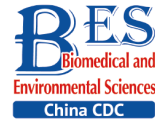


## Letter to the Editor



# Impact of COVID-19 Pandemic on the Mental Health of Returning Employees in Labor-Intensive Companies: A Study Based on Repeated Surveys\*

LIU Yu<sup>1</sup>, WANG Xiao Feng<sup>1</sup>, XI Jun Yan<sup>2</sup>, XIAO Qi Peng<sup>1</sup>, HE Li Ping<sup>1</sup>, LU Ci Yong<sup>3</sup>, and HE Ling<sup>4,5,#</sup>

In December 2019, an outbreak of COVID-19 occurred in Wuhan City in Hubei Province of China. Neighboring Hunan Province launched a Level 1 public health emergency response on January 24, 2020. Chenzhou City, located in the southernmost part of Hunan Province, bordering Guangdong Province and Jiangxi Province, has formed an agglomeration zone for processing trade and labor-intensive industries. At the beginning of the outbreak, most businesses in this region suspended production, and they resumed production gradually after February 10, 2020.

To prevent clustered cases, most companies adopted closed-off management and strictly enforced disinfection measures. All personnel were advised to maintain social distancing, avoid gathering for entertainment activities, wear masks in public places, and strengthen hand hygiene. To evaluate the anxiety of returning employees of labor-intensive enterprises during this special period, we conducted repeated cross-sectional online surveys at three stages of different risk levels, as shown in Figure 1.

The survey was conducted on the QuestionStar platform. A link to the questionnaire was posted for employees by the management of enterprises *via* WeChat or QQ. Employees aged 18 and older returning to work in labor-intensive enterprises in Chenzhou were invited to participate.

The questionnaire had four parts. The first part gathered the demographic information of the participants. The second part was the Chinese version of the Generalized Anxiety Disorder-7 (GAD-7) scale, and its overall score was interpreted as follows: normal (0–4), mild (5–9), moderate (10–14),

and severe (15–21) anxiety. The third part asked about the influence of the pandemic on participants. The fourth part evaluated the social care the participants received.

All statistical analyses were carried out using SPSS (version 26.0, IBM Corp, Armonk, NY). Using the anxiety score as the dependent variable, we used the first survey's results as the baseline data and chose a log-linked negative binomial generalized linear model to compare the change in the anxiety score between the second and the third survey. To explore factors potentially associated with anxiety, incidence rate ratios (*IRRs*) and 95% *CIs* were presented. Demographic characteristic variables were controlled for all our models. The significance level was set at  $\alpha = 0.05$ .

In the three surveys, 1,043, 1,884, and 3,559 employees completed the survey after providing informed consent. Excluding respondents who worked from home, 812, 1,854, and 3,545 valid questionnaires were obtained. The effective response rate increased from 77.9% in the 1st survey to 99.6% in the 3rd survey. Table 1 shows the demographic characteristics of the respondents. In the first survey, the majority of respondents were male employees (63.3%), while in the second and third surveys, the proportion of female employees increased significantly, accounting for 73.8% and 69.2%, respectively, close to the actual situation before the outbreak. The average age of the respondents was  $38.17 \pm 7.75$  years old, 82.9% were married, 83.9% had not attended university, 66.4% were production-line workers, and 90.9% were living with others.

