

43 **Abstract:**

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45 **Background:** On November 26, 2021, WHO designated the variant B.1.1.529 as a new
46 SARS-CoV-2 variant of concern (VoC), named Omicron, originally identified in South
47 Africa. Several mutations in Omicron indicate that it may have an impact on how it
48 spreads, resistance to vaccination, or the severity of illness it causes.

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50 **Methods:** We used our previous modelling algorithms to forecast the spread of
51 Omicron aggregated in the EU-27 countries, the United Kingdom and Switzerland, and
52 report trends in daily cases with a 7-day moving average. We followed EQUATOR's
53 TRIPOD guidance for multivariable prediction models. Modelling included a third-
54 degree polynomial curve in existing epidemiological trends on the spread of Omicron
55 in South Africa, a five-parameter logistic (5PL) asymmetrical sigmoidal curve following
56 a parametric growth in Europe, and a new Gaussian curve to estimate a downward
57 trend after a peak.

58

59 **Results:** Up to January 15, 2022, we estimated a background rate projection in EU-27
60 countries, the UK and Switzerland of about 145,000 COVID-19 daily cases without
61 Omicron, which increases up to 440,000 COVID-19 daily cases in the worst scenario of
62 Omicron spread, and 375,000 in the "best" scenario. Therefore, Omicron might
63 represent a relative increase from the background daily rates of COVID-19 infection in
64 Europe of 1.03-fold or 2.03-fold, that is up to a 200% increase.

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66 **Conclusion:** This warning pandemic surge due to Omicron is calling for further
67 reinforcing of COVID-19 universal hygiene interventions (indoor ventilation, social
68 distance, and face masks), and anticipating the need of new lockdowns in Europe.

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72 **Text:**

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74 Back in March to May 2020, Italy and Spain were the hardest hit European countries
75 during the first wave of COVID-19.¹ There have been several successful attempts to
76 forecast trends of incidence and mortality of COVID-19, most based upon knowledge
77 on viral dynamics from previous pandemics, recent COVID-19 geographical information
78 of diverse granularity, and newly discovered viral characteristics.^{2,3} However, SARS-
79 CoV-2 inherent poor quality RNA copy-editing gene replication makes it prone to
80 mutate and spontaneously create new variants of concern (VoC),⁴ that adapt to any
81 hostile environment, produce new outbreaks, and modify existing epidemiological
82 projections.⁵

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84 On November 26, 2021, WHO designated the variant B.1.1.529 as a new VoC, named
85 Omicron, originally identified in South Africa, on the advice of WHO's Technical
86 Advisory Group on Virus Evolution.⁶ This decision was based on the evidence that
87 Omicron has several mutations that may have an impact on how it spreads, resistance
88 to vaccination, or the severity of illness it causes.⁷ In particular, in South Africa up to

89 December 2, 2021 it was observed a doubling time for the first 3 days after the wave
90 threshold of ten cases per 100 000 population.^{8,9}

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92 We used our previous modelling algorithms,^{10,11,12} to forecast the spread of Omicron
93 aggregated in the EU-27 countries, the United Kingdom and Switzerland, and report
94 trends in daily cases with a 7-day moving average. We followed EQUATOR's TRIPOD
95 guidance for multivariable prediction models.¹³ By applying firstly a third-degree
96 polynomial curve in existing epidemiological trends on the spread of Omicron in South
97 Africa, starting from the first 17 days of the Omicron outbreak (from November 11,
98 2021), and secondly a five-parameter logistic (5PL) asymmetrical sigmoidal curve
99 following a parametric growth,¹⁰⁻¹² we were able to model new infections of COVID-19
100 in South Africa up to December 31, 2021. Overall, the best-case scenario is 80,000
101 COVID-19 daily cases, while the worst case scenario is 120,000 (**Figure 1A**).

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103 Then we modelled these trends to EU-27, the UK and Switzerland new COVID-19 cases
104 using a new Gaussian curve to estimate a downward trend after a peak,¹⁴ and we
105 obtained the expected curve of new COVID-19 infections in Europe, which does not
106 include the potential effect of Omicron VOC. Finally, we estimated the number of
107 susceptible individuals based on actual vaccination in South Africa and applied them in
108 Europe, and we added those cases to our actual predictive model. Given ongoing
109 trends, we envisage a projection in EU-27 countries, the UK and Switzerland of about
110 145,000 COVID-19 daily cases by January 15, 2022 without Omicron, which increases
111 up to 440,000 COVID-19 daily cases by January 15, 2022 in the worst scenario of
112 Omicron spread, and 375,000 in the "best" scenario (**Figure 1B**). Therefore, Omicron
113 might represent a relative increase from the background daily rates of COVID-19
114 infection in Europe of 1.03-fold or 2.03-fold, that is up to a 200% increase.

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116 In probability theory, the conditional expectation of any warning system for an
117 eventual surge of an infectious outbreak, as could happen with the Omicron
118 substituting other SARS-CoV-2 VoC, modifies (reduces) the eventual magnitude of the
119 event itself.¹⁵ Given preliminary evidence from South Africa, our forecast anticipates a
120 large increase in COVID-19 in Europe despite the high levels of vaccination in most of
121 the region. Therefore, this warning is calling for further reinforcing of universal hygiene
122 interventions (indoor ventilation, social distance, and face masks), and anticipating the
123 need of new lockdowns,¹¹ the latter being extremely detrimental to many economies.

