A. Spatial Correlation Analysis

A.1 Getis-Ord Gi*

We further study the spatial dependence of HCWs infection rates using hot spot analysis. Hot spot analysis can calculate Getis-Ord Gi* statistics (called Gi*) for each unit in the dataset. Through the obtained z-score and p-value, the spatial clustering position of high-value or low-value elements can be judged. Getis-Ord Gi* local statistics can be expressed as:

$$G_i^* = \frac{\sum_{j=1}^{n} w_{i,j} x_j - \bar{X} \sum_{j=1}^{n} w_{i,j}}{S \sqrt{\frac{\left[n \sum_{j=1}^{n} w_{i,j}^2 - \left(\sum_{j=1}^{n} w_{i,j}\right)^2\right]}{n-1}}} \tag{S1}$$

where, x_j is the attribute value of element j, $w_{i,j}$ is the spatial weight between element i and j, n is the total number of elements, and:

$$\bar{X} = \frac{\sum_{j=1}^{n} x_j}{n} \tag{S2}$$

$$S = \sqrt{\frac{\sum_{j=1}^{n} x_j^2}{n} - (\bar{X})^2} \tag{S3}$$

A.2 HCWs Infection Rate - Hot Spot Analysis

We point out differences in the infection rates of different types of HCWs in multi-scale units, and further analyze their spatial dependence by using Gi* statistics. Figure S1 shows the spatial correlation of the infection rate among different occupational HCWs, and Figure S2 shows the spatial correlation of the infection rate among varying hospital HCWs at multiple scales.

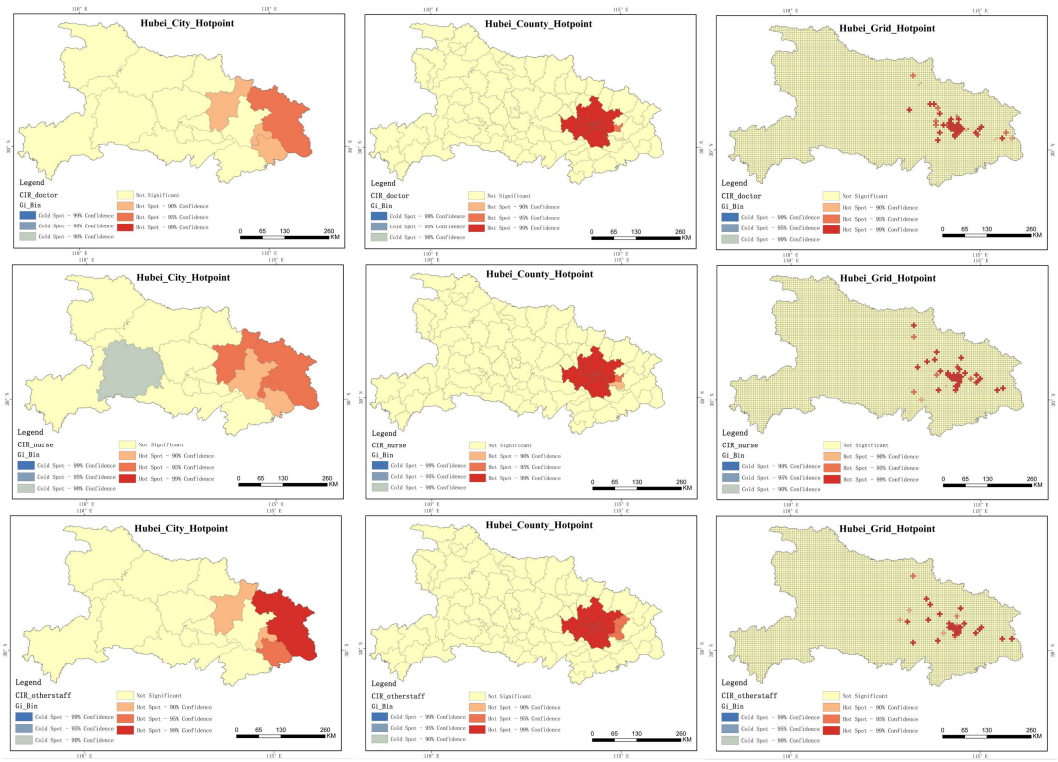

Figure S1. Gi* statistic results of HCWs infection rates in different occupations.

