

Differential household attack rates mirror the ability to control Covid-19

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Dear Editor,

The inability of the US and most of Europe to replicate the successes observed across Asia in controlling the SARS-CoV-2 outbreak has led to spiralling infection rates, repeated lockdowns in Europe, and no sign yet of rounding the turn. In contrast, many Asian and Pacific countries are currently enjoying a semblance of normality. The study by Lewis et al [1] points to one of the causes for these differences.

They find the household secondary attack rate (HSAR) to be around 30% in Utah and Wisconsin, US, through the monitoring of household contacts of cases. This echoes another recent paper by Grijalva et al [2] for households in Wisconsin and Tennessee, who estimate the HSAR to be 30–50%, depending on whether those infected on enrolment are included in the definition.

In contrast, large household studies in China and Singapore found household attack rates to be less than half of their American counterparts: Ng et al [3] showed an HSAR of around 12% in Singapore, while Bi et al [4] estimated it to be 11% in Shenzhen. The difference is not attributable to under-ascertainment as Ng et al confirmed infection status through serology.

We believe that a fundamental difference in case management lies behind these differences. In Singapore, all COVID-19 cases, regardless of severity, are isolated in a healthcare facility upon diagnosis, either at a hospital or a converted community facility akin to China's

fangcang hospitals [5], until they are no longer infectious. No cases are isolated at home. Cases are managed similarly in China.

We previously argued on theoretical grounds [6] that isolation—not self-isolation—of cases may reduce the reproduction number sufficiently to reduce the size of outbreaks. Chain-binomial models (Figure 1) show that reduced HSAR leads to remarkable reductions in secondary household cases – an HSAR of 30% creates an estimated 1.3 secondary infections whereas 12% just 0.4. Given the need to reduce transmission to less than one secondary case per index case for epidemic control, otherwise described as an effective R_0 of below 1, this difference may explain why the epidemic continues to run amok in the US.

For infection control of methicillin-resistant *Staphylococcus aureus* in hospitals, it is established that colonized cases, i.e. those without disease and at low risk of complications, should be cohorted to prevent onward transmission which protects potentially vulnerable inpatients. This principle is not to benefit the colonized patient, who may never develop disease, but those around them. Using the same principle, mild COVID-19 cases ought to be moved out of the household until they no longer pose a threat of transmitting infection.

If a country does not follow fundamental infection control principles in the COVID-19 pandemic, it is scarcely a surprise if they fail to control infection.

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Conflicts of Interest

The authors declare no conflicts of interest.

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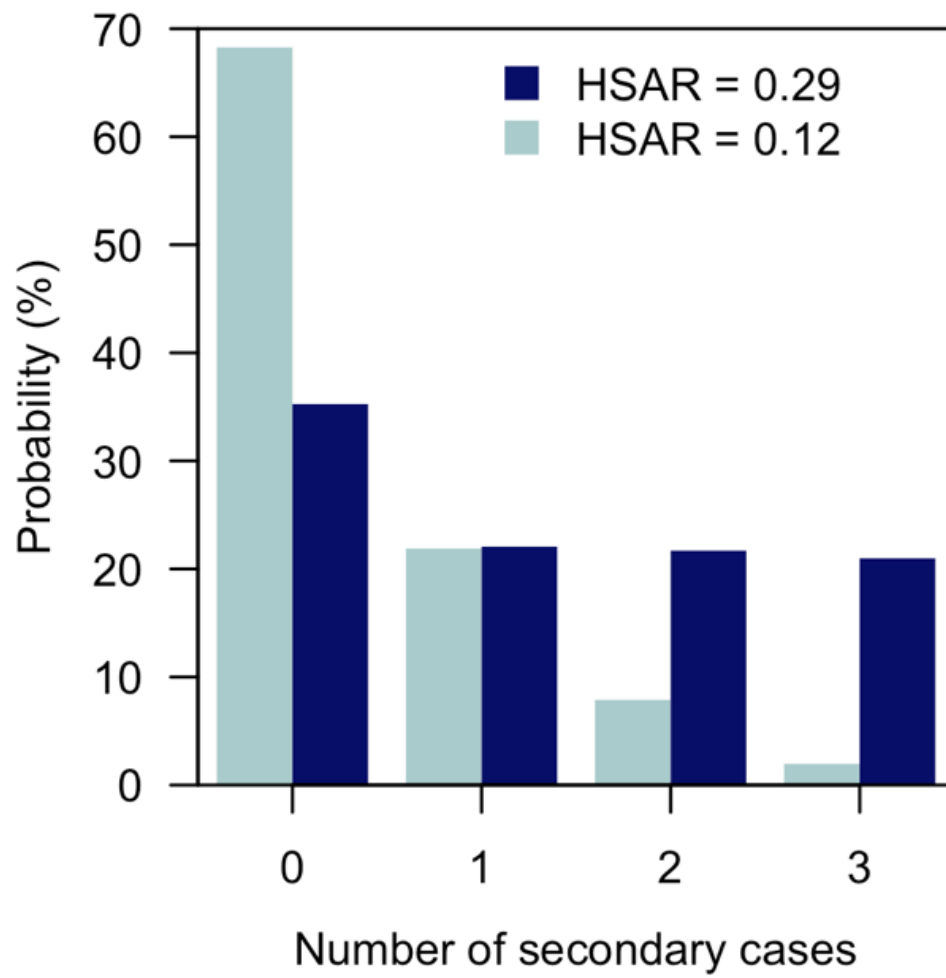
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Figure 1. Number of additional infections in households of four members with a single index case, when the household secondary attack rate (HSAR) is 0.29 (based on Ref [1]) or 0.12 (based on Ref [3]). Probabilities are from a chain-binomial model [7]. The average number of secondary cases in the HSAR=0.29 case is 1.3; for HSAR=0.12 it is 0.4.

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Figure1



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