



# ASSOCIATION BETWEEN INFORMAL EMPLOYMENT AND COVID-19 POSITIVE CASES IN PERU

ASOCIACIÓN ENTRE EL EMPLEO INFORMAL Y LOS CASOS POSITIVOS DE COVID-19 EN EL PERÚ

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BRIEF ORIGINAL

## ABSTRACT

**Objectives:** To identify the association between the number of informal employees and the number of positive COVID-19 cases in Peru. **Methods:** We used data from the Peruvian National Institute of Statistics and Informatics of Peru and the National COVID-19 database were used. Bivariate linear regression and multivariate logistic regression were performed to evaluate the number of informal employees, population density and altitude in relation to the number of positive the number of COVID-19 positive cases. **Results:** Bivariate analysis showed that the number of informal employees was significantly associated with the number of COVID-19 positive cases. Employees was significantly associated with positive cases in both high and low altitude regions. in high and low altitude regions ( $p < 0.001$ ). As for the multivariate multivariate analysis, it was found that the number of informal employees ( $p < 0.001$ ), the population density ( $p = 0.02$ ) and altitude ( $p < 0.001$ ) were associated with the number of COVID-19 positive cases. **Conclusions:** Informal employees are common in low- and middle-income countries low and middle-income countries where there is no social security and economically dependent on daily wages. Their situation worsened due to the restriction social mobilization, so they were forced to continue working and, as a result, quickly become infected, even more so, becoming a focus of contagion.

**Keyword:** Informal sector; COVID, Perú. (Source: MESH-NLM)

## RESUMEN

**Objetivos:** Identificar la asociación entre el número de empleados informales y el número de casos positivos de COVID-19 en el Perú. **Métodos:** Se utilizaron datos del Instituto Nacional de Estadística e Informática del Perú y de la Base de Datos Nacional de COVID-19. Se realizó una regresión lineal bivariada y logística multivariada para evaluar el número de empleados informales, la densidad de la población y la altitud en relación con el número de casos positivos de COVID-19. **Resultados:** El análisis bivariado mostró que el número de empleados informales estuvo significativamente asociado con los casos positivos en regiones de alta y baja altitud ( $p < 0.001$ ). En cuanto al análisis multivariado, se encontró que los empleados informales ( $p < 0.001$ ), la densidad poblacional ( $p = 0.02$ ) y la altitud ( $p < 0.001$ ) estuvieron asociados con el número de casos positivos de COVID-19. **Conclusiones:** Los empleados informales son comunes en países de bajos y medianos ingresos en donde no se cuenta con seguridad social y dependen económicamente del salario diario. Su situación empeoró debido a la restricción de la movilización social, por lo que fueron obligados a seguir trabajando y, en consecuencia, infectarse rápidamente, más aún, convirtiéndose en un foco de contagio.

**Palabras clave:** Sector informal; COVID, Perú. (Fuente: DeCS- BIREME)

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Cite as: Pascual-Guevara M , Cabanillas-Lazo M . Association Between Informal Employment and Positive COVID-19 Cases in Peru. Rev Fac Med Hum. 2024;24(3):95-98. doi 10.25176/RFMH.v24i3.6484

Journal home page: <http://revistas.urp.edu.pe/index.php/RFMH>

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## INTRODUCTION

In low- and middle-income countries, almost three-quarters of non-agricultural jobs are informal<sup>(1)</sup>. This population, lacking social security and government protection, along with their low resources and limited job opportunities, economically depends on daily wages to cover basic needs<sup>(2)</sup>. However, due to current social mobility restrictions and limited support, they have been forced to choose between working with the risk of infection or starving<sup>(3)</sup>.

Depending on the type of occupation, there are certain health risks due to lack of labor regulation compared to formal workers. Associations have been found between informal employment and respiratory infections, such as a high prevalence of tuberculosis<sup>(4)</sup>, which could be exacerbated by the virulence of the coronavirus.

The health emergency led countries to implement social distancing. Although the measures adopted were strict and early, public health was affected by pre-pandemic factors such as informality and social inequality, with Peru being the 7th country with the most cases and the first in global mortality. Additionally, the government took 54 days after imposing quarantine to provide economic support to the informal sector, although food baskets were not included as in neighboring countries.

Thus, at the beginning of the quarantine, 59% of families were vulnerable and forced to go out into the streets, exposing themselves to coronavirus infection in violation of containment and mitigation measures<sup>(5)</sup>. Therefore, our objective was to determine the association between informal employment and positive COVID-19 cases in the Peruvian territory.

## METHODS

### Design and study area

Observational, analytical, and cross-sectional study using secondary sources. The authors used data from the Instituto Nacional de Estadística e Informática of 2018, a nationally representative survey<sup>(6)</sup>, and the National Open Data Platform where COVID-19 cases have been reported from March 3 to November 17, 2020<sup>(7)</sup>.

### Variables and instruments

The units of analysis were the Peruvian geographical regions. The dependent variable was the number of confirmed cases (thousands of positive COVID-19 cases), while the independent variables were the number of informal employees (thousands), population density (inhabitants per km<sup>2</sup>), and altitude (meters). Informal employment was defined as self-employed employers whose productive unit belongs to the informal sector; employees without social security funded by their employer, and unpaid family workers<sup>(8)</sup>.

Altitude was classified as low and high. The capital region, Lima, was excluded from the analysis due to being an outlier with its high population density and number of cases.

### Statistical analysis

The authors analyzed the data using Stata 16 software. Bivariate and multivariate analyses were performed with linear regression, and a P-value <0.05 was considered significant.

