

Despite the vaccine roll out, a large subpopulation has resisted vaccination and a thus remains fully vulnerable to Covid infection, not only here in the US but in most developed western countries. In the less developed economies, availability of vaccine remains limiting and the Delta variant of Covid, somewhat more infectious than its alpha variant predecessor has continued to propagate in the face of patchwork immunization.

In late fall, the identification of the heavily mutated omicron variant form of covid has been followed by the explosive spread of this variant throughout the world. In a matter of few weeks, it has become the most prevalent form of corona virus in many geographies, including the US. This is a living demonstration of the risk of virulent mutation occurring if corona virus active disease can smolder on around the world. To explain why this occurrence was anticipated in my earlier writing and to minimize technical language that tends to confuse non-technical readers, consider the following:

If a virus exists at a very low background level the number of replication events is modest and mutations relatively rare.  $X$  mutations would occur in a year and  $100X$  events in a century. Maybe 1 of those mutated variants will find a new set of hosts and have the right characteristics to cause a pandemic. Recall Spanish flu occurred a century ago. Flu mutations occur in multi-species host cycle involving fowl, swine, and humans.

Now consider that for Covid -19, rather than having a low background of infection occurring mostly unnoticed we have many more infections occurring in an unvaccinated reservoir of hosts. The vaccinated do not meaningfully contribute to the spread and the disease and a background of disease smolders. If 100 times more people on average are infected then the  $100X$  mutation events that occurred in a century in the first example, will now happen in one year instead of a 100 years. If the mutation is like omicron and it causes infection in many fully vaccinated hosts then the disease will rapidly spread through the whole population once again.

The vaccine very much reduces the severe consequence for the vaccinated hosts, but suddenly the risk of being infected increases dramatically for all the remaining unvaccinated people. The question becomes not if, but rather how soon will individuals become infected. For the unvaccinated the risk of severe disease remains as it has been since the start of the pandemic. But with a highly infectious variant, the number of people infected in a short period is very high. and the number of unvaccinated cases having severe sequela is substantial. The impact on hospitals capacity and society becomes devastating. The bright side is that herd immunity will rapidly emerge from the carnage.

As I wrote in August, the politicization of the pandemic has been a most unfortunate turn and it may well result in the needless deaths of millions of people across the world. Populist hostility to science and technology as well as resistance to change within scientific and medical paradigms have been two constants throughout the ages. Galileo was imprisoned for his heretical observations regarding planetary motion. Phobic

attitude toward vaccines as well as a confusion between one's freedom to harm oneself versus freedom to harm others are playing an increasingly important part of the continuing story.

If society has the right to draft an individual for military service or require a license to drive a motor vehicle on public highways, then society can demand one be vaccinated if one wishes to use public space. The risk of dying from the vaccine is vanishing small. The risk of dying from infection is some number also small but it approaches 1% in some series. Most patients will survive covid without complication, but long covid symptoms are reported in up to one third of cases. Since infection is now a certainty and complications from infection are far more common than the complications from vaccination, avoiding vaccination is not the correct choice, even if one is afraid of a complication. Both mRNA and viral proteins found in vaccines are also found in an infected patient

The real reason to be vaccinated is not only for one's self-protection, but rather it is to eliminate that reservoir of ongoing mutation. The next mutation to emerge after omicron might be omicron-like in infectivity but far more lethal. If vaccines reduce global vaccine burden by say 1000-fold, the likelihood of emergence of yet an even more lethal variant is reduced at least 1000-fold and perhaps more.

Everyone on earth should be vaccinated, now.