The Efficacy of Vaccines

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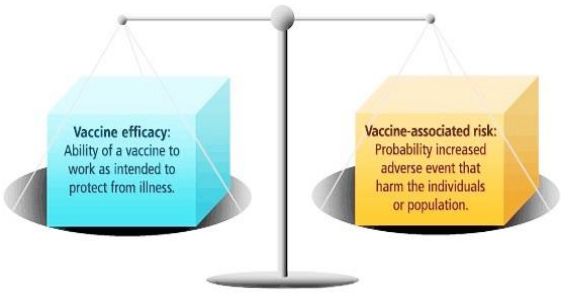
1.1.1 The Efficacy of Vaccines

Note: As a starting point, a video entitled 'Vaccine vs Herd Immunity', dated 18-May-2020, may provide a balanced introduction to this discussion.



The goal of this discussion is not to add further controversy surrounding the growing number of '*anti-vaxxer'* campaigns, as it is accepted that some vaccines are effective. However, there is legitimate concern about the idea that mandatory mass vaccinations may be the only way to eradicate the Covid-19 pandemic. Equally, there might be understandable concerns about the possibility that any Covid-19 vaccine might be fast-tracked through the normal lengthy approval process, such that the side-effects on children and those with existing immune system deficiencies might not be fully recognised. So, given the introduction provided in the video first referenced in the note above, *herd-immunity* might simply be described as a population in which some form of an immunity to an infections has developed. In this context, a vaccine might be an effective way of accelerating the process of herd-immunity, while possibly reducing the number of deaths. However, the efficacy of this approach requires careful examination of the actual risks, for and against, along with other potential side-effects and implications. For no matter how herd-immunity is achieved, protection against disease still depends on the efficacy of our *immune system* to defend us against the millions of bacteria, microbes, viruses, toxins and parasites that invade and attack the body every day. While the complexity of the immune system is beyond the scope of this discussion, reference might be made to two distinct '*modes*' of operation known as the *innate* and *adaptive* immune systems – see video *Nuts and Bolts of the Immune System*, dated 21-Jul-2011, for more detail. Based on this video, we might begin to understand how these vitally important protective systems can be impaired by age and poor health, which might be countered if the general public were better advised about preventative healthcare.

Note: The effectiveness of our immune system is often impaired by poor dietary nutrition*, which in-turn can affect the* gut microbiome*. It has long been known that this damage can be addressed by adapting our dietary needs to just the essential foods, where carbohydrates can be eliminated and replaced by appropriate amounts of healthier proteins and fats. In addition, certain vitamins and minerals are also considered essential in order to maintain an effective immune system, especially as people age.*

In terms of the Covid-19 virus, previous discussions entitled *All-Cause Mortality* and *Data Models* have attempted to put the risk of death from the virus into better statistical perspective by trying to assess this risk against all-cause mortalities. It is well-known that age and poor health is a common risk factor, although the underlying cause might be better described in terms of a weakened immune system. As a somewhat tangential, but important point, it might be highlighted that certain ethnic groups, with darker skin, have been shown to be disproportionally affected by the Covid-19 virus, possibly due to Vitamin-D deficiency – see video *Vitamin D and Latitude Powerful Effects*, dated 25-May-2020, for more details on this issue.

Note: Why this sort of advice has not been more widely communicated to the public to help maintain a healthy and effective immune system is an open question, although it might not be wide of the mark to simply follow a profit motive – see Prevention versus Cure *for more details. Whether this concern applies to those who want to promote a Covid-19 vaccine as the only way to exit lockdown is conjecture, although the concerns may not be without some foundation.*

So, this discussion is a continuation of a series that have attempted to review some of the issues surrounding the *Covid-19 Pandemic* and the *Efficacy of the Lockdown Policy*, which the mainstream media appears to have ignored. As indicated, the discussions of *All-Cause Mortality* and *Data Models* provides a statistical assessment of risk, which may be important if the efficacy of any vaccine is to be understood. However, for the purposes of this discussion, this risk might be outlined in terms of the charts to follow, which are specific to the UK population of some 67 million, where estimates suggest that all-cause mortality, prior to the Covid-19 virus, typically resulted in over 600,000 deaths every year, i.e. 1% of the population.