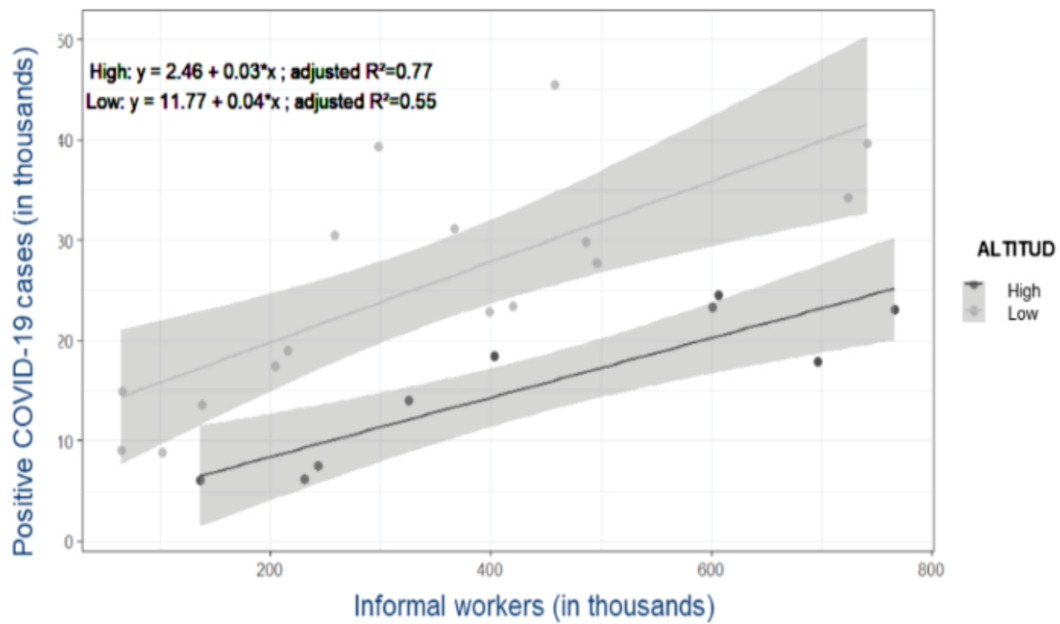
### Ethical considerations

Not relevant when working with secondary sources open to the general reader, where no survey or study participant data are recorded.

## RESULTS

Twenty-five geographical regions were included after excluding Lima, 16 of which were categorized as low-altitude areas and 9 as high-altitude areas. The high-altitude regions had a lower prevalence of positive cases. In the bivariate analysis (Fig. 1), it was found that in low-altitude regions, the number of informal employees was positively associated with the number of positive cases ( $\beta=4.0 \times 10^{-2}$ ;  $p < 0.001$ ), while population density was not associated ( $\beta=2.2 \times 10^{-3}$ ;  $p=0.2$ ). In high-altitude regions, the number of informal employees was also positively associated with the number of positive cases ( $\beta=3.0 \times 10^{-2}$ ;  $p < 0.001$ ); however, density was not associated ( $\beta=5.1 \times 10^{-1}$ ;  $p=0.08$ ).





**Figure 1.** The relationship between the number of informal workers (in thousands) and the number of positive COVID-19 cases (in thousands) until November 17, 2020, in high and low altitude regions.

In the multivariate analysis, it was evidenced that the number of informal employees ( $\beta=3.7 \times 10^{-2}$ ;  $p < 0.001$ ), population density ( $\beta=2.4 \times 10^{-3}$ ;  $p < 0.001$ ), and region

altitude ( $\beta=-12.6$ ;  $p < 0.001$ ) were associated with the number of positive COVID-19 cases.

**Table 1.** Multivariate analysis between informality and COVID-19 positive cases.

Variables	$\beta$	95% CI	p value
Informal employment	$3.7 \times 10^{-2}$	$3.0 \times 10^{-2} - 4.4 \times 10^{-2}$	<0.001
Population Density	$2.4 \times 10^{-3}$	$1.8 \times 10^{-3} - 3.0 \times 10^{-3}$	<0.001
Region Altitude	-12.6	-15.0 -10.2	<0.001

95% CI: 95% Confidence Interval

## DISCUSSION

Our results showed an inverse relationship between altitude and the number of positive COVID-19 cases, as previously reported in other studies<sup>(9)</sup>. After stratifying the regions by altitude, the number of informal employees was positively associated with positive COVID-19 cases, suggesting that regions with higher informality will continue to be affected, especially

in the face of possible waves or variants. In countries like India or South Africa, where informality rates are higher, the number of cases per 100,000 inhabitants has not been as high as in Peru. This could be explained by the fact that these populations received early support from their governments through basic cash subsidies and food baskets, as well as personal protective

equipment and a safe working environment after the quarantine<sup>(10)</sup>.

Due to low wages, nonexistent health coverage, and poor working conditions offered by informal employment to economically dependent families, they become more vulnerable to diseases and consequently have to pay for treatments, making them poorer and more dependent on their employment<sup>(2)</sup>. This can be demonstrated as more than 50% of sick women continue to work informally out of necessity<sup>(1)</sup>. Therefore, in this pandemic situation, the need forces them to go out into the streets and expose themselves to infection.

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**Authorship contributions:** The authors participated in the conceptualization, research, methodology, resources, and writing of the original draft.

**Funding:** Self-funded.

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## CONCLUSIONS

In conclusion, it is necessary to provide these families with financial assistance plans, such as tax reductions and financial facilities, accompanied by continuous epidemiological surveillance.

In the long term, the government can offer jobs to low-income individuals and monitor working conditions to integrate them into the formal sector. This association should be considered in countries with high rates of informal employment to prevent this group from becoming a high-prevalence population and a focus of contagion in future health emergencies.

**Conflict of Interest:** The authors declare no conflicts of interest.

**Received:** April 27, 2024.

**Approved:** June 12, 2024.