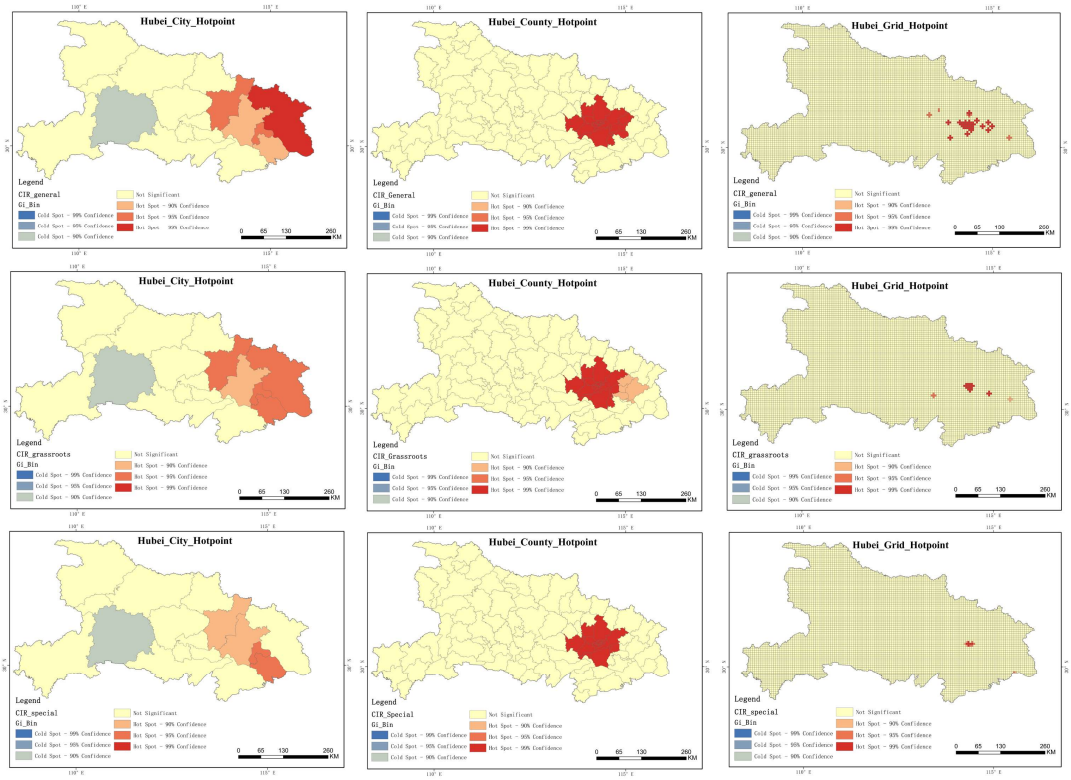

Figure S2. Gi* statistic results of HCWs infection rates in different hospital.

In Figure S1, the three occupational infection rates radiate from Wuhan to the northeast to form a hot spot cluster at the city scale. At the county level, the infection rate of HCWs has formed a high concentration of hot spots with the counties in Wuhan as the center. In the grid-scale, the hot spots of HCWs infection rates are no longer concentrated in a certain area but form multiple sporadic small hotspots. The result shows that the analysis of the worst-hit areas of the epidemic on a single scale is not very accurate. From the results at the grid-scale, it can be seen that the hot spots are dense in the central urban area of Wuhan, and scattered points are distributed in the grid cells around the major urban area. It also confirms the conclusions obtained by using distribution fitting, i.e., when the number of infected HCWs in a unit is only a few random, it is considered an occasional phenomenon. The occurrence of cases in the peripheral areas of the epidemic presents random events. Traffic control between cities restricts the spread of hot spots at the county level, and grid-based control and management measures for outbreaks such as closed community units have effectively blocked the convergence of small hot spots. The result provides a powerful reference for precision epidemic prevention and shows the necessity of multi-scale HCWs infection analysis.

In Figure S2, it can be seen that the HCWs infection rate in different hospital types is similar to that of different occupations at the city and county scales. At the grid level, it is evident that the infection rate hotspots of general hospitals are relatively dense, followed by grassroots hospitals, and the hotspots of specialized hospitals are concentrated in the central area of the epidemic in Wuhan. Some of the scattered primary hospitals' hot spots may be appointed designated hospitals for fever, or another

reason may be the limitation of the type of regional hospitals.

B. Stratified Analysis of HCWs Infection Rate

B.1 Stratified Analysis

In the original text, in order to facilitate the display of the results, we merge the overall P-value and the occupational layer with the highest infection rate. The appendices show the results of our stratified analysis for each type. Here Figures S3, S5, and S7 show the P-values of the Chi-square test in different occupations and hospitals at multi-scales. Figures S4, S6, and S8 show hierarchical visualization of professions and hospitals with the highest infection rates at multi-scales.