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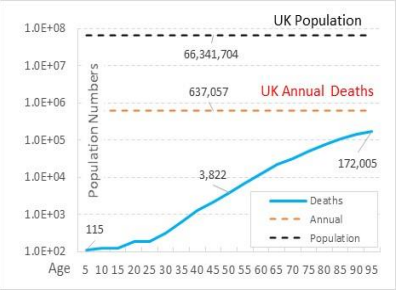
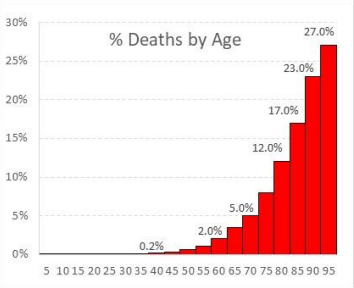
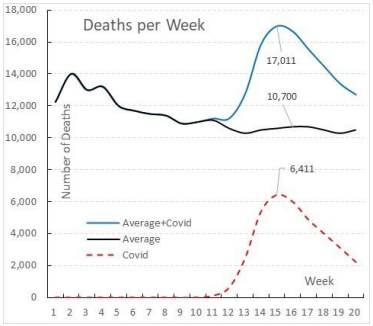
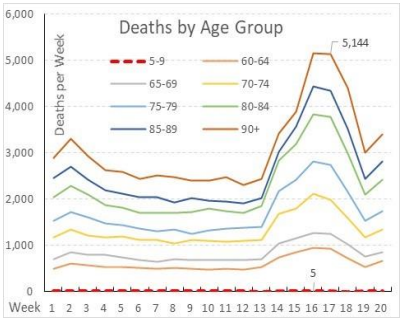




In the chart right, we might immediately see that even in normal times, the risk of death is very much dependent on increasing age, where age groups over 60 represent 97.5% of all-cause mortalities. In the chart left, the vertical scale is logarithmic, such that we might make some form of comparison of the deaths in each age group against the horizontal lines representing the annual all-cause deaths and the UK population. However, it has been argued that Covid-19 related deaths might follow a very similar distribution to the chart right, where the charts below show the weekly mortality figures for 2020. In the chart below, left, the black curve shows the distribution of all-cause mortalities averaged over the years 2015 to 2019, i.e. prior to the pandemic, onto which is added the reported Covid-19 deaths, shown as the red dashed curve, to create the blue curve. The chart right, then highlights how the Covid-19 deaths are biased to the age-groups above 60, where the red-dashed line at the bottom, for the 5-9 age group, is hardly noticeable on the scale shown.





Note: These charts are explained in more details in the Data Model *discussion, but it will be highlighted that excess deaths, possibly caused by the lockdown, have been removed. Likewise, the number of Covid-19 deaths has simply been accepted at face-value, although there is clearly some ambiguity as to whether the Covid-19 virus was simply present at death, one of a number of other causal factors or the primary cause.*

Based on the charts above, the peak of UK Covid-19 deaths occurred in week-15, i.e. 6-12 Apr-2020. As of 15-May-2020, the recorded number of Covid-19 deaths was 35,168, such that the final number in 2020 might be estimated in the region of 50,000. However, in order to put this risk into better perspective, these additional deaths would equate to an increase from 0.94% to 1.04%, i.e. 0.1% increase, relative to the UK population. Based on this risk assessment, we might immediately question the effectiveness of a Covid-19 vaccine for young children, where the risk of serious illness and death associated with the Covid-19 virus appears minimal, as shown in the charts. Equally, while statistics clearly suggest that older age groups are disproportionally at risk to the Covid-19 virus, the efficacy of a Covid-19 vaccine might still be questioned as it will not provide any protection against all other forms of all-cause mortality to which these age groups are vulnerable.

Note: While still speculative at this stage, many sources are now questioning the high mortality rate that was originally associated with the Covid-19 pandemic. While the following videos may not be authoritative, they possibly have value in putting the wider risk into some better perspective – see Worldometer Statistics *and* Revised CDC Statistics.

