

## **Modelling in-hospital survival and associated factors among hospitalised patients with COVID-19, Zambia, March 2020 to December 2022: A retrospective cohort study**

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### **Introduction**

Numerous studies document the in-hospital survival time of COVID-19 patients, commonly reporting older, male gender, comorbidities, and compromised immune function. Yet few examined the variability of baseline mortality hazard. We estimated the median survival time for hospitalized COVID-19 patients, identified factors associated with in-hospital mortality, and assessed whether mortality risk changed over time.

### **Methods**

We analysed routinely collected clinical information of patients admitted to COVID-19 treatment centres in five Zambian cities, these being Lusaka, Ndola, Livingstone, Kabwe, and Kitwe between Mar-2020 and Dec-2022. Severe COVID-19 was defined as having oxygen saturation <90%, respiratory rate >30 breaths/minute, or oxygen therapy requirement. We fitted Kaplan-Meier, Cox proportional hazard and parametric survival models in R, and right censored patients discharged from the hospital.

### **Results**

Out of 3,921 patients, a minority (N=865, 22.6%) died with majority being male (65%). The median survival time was 25 days (IQR: 9-124) and mortality rate was 29.8 deaths per 1,000 persons per day. Factors associated with in-hospital time-to-mortality included: age  $\geq 60$  compared to <60 years (adjusted hazard ratio [aHR]: 2.90, 95% confidence interval [CI]: 1.78-4.74), having  $\geq 3$  comorbidities (aHR: 1.90; 95% CI: 1.23-2.92), COVID-19 severity (aHR: 4.52; 95% CI: 3.01-6.79) and  $\geq 1$  vaccine dose (aHR: 0.43; 95% CI: 0.27-0.69). The baseline mortality hazard was disproportional to time but increased for 5 days and then decreased over time. In the parametric accelerated failure time model, the effect of severe COVID-19 was to shorten (accelerate) the median time-to-mortality (adjusted time ratio [aTR]: 0.25; 95% CI: 0.18-0.36) while vaccinated patients had a longer (decelerated time-to-mortality) median survival time (aTR: 2.59; 95% CI: 1.63-4.09).

## **Conclusion**

In-hospital mortality risk factors in Zambia reflect data reported in the Western world, including age, comorbidities, COVID-19 severity, and vaccination status. However, the increased and then decreased mortality risk over time would suggest that patients who died may have presented late to the hospital. Strengthening health systems and educating the public about early seeking and when to seek for care for COVID-19 may likely reduce in-hospital mortality in Zambia.