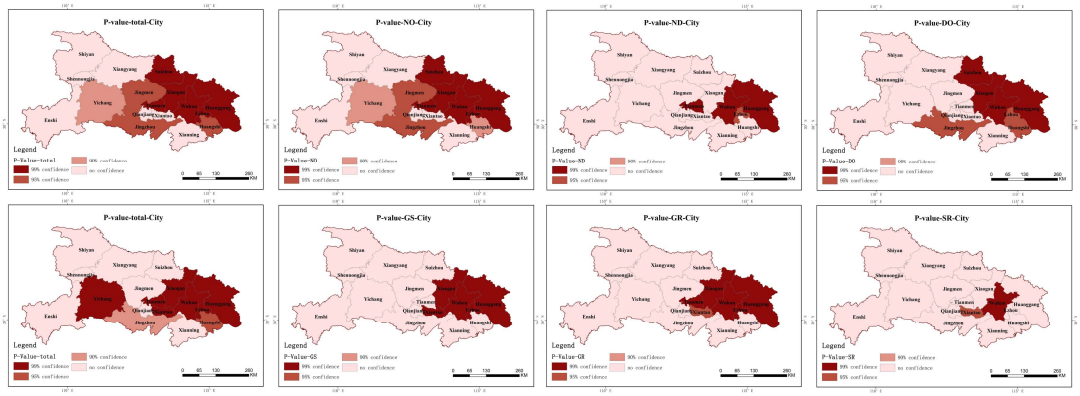

Figure S3. *p* values of Chi-square test for different types of HCWs at the city scale.

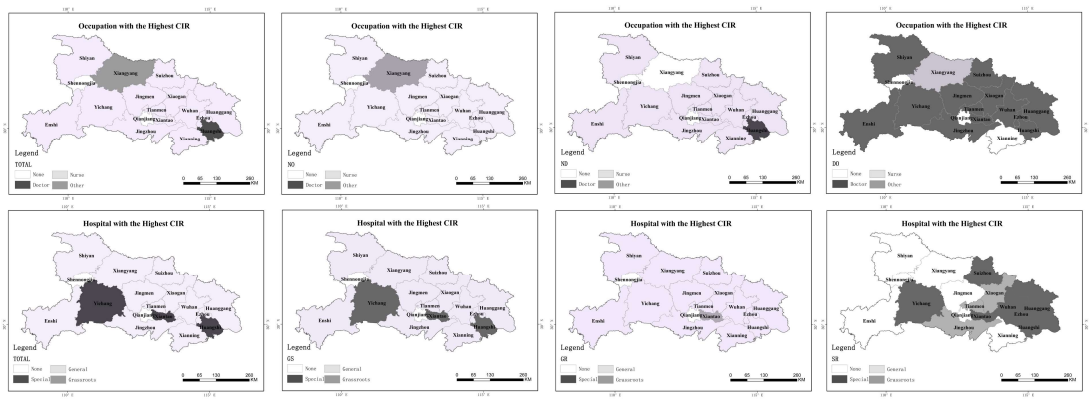

Figure S4. Occupations with the highest rate of infection in HCWs at the city scale.

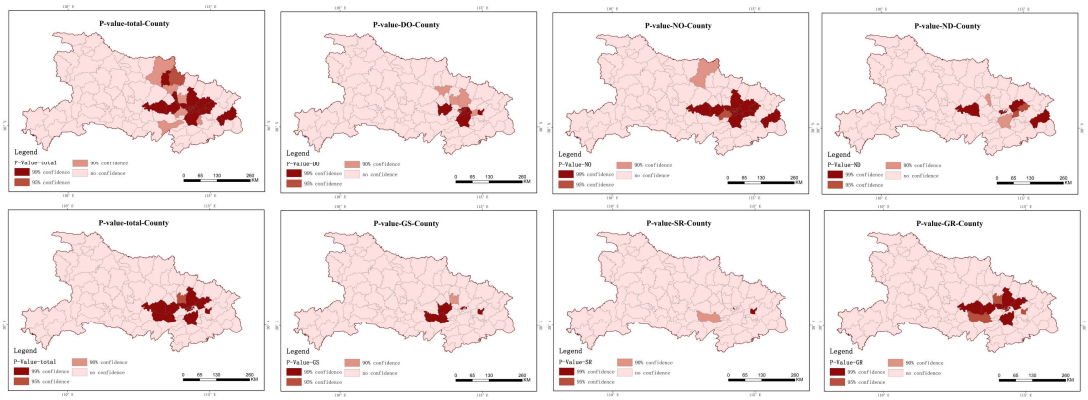

Figure S5. P values of Chi-square test for different types of HCWs at the county scale.