Table 2 shows that the rate of anxiety was

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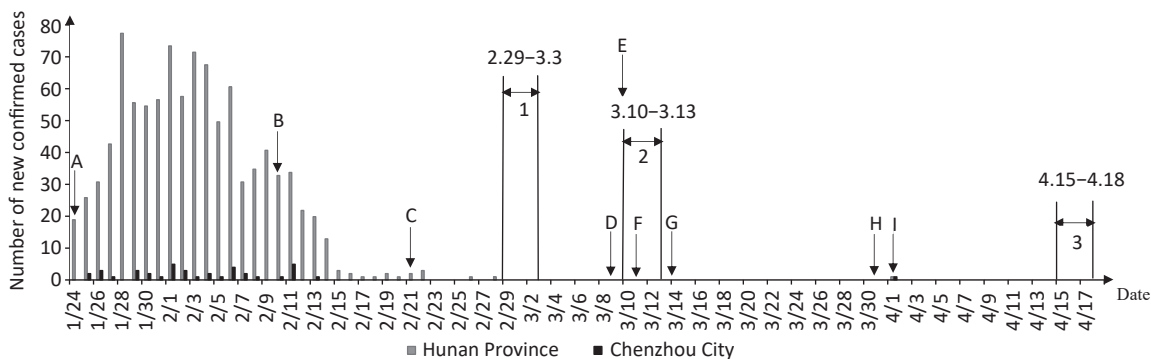
1. School of Public Health, Xiangnan University, Chenzhou 423001, Hunan, China; 2. Department of Medical Statistics, School of Public Health, Sun Yat-sen University, Guangzhou 510080, Guangdong, China; 3. Department of Epidemiology, School of Public Health, Sun Yat-sen University, Guangzhou 510080, Guangdong, China; 4. School of Educational Sciences, Xiangnan University, Chenzhou 423001, Hunan, China; 5. School of Educational Sciences, Hunan Normal University, Changsha 410081, Hunan, China

highest in the first survey, with 15.3% having mild anxiety (95% CI: 12.9%–17.9%), 3.1% having moderate anxiety (95% CI: 2.0%–4.5%), and 1.5% having severe anxiety (95% CI: 0.8%–2.6%). The results were lower than those of general population nationwide at 31.6% (95% CI: 31.2%–32.0%) during the same period<sup>[1]</sup>. We expected that returning to work would increase anxiety among employees, but the results showed a downward trend in the three surveys. Shi<sup>[1]</sup> reported that compared with those who did not work or worked from home or without exposure to people at work, the rate of anxiety in people who were exposed to people at work was lower. Tan<sup>[2]</sup> also found that returning to work did not cause high levels of psychiatric symptoms in the workforce.

Table 3 shows the underlying factors associated with anxiety. In the first survey, increased work stress and reduced expected earnings were associated with high levels of anxiety, possibly due to a lack of understanding and adaptation of returning employees to work patterns during the pandemic. In the second and third surveys, no change in work stress was associated with low anxiety levels, while significantly changed hygiene habits was associated with high anxiety levels. Previous studies have found that individuals with high pollution fear more frequently adopt safety behaviors<sup>[3]</sup>, and there is a positive correlation between disease-related anxiety and safety

behaviors<sup>[4]</sup>. While changes in the hygiene habits of returning employees may not be the result of voluntary choice<sup>[5]</sup>, cumbersome operations may be a constant reminder of the risks of the pandemic, and a reduced risk of infection is associated with lower anxiety. How to relieve the negative emotions while requiring employees to adopt safe behaviors is worth further study.

Notably, a decline in quality of life was consistently associated with high anxiety, while corporate care for employees was associated with low anxiety. In the first survey, psychological adjustment materials, knowing the counseling hotline, actively confiding in others, and misinformation were not associated with anxiety. In the second and third surveys, actively confiding in others was associated with high anxiety, while knowing the counseling hotline was associated with low anxiety. In the third survey, psychological adjustment materials were also a protective factor. From these results, it can be seen that in the early stage of resuming work, employees had a simple way to regulate their anxiety and tended to passively accept help, while after a period of time, they began to actively seek improvement. Results from a randomized clinical trial during the COVID-19 pandemic showed that a 4-week phone service with a lay person focused on empathetic listening improved loneliness, depression, and anxiety<sup>[6]</sup>. In addition, we found that people’s trust in pandemic



