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MODELLING SHOWS 85% FULL COVERAGE NEEDED TO REACH HERD IMMUNITY

EMBARGOED UNTIL 12:01am Monday 6 September 2021

AUSTRALIA'S current "mixed" COVID-19 vaccination program (vaccinating over 60s with AstraZeneca and under 60s with Pfizer) will not achieve herd immunity unless 85% of the population, including many 5-16 year-olds, are fully vaccinated.

Researchers from James Cook University (JCU) and Monash University, led by Professor Emma McBryde, chair of Infectious Diseases Modelling and Epidemiology at JCU, published their modelling today in the *Medical Journal of Australia*.

"Assuming a pre-vaccination effective reproduction number for the Delta variant of 5, we show the current 'mixed' program will not achieve herd immunity under 85% of full coverage," McBryde and colleagues wrote.

"At a lower effective reproduction number of 3, the mixed program can achieve herd immunity at 60-70% coverage without vaccinating 5-15 year-olds.

"An effective reproduction number of 7 precludes achieving herd immunity with existing vaccines, however vaccination still prevents over 85% of deaths compared with no vaccination."

McBryde and colleagues analysed the direct and indirect effects of COVID-19 vaccination by vaccine type, age-strategy, and coverage. The model incorporated age-specific mixing, infectiousness, susceptibility and severity to assess the final size of the epidemic under different public health intervention scenarios in Australia. The model predicts the final infected population, cumulative hospitalizations, deaths and years of life lost following an epidemic wave, taking into account vaccination and additional mitigation measures.

"Vaccinating the vulnerable first is the optimal policy at low coverage, but vaccinating high transmitters becomes more important in settings where reproduction numbers are lower and coverage is higher," they concluded.

"Vaccinating over 85% of the population including children would likely be needed to achieve herd immunity at the most plausible effective reproduction number of 5. Even without herd immunity, vaccines are highly beneficial at reducing deaths.

"Australia is unlikely to achieve herd protection unless vaccination is extended to younger ages or combined with other measures.

"Australia should now prioritise delivering Pfizer vaccine to 12-40 year-olds."

McBryde and colleagues said this work provides a tool that is open access and easy to use to consider a range of different vaccine strategies, across most countries in the world. This work has open source code which is an essential part of transparency in modelling.

The article will be available, free to access, after 12.01am on Monday 6 September, at:

https://www.mja.com.au/journal/2021/modelling-direct-and-herd-protection-effects-vaccination-against-sars-cov-2-delta

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CONTACTS:

Professor Emma McBryde
Infectious Diseases Modelling and Epidemiology
James Cook University
Email: emma.mcbryde@jcu.edu.au

Alistair Bone
Media Liaison
James Cook University
Ph: 0409 734 542
Email: Alistair.bone@gmail.com