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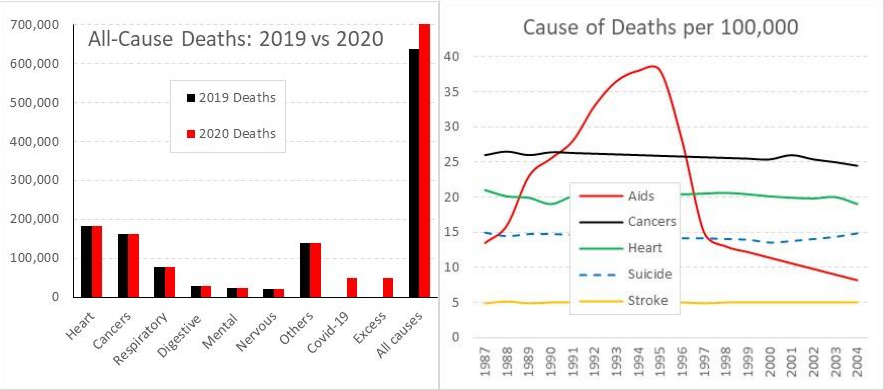
As indicated, the efficacy of a vaccine, along with the lockdown approach, possibly needs to be considered in terms of a careful examination and assessment of the actual risks, rather than just model projections. However, this type of risk assessment appears to have been ignored by mainstream media, such that this discussion will continue to pursue such issues. In terms of the following charts. The first, left, provides a possible comparison of all-cause deaths in 2019 against a 2020 projection. The second, right, provides a more retrospective comparison of all-cause deaths, inclusive of AIDS caused by the HIV virus, which will be outlined in a little more detail below.



While it is accepted that the chart, left, is a simplistic comparison of all-cause deaths in 2019 against a 2020 projection, it is based on reasonably authoritative sources, i.e. ONS, see discussions *All-Cause Mortality* and *Data Models* for more details. So, within this comparison, the primary difference between 2019 and 2020 relate to the additional deaths caused by the Covid-19 virus and the excess deaths, possibly caused by the lockdown, which will eventually be distributed over the other all-cause mortalities. However, for the purposes of this general discussion, the number of Covid-19 deaths and excess deaths have both been estimated to be 50,000 in 2020, where the overall increase in 2020 compared to 2019 would translate into a 15% increase, although the Covid-19 virus only contributes 6.83% to the 2020 total. As such, even a conceptual 100% effective Covid-19 vaccine would only be addressing the 6.83% increase in 2020, although the historic chart right might suggest that this number will not be maintained in future years as previous AIDS deaths eventually decline without a vaccine.

> *Note: Again, it will be highlighted that there is considerable ambiguity as to whether the Covid-19 virus might have only been present at death. As such, it may have only been one of a number of other causal factors rather than the primary factor. However, what appears not to be disputed is that 97% of the Covid-19 deaths correspond to the over 60 age groups, where most may have other pre-existing health conditions that made them more vulnerable to the virus.*

Before considering the chart right, some clarification of the differences between AIDS and the HIV virus may be necessary. The '*Human Immuno-deficiency Virus (HIV)'* is a type of virus that can lead to a deterioration of the immune system. Therefore, HIV is a virus that causes the initial infection, while the condition described as *Acquired Immuno-Deficiency Syndrome (AIDS)* exposes an individual to a multitude of additional health risks. However, the HIV virus, like the Covid-19 virus today, caused considerable public anxiety, if not fear, as its rate of transmission and those at risk was not initially understood. It might also be highlighted that while the HIV virus was first discovered in 1981, nearly 40 years ago, there is still no vaccine or a cure, although there are now more effective treatments. So, as suggested by the chart above, right, considerable progress has been made in treating AIDS, which it is estimated has killed 35 million people over the years. However, as an increasing number of people gained access to life-saving treatment, the number of deaths has fallen, although it is still a major problem in Africa. So, having outlined a risk assessment by which we might better judge the efficacy of any potential covid-19 vaccine, we might now table a question that needs to be addressed.

What are the prospects of a Covid-19 vaccine and will it be effective?

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At this point, it might be reasonable to concede that a vaccine, even if not totally effective, may still help increase the overall *'herd-immunity'* for this virus, assuming that one can be produced. While this discussion cannot address all the complexity surrounding the development of a *Covid-19 vaccine*, the previous link might provide some initial details, although reference should also be made of the *potential limitations* of this vaccine, which is summarised below for reference.

> *It is possible vaccines in development will not be safe or effective. One study found that between 2006 and 2015, the success rate of obtaining approval from Phase-I to successful Phase-III trials was 16.2% for vaccines, and CEPI indicates a potential success rate of only 10% for vaccine candidates in 2020 development. The rapid development and urgency of producing a vaccine for the Covid-19 pandemic may increase the risks and failure rate of delivering a safe, effective vaccine. Although the quality and quantity of antibody production by a potential vaccine is intended to neutralize the COVID-19 infection, a vaccine may have unintended effects by causing* antibody-dependent disease enhancement.

