.046       | 1.004–1.092 |
| Fruits                   |                               |                                |               |               |         |               |         |             |       |
| Normal                   | 2563                           | 84.3                           | 17052         | 85.4          | 14.0   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| Salty                    | 104                            | 15.7                           | 1833          | 10.6          | 14.2   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| Grains                   | 185                            | 5.5                            | 834           | 4.5           | 18.6   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| Others                   | 8                              | 0.3                            | 25            | 0.1           | 24.2   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| Exercise                 |                               |                                |               |               |         |               |         |             |       |
| Normal                   | 690                            | 52.7                           | 16066         | 54.0          | 18.8   | 690           | 0.001   | 1.054       | 1.008–1.099 |
| Salty                    | 644                            | 47.3                           | 4716          | 44.0          | 12.3   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| Never or rarely          | 1707                           | 56.1                           | 8122          | 44.1          | 17.4   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| BMI                      |                               |                                |               |               |         |               |         |             |       |
| Normal                   | 1865                           | 48.5                           | 6075          | 43.9          | 14.9   | 2046          | 0.002   | 0.988       | 0.960–0.980 |
| Underweight              | 164                            | 5.5                            | 773           | 4.2           | 17.9   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| Overweight               | 970                            | 31.9                           | 6305          | 34.4          | 13.3   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |
| Obesity                  | 463                            | 13.6                           | 2692          | 16.9          | 13.3   | 1.054         | 0.028   | 1.034       | 0.978–1.094 |

a Age, gender, district, education, marriage, occupation, average monthly household income, smoking, and drinking habits are adjusted.
Similar to previous research (9), people who often eat fruits and vegetables have a good mental health. Fruits and vegetables are rich in vitamins and microelements essential for maintaining the excitability of nerves and muscles. In addition, this study found that exercise and BMI were significantly associated with mental health. Based on the findings, lack of exercise and underweight were closely associated with poor mental health.

In summary, this study revealed a significant association between diet and mental health in Northeast China. Although some similar studies have been conducted in this area, they have primarily focused on Western populations. The results presented in this study could provide information on how to maintain good mental health through diet (especially in Chinese populations).

The strengths of this study include the large sample size and data collection by trained interviewers. This study presents only a small part of the findings from a large-scale inventory survey; therefore, there are some limitations inevitably. First, there are no currently available standard dietary questionnaires. Second, GHQ is only a screening tool, and not a diagnostic scale. Third, the causal relationships could not be examined due to the cross-sectional design of the study. Therefore, further studies are required to determine the relationship between diet and mental health.

Footnote

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