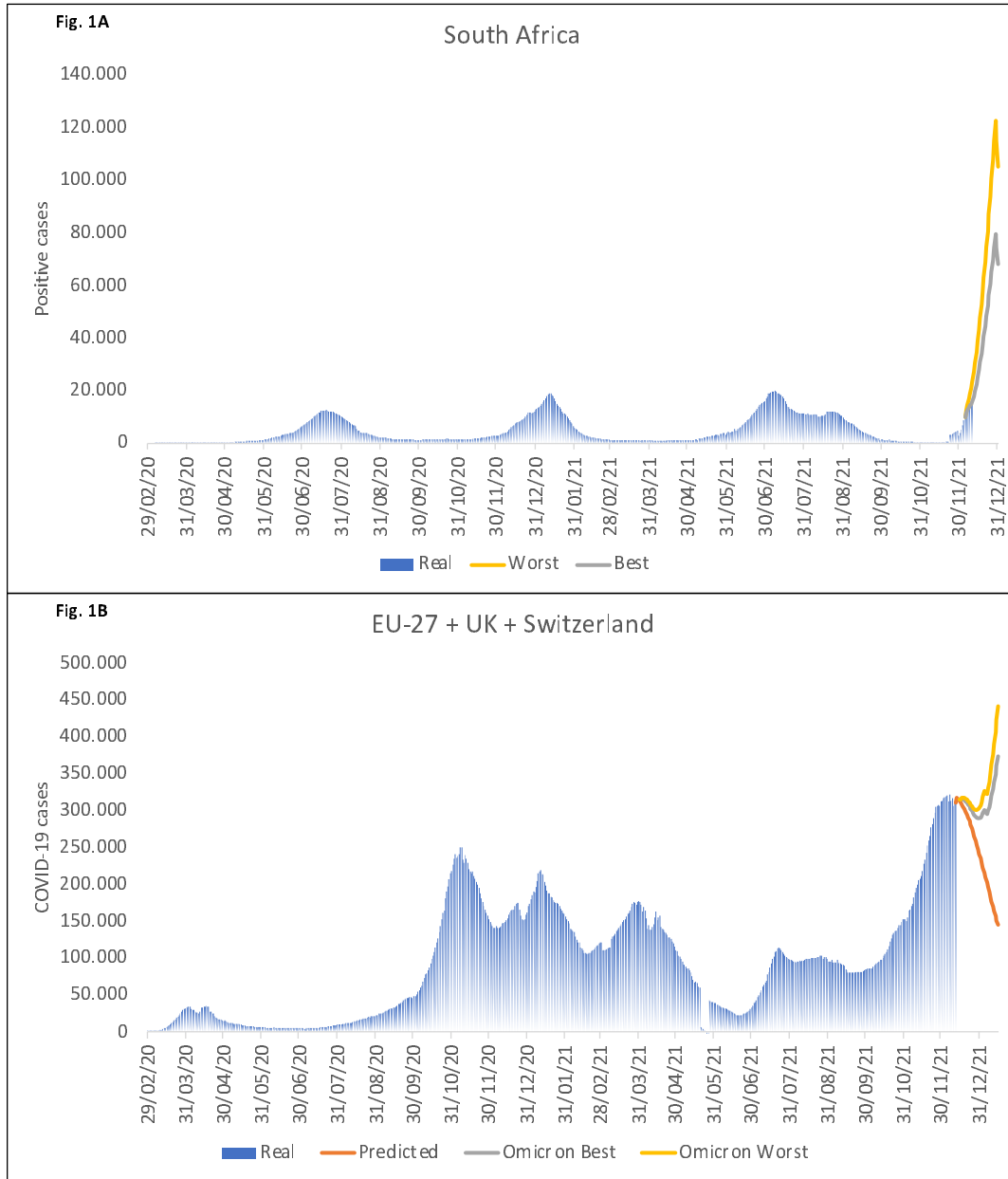
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125 In Denmark, considered a European leader in sequencing SARS-CoV-2 VoC, where
126 testing of all positive PCR tests is commonplace, cases of Omicron have been reported
127 to double every second day.¹⁶ There, almost 75% of those infected by Omicron had
128 received full (two doses of) COVID-19 vaccination already. On the positive side, it
129 appears most Omicron-related COVID-19 cases are mild or even pauci-symptomatic.

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131 All viruses change in time and space by natural or artificial Darwin's selection, and
132 survival of the fittest,¹⁷ due either to high levels of herd immunity or low vaccination
133 coverage, respectively. The toll associated with VoC Omicron underlines WHO's
134 COVID-19 message that "No one will be safe, until the entire World is safe (ergo
135 vaccinated)".

136 **Figure 1:** Trends in COVID-19 daily new infections with a seven-day moving average
137 observed and expected in A) South Africa and B) EU-27 countries + UK + Switzerland
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