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*Quantifying the Basic Reproduction Number and the Underestimated Fraction of Mpox Cases: Mathematical Modelling and ML Study*

The current global outbreak of mpox, which started in April 2022 has different epidemiological and clinical features compared to previous mpox outbreaks. Sexual contact has been hypothesized as the major transmission route for the disease in this outbreak, with the community of men having sex with men (MSM) disproportionately and dramatically affected. To better understand the transmission dynamics of the disease, it is essential to understand its dynamics during the early stages of the outbreak. In this article, we estimate the basic reproduction number and the ascertainment fraction of the reported cases of mpox around the world. We divide the population of each country into two groups (high-risk and low-risk groups) and consider two routes of transmission: sexual and non-sexual. Our estimate of the basic reproduction number of mpox in the considered countries ranges between 1.37 (Canada) and 3.68 (Germany). Furthermore, our estimates of the ascertainment fraction for the reported cases of mpox show a large variation in the under-reporting of cases in the high-risk population around the world with ascertainment fractions between 0.25 and 0.93, and a more consistent ascertainment fraction for the low-risk population, which ranges from 0.65 to 0.85. Our estimates can help public health decision- and policymakers better understand the mpox outbreak, in terms of how many underestimated cases can occur in several countries, and how the epidemic can spread differently.