







Letter to the Editor

Does level of education influence mortality of SARS-CoV-2 in a developing country?

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Editorial decision 8 September 2020; Accepted 8 September 2020

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a highly contagious virus of international concern which spreads mainly from person to person through respiratory droplets.^{1,2} As of July 2020, outbreaks are being reported in China, the pandemic's country of origin where it was thought initially to be controlled.³ In a similar manner, the pandemic is increasing in prevalence in other countries, such as Peru, where quarantine started on 15 March 2020 and the first death from coronavirus disease 2019 (COVID-19) was registered on 18 March. As of 7 September, 2020, >27 million cases had been confirmed across the world, with >690 000 cases and >30 000 deaths in Peru.⁴

Thus, adopting intentional and extensive measures to control the SARS-CoV-2 pandemic is necessary. Social distancing, minimizing personal contact, and hand sanitization are effective measures in limiting the community spread of SARS-CoV-2.¹ However social factors, such as lower educational attainment, are also related to the morbidity and mortality of COVID-19.^{5,6}

The US Centers for Disease Control and Prevention (CDC) describes a list of risk factors for SARS-CoV-2 infection, which include poverty and crowding.² Likewise, a UK-based study investigated the role of ethnicity and socioeconomic position in the development of SARS-CoV-2 infection. The authors found that socioeconomic

deprivation and low educational attainment were consistently associated with a high risk of confirmed infection.⁶ Furthermore, reports have demonstrated higher mortality from infectious diseases in patients with low levels of education.⁷

The number of deaths relating to COVID-19 is deemed to exceed 40 000, and no study has investigated the relationship between education level and mortality due to COVID-19 in Peru. We used official data from the Peruvian National Death System (SINADEF), which integrates the records made online by doctors and the data record of the manual certificates.⁸ Although the approximate percentage of deaths that have not been included in the data is unknown, the country-wide system allows swift access to mortality information. Using the database we found that, after the start of the COVID-19 pandemic, both high educational attainment and low educational attainment groups showed increases in the numbers of deaths compared with last year, and that the increase was steeper among the latter group (Figure 1). Presumably many of these deaths were from COVID-19, given the timing of the increase. As older individuals often have a lower educational level, age could be a confounding factor. For this reason, we stratified the figure by ages less than 50 years, between 50 and 70 years, and older than 70 years (Figure 2). To a degree the educational difference

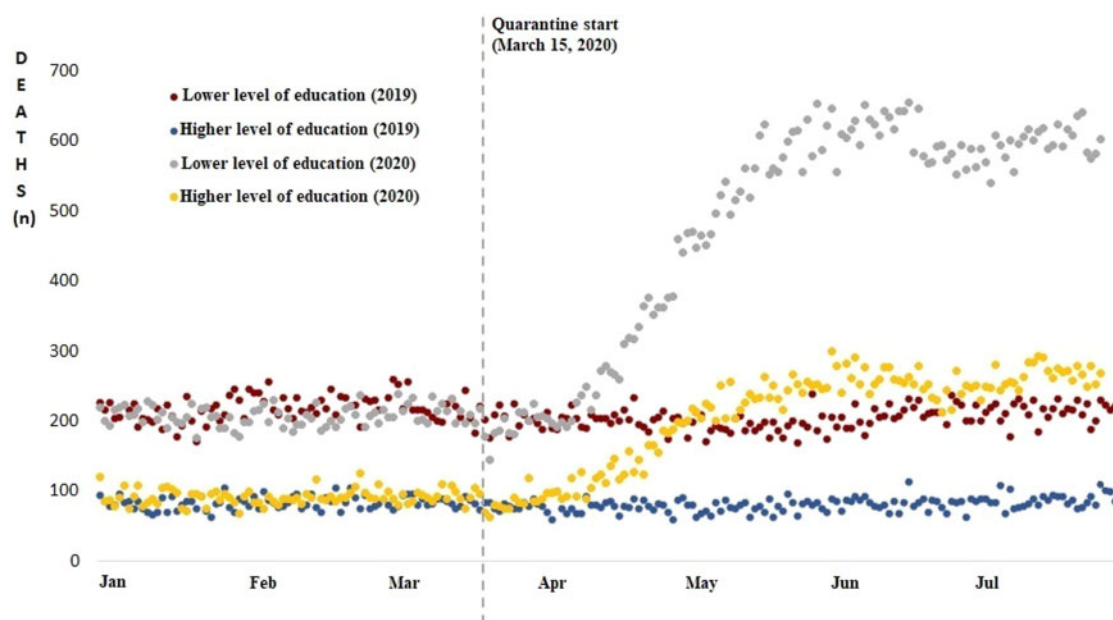


Figure 1. All-cause mortality according to the level of education in Peruvian people over 12 years of age, during the period of January to July 2020 and January to July 2019. Lower level of education included illiterate persons, people with incomplete primary and incomplete secondary. National Death Registry Information System (SINADEF), Ministry of Health, Peru, 2020. URL: <https://www.datosabiertos.gob.pe/dataset/informaci%C3%B3n-de-fallecidos-del-sistema-inform%C3%A1tico-nacional-de-defunciones-sinadef-ministerio>