**Figure 1.** Graph of the pandemic development in Hunan Province and Chenzhou City. A, Hunan Province launched a Level 1 public health emergency response, and Chenzhou City was classified as a medium-risk B area. B, First batch of companies in Chenzhou allowed to officially reopen. C, Chenzhou City was adjusted to a medium-risk C area. D, Chenzhou City was adjusted to a low-risk area. E, Hunan Province emergency response level for COVID-19 was adjusted from Level 1 to Level 2. F, Chenzhou City no longer required reviews and approval for companies to resume operation. G, Number of COVID-19 patients hospitalized in Hunan Province became zero. H, Hunan Province emergency response level for COVID-19 was adjusted from Level 2 to Level 3. I, One new confirmed case of COVID-19 in Chenzhou City, imported from abroad. 1 First survey period, February 29–March 3, 2020. 2 Second survey period, March 10–March 13, 2020. 3 Third survey period, April 15–April 18, 2020.

information they received was also related to anxiety (1.345, 95% *CI*: 1.178–1.535). Wong<sup>[7]</sup> found that anxiety played a mediating role between using social media to receive COVID-19 information and

trust in information. Anxiety symptoms predict a lower level of trust in information.

The current study is not without limitations. First, while the sample is representative of the returning

**Table 1.** Sample demographics

| Characteristics                              | 1st survey | 2nd survey   | 3rd survey   |
|--|------------|--------------|--------------|
| Sample ( <i>n</i> )                          | 1,043      | 1,884        | 3,559        |
| Effective Sample                             | 812        | 1,854        | 3,545        |
| Response rate                                | 77.9       | 98.4         | 99.6         |
| Gender, <i>n</i> (%)                         |            |              |              |
| Male   | 514 (63.3) | 486 (26.2)   | 1,091 (30.8) |
| Female                                       | 298 (36.7) | 1,368 (73.8) | 2,454 (69.2) |
| Age, <i>n</i> (%)                            |            |              |              |
| < 30   | 110 (13.5) | 198 (10.7)   | 472 (13.3)   |
| 30–39  | 311 (38.3) | 985 (53.1)   | 1,491 (42.1) |
| 40–49  | 254 (31.3) | 625 (33.7)   | 1,417 (40.0) |
| ≥ 50   | 137 (16.9) | 46 (2.5)     | 165 (4.7)    |
| Marital status, <i>n</i> (%)                 |            |              |              |
| Single                                       | 104 (12.8) | 206 (11.1)   | 490 (13.8)   |
| Married                                      | 679 (83.6) | 1,559 (84.1) | 2,911 (82.1) |
| Divorced/widowed                             | 29 (3.6)   | 89 (4.8)     | 144 (4.1)    |
| Education attainment, <i>n</i> (%)           |            |              |              |
| Junior high school and below                 | 229 (28.2) | 1,135 (61.2) | 2,136 (60.3) |
| High school/technical secondary school       | 296 (36.5) | 476 (25.7)   | 937 (26.4)   |
| Junior college and above                     | 287 (35.3) | 243 (13.1)   | 472 (13.3)   |
| Job position, <i>n</i> (%)                   |            |              |              |
| Production-line workers                      | 405 (49.9) | 1,205 (65.0) | 2,515 (70.9) |
| Manager                                      | 185 (22.8) | 237 (12.8)   | 388 (10.9)   |
| Technical/R&D personnel                      | 58 (7.1)   | 123 (6.6)    | 268 (7.6)    |
| Clerical/office personnel                    | 65 (8.0)   | 103 (5.6)    | 138 (3.9)    |
| Others                                       | 99 (12.2)  | 186 (10.0)   | 236 (6.7)    |
| Living arrangement, <i>n</i> (%)             |            |              |              |
| Living alone                                 | 73 (9.0)   | 177 (9.5)    | 317 (8.9)    |
| Living with family/friends                   | 601 (74.0) | 920 (49.6)   | 1,789 (50.5) |
| Living with colleagues/others                | 138 (17.0) | 757 (40.8)   | 1,439 (40.6) |
| How long ago they resumed work, <i>n</i> (%) |            |              |              |
| < 1 week                                     | 121 (14.9) | 61 (3.3)     | 39 (0.01)    |
| 1 week                                       | 221 (27.2) | 90 (4.9)     | 78 (0.02)    |
| 2 weeks                                      | 224 (27.6) | 449 (24.2)   | 52 (0.02)    |
| 3 weeks                                      | 186 (22.9) | 112 (6.0)    | 113 (0.03)   |
| 4 weeks                                      | 60 (7.4)   | 1,142 (61.6) | 3,263 (0.92) |