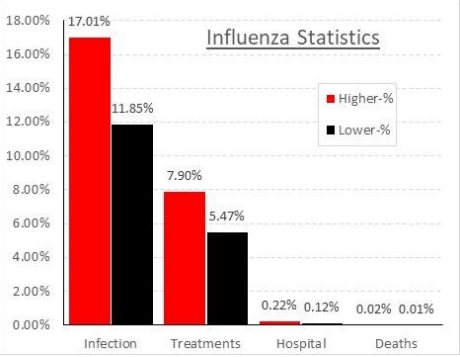
Despite some much-touted optimism, if the past is any indicator, probability suggests that a coronavirus vaccine will take, at least, 1-2 years to develop, assuming normal safety trials. The development of a mumps vaccine is currently the fastest on record, but took 4 years from collecting viral samples to licensing in 1967. However, within this historic context, we might also highlight the successful development of the *polio vaccine*, where two doses of an inactivated vaccine (IPV) is estimated to be 90% effective against polio, while three doses is estimated to increase this to 99% effective. However, there are a number of caveats around these figures, which this outline will not detail, regarding protection against mutating strains of the virus causing polio. However, given the success of vaccines to treat many viral infections of the past leads to an obvious question.

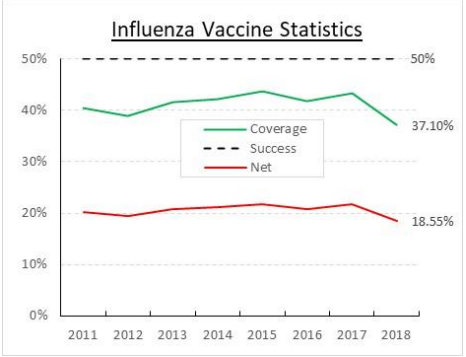
Why is there not a vaccine for the common-cold?

The *common-cold* is a viral infection of the upper respiratory tract, where a vaccine has proved very difficult, primarily because there are more than 200 different varieties of viruses that can cause colds, while in comparison there are only four basic types of *influenza viruses*: A, B, C and D. However, of these types, influenza A and B viruses are the primary cause of seasonal flu, which generally occur in the winter month, possibly linked to vitamin-D deficiency. However, an influenza pandemic can occur when a new variant of the influenza virus emerges, which can both infect people and spread rapidly. As a consequence, new versions of the influenza vaccines have to be developed twice a year due to rapid mutations in the influenza virus.

So how might the effectiveness of influenza vaccines *be estimated?*

In part, risk assessment might be best visualised in terms of percentages relative to the population. While the figures below are statistics relating to the US population, as percentages, they may provide a general estimate for other developed countries. In the chart, left, we see the percentages associated with influenza ranging from infections, treatments, hospitalisation and deaths with high and low estimates. In the chart, right, is a speculative assessment of the [Net] efficacy of the influenza vaccine, shown in red, based on the recorded vaccinations, in green, of around 40% of the population with an assumed 50% effectiveness.





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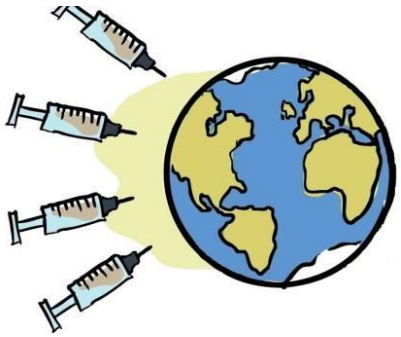
How might we interpret these charts?

First, the figures are averages for the entire US population, i.e. all age-groups. In this respect, the percentage of older age groups receiving the influenza vaccine might be increased to 60%, but if only 50% effective would reduce the net figure to 30%. However, it might be realised that younger age groups with an influenza infection may still be the primary source of infection transmission, both socially and at work. So, while vaccinating the older age groups may protect these groups from the worst-case outcomes, it may not have such an impact on the percentage of infections in the population at large. It might also be highlighted that the US all-cause mortality approximates to 0.85% of the population, where the percentage deaths due to influenza only amounts to 1-2% of this figure, i.e. between 0.0085% to 0.019% of the population. Therefore, we might now attempt to extend the discussion of *influenza* to include the *corona-type virus*, which while being a different virus also leads to infectious respiratory illnesses with similar symptoms.

> *Note: It might be highlighted that the symptoms experienced by a person with an influenza or coronavirus, e.g. Covid-19, might depend on their health, especially in terms of the effectiveness of their immune system to counter the viral infection.*

So, how might we estimate the effectiveness of any future Covid-19 vaccine?