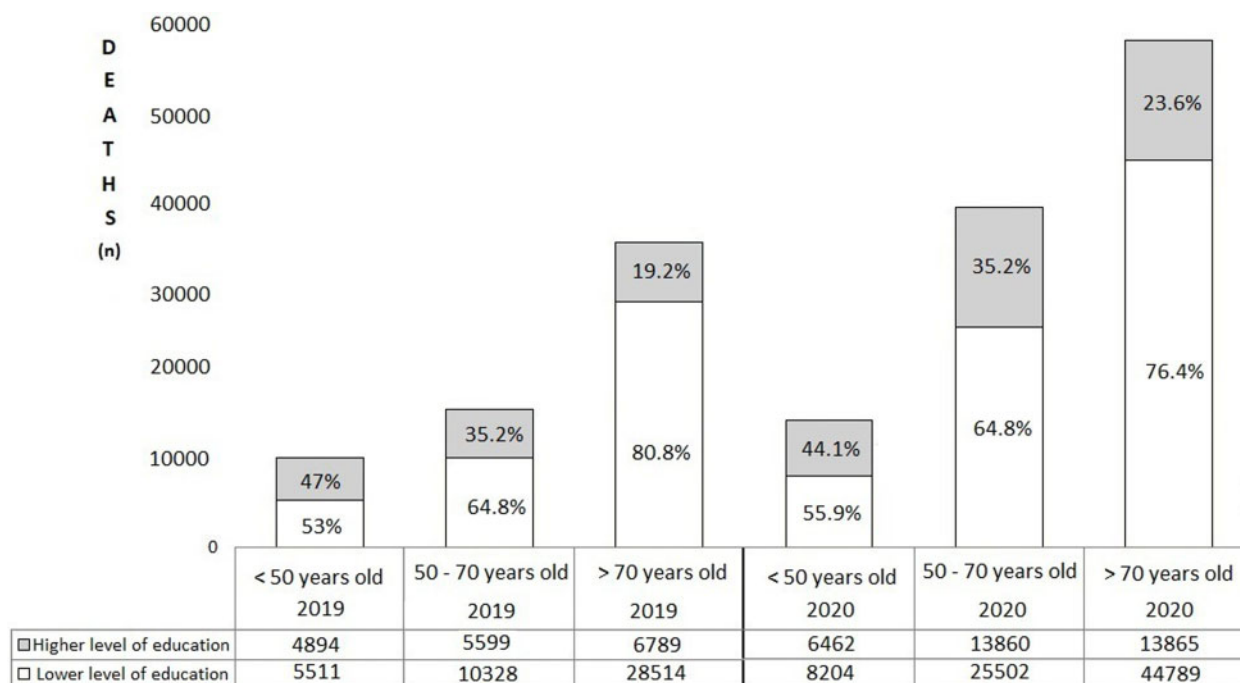


Figure 2. All-cause mortality according to the level of education and stratified by age, in Peruvian population, during the period of January to July 2020 and January to July 2019. National Death Registry Information System (SINADEF), Ministry of Health, Peru, 2020. URL: <https://www.datosabiertos.gob.pe/dataset/informaci%C3%B3n-de-fallecidos-del-sistema-inform%C3%A1tico-nacional-de-defunciones-sinadef-ministerio>

diminished, but high mortality in people with low educational attainment remained in all age groups. This may be due to pre-existing health conditions, poverty and lack of

access to health care. Also, we postulate that people with lower levels of education were less able to quarantine and continued to work, due to greater economic constraints.

Several types of health behaviours, such as smoking, excessive alcohol consumption, physical inactivity and an unhealthy diet, are expected to mediate the impact of educational level on the incidence of non-communicable diseases.⁹ Notably among those people with lower levels of education in Peru, the prevalence of overweight and obesity is 63% and 21%, respectively.¹⁰ Furthermore, low levels of education are related to high incidence and prevalence of cardiovascular and cerebrovascular diseases, cancer, diabetes, hypertension and chronic respiratory diseases.⁹ Patients with these diseases are at increased risk of severe disease due to COVID-19 because of low levels of immune cells and high levels of cytokines in body fluids.^{1,2}

Previous studies estimated that 24% of the Peruvian population live in conditions of poverty⁵ and demonstrated that the socioeconomic status of patients influences educational inequalities, in non-communicable diseases. As expected, low income level and unstable job status, which may be linked to low educational level, are reasonably predicted to increase the risk of the above-mentioned diseases.⁹ In addition, a substantial population notably continues to live in rural areas, with limited access to medical care, chronic disease treatment and education. These rural residents are often poorer and less educated than their urban counterparts.¹¹

An estimated 20.9% of Peru's population are still living in rural areas, where people are not only disadvantaged in terms of access to education services and quality health care, but also suffer from social and economic inequities.⁵ No less important, the quality of health services in hospitals under typical scenarios is perceived to be low.¹² The COVID-19 pandemic hit Peru when the country was in the process of improving health services and indicated significant deficiencies across the health system, thus revealing the need for urgent action. The lack of equipment, supplies and medicines translates into low-quality care, in addition to the fact that not all of the Peruvian population have access to health services, which plays an important role in the health consequences of the COVID-19 pandemic.

In conclusion, we highlight the importance of improving the educational attainment of the Peruvian population

and reducing the inequality of social factors, to facilitate the proper management of the COVID-19 pandemic.

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