**Table 2.** Anxiety and its temporal trend among returning employees of labor-intensive companies

| Survey time | Mild anxiety, <i>n</i> (%), 95% <i>CI</i> | Moderate anxiety, <i>n</i> (%), 95% <i>CI</i> | Severe anxiety, <i>n</i> (%), 95% <i>CI</i> | <i>IRR</i> | 95% <i>CI</i> |
|-------------|---|---|---|------------|---------------|
| 1st survey  | 124 (15.3, 12.9–17.9)                     | 25 (3.1, 2.0–4.5)                             | 12 (1.5, 0.8–2.6)                           | 1          | Reference     |
| 2nd survey  | 213 (11.5, 10.1–13.0)                     | 62 (3.3, 2.6–4.3)                             | 26 (1.4, 0.9–2.0)                           | 0.875      | 0.791–0.969   |
| 3rd survey  | 365 (10.3, 9.3–11.3)                      | 90 (2.5, 2.0–3.1)                             | 48 (1.4, 1.0–1.8)                           | 0.761      | 0.693–0.836   |

**Note.** *IRR*, incidence rate ratio; *CI*, confidence interval.

employees across a number of key demographic indicators, the study is prone to a number of sampling biases. The psychological impact of the

pandemic on employees may be underestimated, as many individuals were excluded due to rigorous health screening before returning to work. Second,