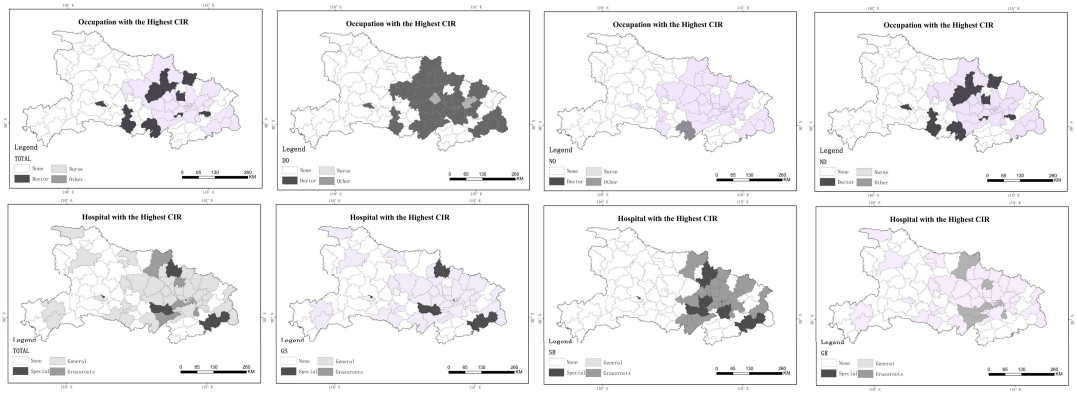

Figure S6. Occupations with the highest rate of infection in HCWs at the county scale.

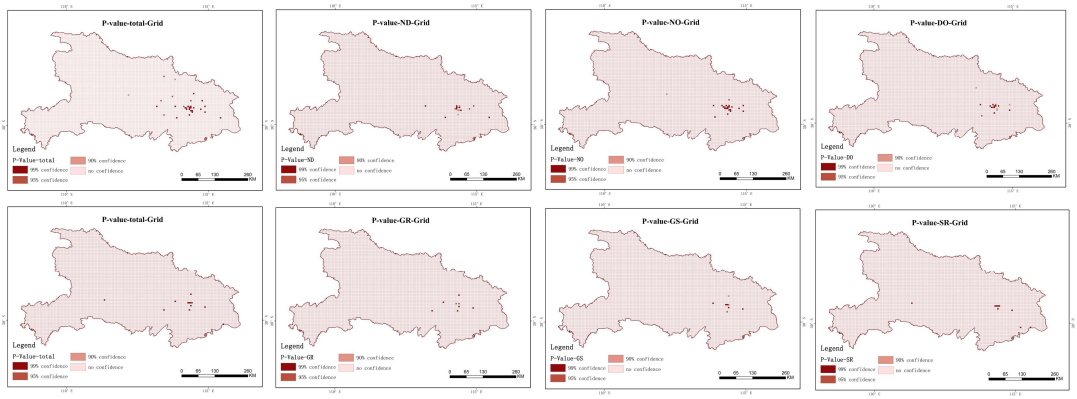

Figure S7. P values of Chi-square test for different types of HCWs at the grid scale.

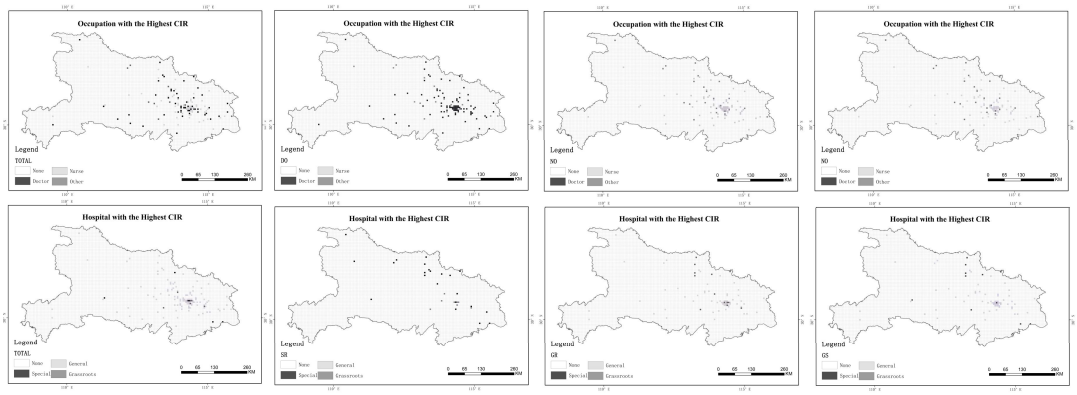

Figure S8. Occupations with the highest rate of infection in HCWs at the grid scale.

The results of the stratification were added with the Chi-square test and infection rate comparison between the two different types of HCWs. The result may be helpful for some readers who are concerned about the difference in the infection rate of the two types of occupations or hospitals. The above-mentioned multi-scale differences in the infection rates of different kinds of HCWs are consistent with those described in the main text, and the Figures here are used as an auxiliary illustration.