Transmission dynamics are crucial to COVID-19 vaccination policy

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Goldstein et al.'s (1) article, "Vaccinating the oldest against COVID-19...," provides a useful and timely analysis of the value of protecting older people from infection. The authors show convincingly that the expected number of life years saved by focusing protection on old people is more than commonly supposed.

Unfortunately, the article is framed, and titled, in a way that seems certain to lead to misunderstanding. The core analysis is about the effects of reducing mortality in different age groups, but is framed in the paper as an analysis of the effects of vaccination. Although superficially similar, these are very different questions, primarily because of the indirect effects of vaccination (2).

Goldstein et al.'s (1) main arguments are based on calculating the product of an estimated COVID-19 death rate and estimated life expectancy over age classes. That is, they are calculating the effect of directly protecting an individual from COVID-19 death, not the effects of vaccination per se.

The difference is critical. Since current COVID-19 vaccines are expected to prevent some fraction of transmission (3), vaccination has both direct and indirect effects. Indirect effects, mediated by transmission dynamics, may be very important. Vaccinating one frontline worker may protect many people, including older people. Goldstein et al. (1) provide important information about the value of directly protecting older people, but they leave the question of the relative value of vaccinating older people wide open.

The difference cuts both ways. The article has less to say about vaccination policy than a casual reader might conclude, but more to say about intervention in general. The authors' demonstration that protecting the very old from COVID mortality will save relatively more overall years of life than is commonly supposed (1) has implications for how to focus a wide variety of lockdown, surveillance, and testing programs.

The authors recognize that their analysis is limited, and specifically mention transmission dynamics (1). They do not, however, apply this realization to their premises—"Vaccinating the very old against COVID-19 saves the most lives"—or to their conclusions—"(this) also maximizes years of remaining life expectancy." These are convincing statements about direct protection from COVID mortality, based solidly on the authors' arguments. But the authors do not make a sufficient argument that they are correct statements about vaccination.

The framing error is consequential, because there is good reason to suspect that vaccinating the very old may be less effective in reducing their risk of mortality, relative to vaccinating frontline workers, than is commonly supposed. Essential workers are less able to reduce contacts than others are, and they are rarely very old. Modeling studies suggest that vaccinating groups strongly involved in transmission may be the best way to save lives (4). Further research is needed: If the import of the Goldstein et al. (1) article is understood and communicated correctly, it will be valuable in evaluating strategies, but it does not show that vaccinating from oldest to youngest is best.

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