**Table 3.** Underlying factors associated with anxiety of returning employees at labor-intensive companies

| Characteristics  | 1st survey |             | 2nd survey |             | 3rd survey |             |
|--|------------|-------------|------------|-------------|------------|-------------|
|  | IRR        | 95% CI      | IRR        | 95% CI      | IRR        | 95% CI      |
| Intercept  | 0.912      | 0.469–1.772 | 1.879      | 0.976–3.617 | 2.497      | 1.626–3.833 |
| Work stress  |            |             |            |             |            |             |
| Somewhat reduced                                       | –          | –           | 1          | Reference   | 1          | Reference   |
| No change  | 1          | Reference   | 0.442      | 0.291–0.672 | 0.366      | 0.273–0.491 |
| Increased  | 2.153      | 1.671–2.773 | 0.883      | 0.589–1.324 | 0.752      | 0.567–1.098 |
| Significantly increased                                | 2.230      | 1.657–3.001 | 1.281      | 0.838–1.959 | 0.901      | 0.668–1.215 |
| Expected income  |            |             |            |             |            |             |
| No change  | 1          | Reference   | 1          | Reference   | 1          | Reference   |
| Somewhat reduced                                       | 1.735      | 1.172–2.567 | 1.050      | 0.862–1.278 | 1.133      | 1.007–1.255 |
| Significantly reduced                                  | 1.976      | 1.295–3.015 | 1.236      | 0.986–1.549 | 1.121      | 0.956–1.314 |
| Unclear  | 1.861      | 1.173–2.953 | 1.145      | 0.844–1.554 | 1.070      | 0.868–1.318 |
| Hygiene habits   |            |             |            |             |            |             |
| No change  | 1          | Reference   | 1          | Reference   | 1          | Reference   |
| Moderately changed                                     | 0.897      | 0.667–1.207 | 1.224      | 1.021–1.467 | 0.971      | 0.854–1.104 |
| Relatively significantly changed                       | 1.223      | 0.921–1.624 | 1.494      | 1.238–1.804 | 1.150      | 1.004–1.317 |
| Significantly changed                                  | 1.220      | 0.900–1.654 | 1.539      | 1.256–1.885 | 1.063      | 0.915–1.235 |
| Quality of life  |            |             |            |             |            |             |
| No change  | 1          | Reference   | 1          | Reference   | 1          | Reference   |
| Somewhat reduced                                       | 1.339      | 1.030–1.742 | 1.407      | 1.174–1.685 | 1.129      | 0.997–1.279 |
| Significantly reduced                                  | 1.261      | 0.911–1.745 | 1.425      | 1.137–1.786 | 1.349      | 1.142–1.592 |
| Risk of being infected                                 |            |             |            |             |            |             |
| Somewhat increased                                     | 1          | Reference   | 1          | Reference   | 1          | Reference   |
| No change  | 0.456      | 0.280–0.741 | 0.793      | 0.504–1.249 | 0.717      | 0.533–0.964 |
| Somewhat decreased                                     | 0.791      | 0.498–1.256 | 0.750      | 0.483–1.166 | 0.843      | 0.632–1.124 |
| Significantly decreased                                | 0.775      | 0.496–1.209 | 0.508      | 0.332–0.779 | 0.654      | 0.496–0.861 |
| Corporate care   |            |             |            |             |            |             |
| No   | 1          | Reference   | 1          | Reference   | 1          | Reference   |
| Yes  | 0.591      | 0.447–0.782 | 0.774      | 0.652–0.920 | 0.752      | 0.657–0.861 |
| Psychological adjustment materials                     |            |             |            |             |            |             |
| No   | 1          | Reference   | 1          | Reference   | 1          | Reference   |
| Yes  | 1.043      | 0.785–1.385 | 0.897      | 0.751–1.071 | 0.817      | 0.713–0.938 |
| Knowing the counseling hotline                         |            |             |            |             |            |             |
| No   | 1          | Reference   | 1          | Reference   | 1          | Reference   |
| Yes  | 0.842      | 0.692–1.025 | 0.726      | 0.634–0.832 | 0.850      | 0.768–0.940 |
| Actively confide to others                             |            |             |            |             |            |             |
| Rarely   | 1          | Reference   | 1          | Reference   | 1          | Reference   |
| Sometimes  | 0.959      | 0.694–1.325 | 1.499      | 1.202–1.870 | 1.706      | 1.450–2.006 |
| Frequently   | 1.046      | 0.718–1.524 | 1.674      | 1.286–2.177 | 2.429      | 2.014–2.931 |
| Amount of false information they thought they received |            |             |            |             |            |             |
| Minority   | 1          | Reference   | 1          | Reference   | 1          | Reference   |
| About half   | 1.128      | 0.807–1.575 | 1.034      | 0.839–1.274 | 1.345      | 1.178–1.535 |
| Majority   | 1.258      | 0.838–1.888 | 1.086      | 0.855–1.379 | 1.180      | 1.000–1.391 |

**Note.** IRR, incidence rate ratio; CI, confidence interval.

despite the use of multi-stage cross-sectional investigation, it was still not possible to demonstrate the causal relationship between underlying factors and anxiety.

In conclusion, during the outbreak of emerging infectious diseases, the anxiety level of employees in labor-intensive enterprises is not significantly higher than that of the general population. When implementing epidemic prevention measures, enterprise managers should pay attention to the possible negative impact on employees. The negative emotions of returning employees can be alleviated by issuing authoritative information, caring for employees' emotional needs, improving their life quality, and encouraging them to participate in psychological counseling by telephone.

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LIU Yu conceived the design, collected data, and wrote the manuscript. WANG Xiao Feng and XIAO Qi Peng designed the questionnaire and collected data. XI Jun Yan analyzed the data. HE Li Ping and LU Ci Yong reviewed the manuscript. HE Ling conceived the design and reviewed the manuscript.

<sup>#</sup>Correspondence should be addressed to HE Ling, PhD, E-mail: heling82@126.com, Tel: 86-18169200020.

Biographical note of the first author: LIU Yu, female, born in 1983, Lecturer, majoring in environmental epidemiology and public health education.

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