Post-disruption catch-up of child immunisation and health-care services in Bangladesh

The COVID-19 pandemic has affected child immunisation service delivery and use across the globe.[1–4] Amid overwhelming reports of disrupted immunisation services during the early pandemic months, the Correspondence by Anna A Jarchow-MacDonald and colleagues[5] drew our interest. The authors reported on stable child immunisation services in the Lothian area of Scotland during the lockdown period and described attributable adaptations and strategies.

After the first COVID-19 case was diagnosed in March, 2020, child health service delivery and use declined in rural remote communities in Bangladesh. We retrieved annual data for 2019 and 2020 from Bangladesh's district health information system (DHIS) for child immunisation and sick children's care-seeking in six subdistricts of Barishal, Bangladesh.

34 838 children younger than 5 years sought care in 2020, which was 11% fewer than the previous year (39 078). The greatest decline in care-seeking for sick children younger than 5 years was observed during April–July (70%; 4151 in 2020 *vs* 13 983 in 2019). After July, 2020, care-seeking for sick children began to increase (appendix) and 23% more children younger than 5 years sought care during August to December in 2020 than in the same period in 2019 (20 159 *vs* 16 348).

Child immunisation services were mostly disrupted in April and May, 2020, when 20% (280 of 1414) and 25% (346 of 1395) of planned outreach immunisation sessions were cancelled, respectively (appendix). On average, the greatest disruption was observed during these months in three remote subdistricts: Hijla (57% [185 of 322]), Agailjhara (25% [69 of 275]), and Mehendiganj (20% [135 of 660]). Available data and reports from DHIS revealed the halt of further disruption and improved child immunisation coverage during post-disruption months (July–October, 2020; appendix). On average, about 99% of immunisation sessions were held during July–October, 2020 (appendix).

We adopted alternate approaches, similar to some of those reported by Jarchow-MacDonald and colleagues,[5] to stop further disruption and to improve child health and immunisation service coverage within our project catchment area. We facilitated the district health management and local ministry of health authority to train service providers and use resources from other programmes to ensure infection prevention and control initiatives. We also facilitated district and local health management teams to organise mobile immunisation outreach services and crash immunisation campaigns in hard-to-reach remote areas, tracing and immunising children who had missed their vaccinations, and targeted home visits by community health workers.

Our experience suggests that need-based and context-specific alternate approaches might help to catch-up and improve child health and immunisation services that have been affected by the pandemic in remote rural communities of countries like Bangladesh.

We declare no competing interests.

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SARS-CoV-2 incidence and vaccine escape

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An Editorial[1] earlier this year described the potential for the evolution of SARS-CoV-2 variants that render vaccines less effective (vaccine escape), assisted by waning immunity following vaccination. This raises a crucial question: how can COVID-19 exit strategies be planned while limiting the vaccine escape risk?

A key component of any plausible strategy towards the permanent removal of non-pharmaceutical interventions (NPIs) is ensuring low case numbers in the short to medium term using NPIs and vaccination. Assuming a fixed vaccine escape mutation probability per infection (p), the risk of a vaccine escape variant arising in a specified time period is $1-(1-p)^N$, where N represents the number of cases in that period. Crucially, this expression indicates that the vaccine escape risk is sensitive to background incidence; the risk of an escape variant appearing within a fixed time is an increasing function of incidence (figure). Reducing cases is not only beneficial for decreasing the pressure on health-care systems, but also for lowering the vaccine escape risk.

See **Online** for appendix

Of course, there are fundamental differences between using NPIs and

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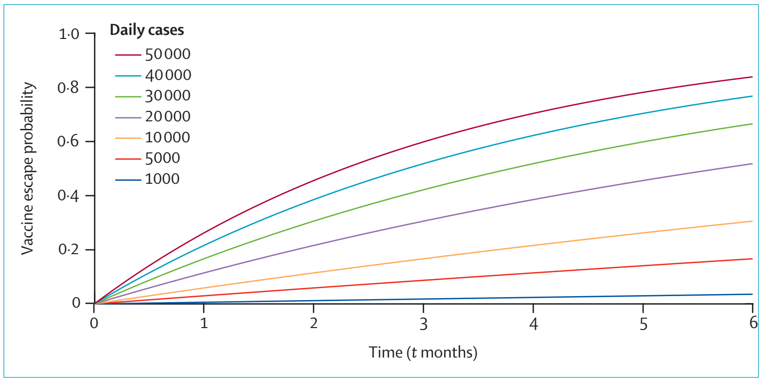

Figure: **Risk that at least one vaccine escape variant arises in a time period of length *t*, for different daily numbers of cases**
The per-infection probability of vaccine escape is $p=2 \times 10^{-7}$ (for details, see the appendix).

vaccines to lower incidence. When considering vaccines that do not prevent transmission entirely, there is an interplay between reduced cases at the population-level and the potential for selection for vaccine escape variants in infected vaccinated hosts.[2–4] A related question is whether it is most beneficial to vaccinate many individuals using single vaccine doses or fewer individuals twice. Dose-sparing strategies could in theory lead to selection for vaccine escape variants.[5] However, evidence suggests tentatively that the net vaccine escape risk is lower when more hosts are vaccinated with single doses than when fewer hosts are vaccinated twice due to reduced cases.[2]

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Despite its simplicity, our quantitative illustration demonstrates that strategies for mitigating the vaccine escape risk should be explored. Reducing case numbers locally should be only one element of these strategies. Travel restrictions to reduce the risk of importing novel variants should be considered. We recognise that assessing the escape variant emergence risk not only requires the variant to arise via mutation as considered here, but also to grow to appreciable frequencies. This is a stochastic process, depending on the availability of hosts to infect and the escape variant's fitness. A reduction in cases leads to both a reduction in the risk of escape variants appearing and a reduction in their subsequent establishment via transmission in the population. Acquisition of additional mutations that are beneficial for the virus is also more likely to be suppressed if incidence is reduced.

In summary, high SARS-CoV-2 incidence rates act to increase the vaccine escape risk. Maintaining low case numbers using NPIs and vaccines is crucial at this time.

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Lowering SARS-CoV-2 viral load might affect transmission but not disease severity in secondary cases

We read with interest the Personal View by Matthew A Spinelli and colleagues.[1] We agree with the authors on the evident advantage provided by non-pharmaceutical interventions (facial masking, social distancing, and improved ventilation) in lowering SARS-CoV-2 inoculum, thereby reducing viral transmission. Nevertheless, we call for caution before asserting that such measures could make a substantial difference in reducing COVID-19 severity.

Animal models examining a potential dose–response relationship reported conflicting results, and experimental inoculation might inaccurately mimic real-life infection dynamics,[2] including inoculum doses. Two studies are cited to support Spinelli and colleagues' hypothesis.[3,4] Bielecki and colleagues observed no symptomatic SARS-CoV-2 infections in a military company where protective measures were rigorously implemented, whereas 47% of all infections were symptomatic in an identical company where such measures were less strict.[3] This finding is hardly applicable to the general population as the study was in young (median age 20 years), healthy individuals.[3] Bias due to sampling and testing based on self-reported symptoms could not be ruled out, non-airborne routes of transmission could have prevailed, and the primary study aim was not to