It has to be realised that we are currently dealing with speculation, because no Covid-19 vaccine exists, such that we also have to speculate about its general effectiveness, e.g. 50%, and the coverage of the vaccine, e.g. 40%, within a population. While we might reasonably adopt the figures known for influenza, probability suggests that even if a Covid-19 vaccine is realised, its widespread use on the general public is unlikely before summer 2021, which would be the low-point for seasonal viral infections in the northern hemisphere. In the case of the UK, it has been estimated that the total 2020 Covid-19 deaths might be in the region of 50,000, such that this might also be an upper limit in 2021. Of course, it might not be unreasonable to suggest that this figure might be halved to 25,000 due to an increase in general herd-immunity, although this cannot be quantified, along with additional treatments to mitigate the worst outcomes.

Might we also put a revised figure for Covid-19 deaths in 2021 into better perspective?

If we assume a return to the normal baseline of all-cause deaths in 2019, i.e. 637,000, to which we add 25,000 Covid-19 deaths, but no further excess deaths, we might estimate a 2021 figure in the region of 662,000 all-cause mortalities. In reality, this figure may be lower as many who succumbed to the Covid-19 virus this year may not now appear in the normal rate of all-cause mortalities in 2021. Even so, the 25,000 Covid-19 deaths estimated would approximate to 3.78% of all-cause mortalities and 0.04% of the UK population of 67 million. Of course, this estimate makes no assumption about the possible impact of a Covid-19 vaccine, although should a vaccine be possible, but not available until summer 2021, then this may only infer a small reduction in Covid-19 deaths in 2021.

Might we consider vaccination as part of a wider herd-immunity model?

Certainly, if a tried and tested Covid-19 vaccine were available for widespread use in summer 2021, it would be a welcomed addition to help provide increased herd-immunity, especially for older age groups. Of course, if this is a realistic timeframe for a fully-tested vaccine, might we question whether the crippling effects of the lockdown policy on the economy and the social lives of people can be maintained for another year. If not, then some further risk assessment of a herd-immunity model might be required, which we might initially consider in terms of a comparison of the Covid-19 statistics between the UK and Sweden, as they adopted different degrees of lockdown.

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	Pop	(I)	(D)	%-(I/Pop)	%-(D/I)	%-(D/P)
UK	66,341,704	283,311	40,261	0.427%	14.211%	0.061%
Sweden	10,094,260	42,939	4,639	0.425%	10.804%	0.046%

Note: The figures in the table above were taken from the virusncov.com website, dated 6-Jun-2020.

In order to do any sort of comparison of the number of infections (I) and deaths (D) attributed to the Covid-19 virus requires some normalisation to the size of the population, which is presented in the percentage figures. In this respect, the UK and Sweden appear surprisingly similar in the percentage figures shown on the right of the table. Again, it might immediately be highlighted that the number of reported infections is probably a gross under-estimation of the actual infections, such that any suggestion that infections represent less than 0.5% of the population has to be questioned. Other estimates of major cities like London and Stockholm suggest that the infection rates may be as high as 10%, which would then reduce the percentages of deaths to infections [%-(D/I)] being over 10% to be in 1-2% range. However, it is possible that the only meaningful measure of Covid-19 deaths is relative to the population size, which in both cases would be less than 0.1%

Note: By way of another comparative measure of risk, it is estimated that there are on average 15,000 influenza deaths in the UK every year, which would align to 0.023% of the UK population. In comparison, the current Covid-19 deaths equate to 0.061%, which while suggesting a 3-fold difference in mortality is very far from the +10% figures suggested against reported infections, such that reference to this statistic will simply be ignored.

Obviously, some care is required in any direct comparison between the figures for the UK and Sweden as there are important demographic differences, although for the purposes of this discussion, the primary focus is the respective approaches to the Covid-19 pandemic. Not unlike all governments, the goal of the Swedish strategy was to try to protect its most at-risk citizens and to slow down the spread of the virus in order to keep the healthcare system from being overwhelmed. While the details of *Sweden's pandemic approach* can be reviewed via the reference, it broadly covered 3 restrictions, i.e. social distancing, especially within older age groups, a ban on gatherings over 500 people and measured travel restrictions. This might then be compared to the *UK pandemic approach* of lockdown, although the table suggests no discernible difference in outcome. .

What risk assessment might be made from these statistics?

While the statistics presented have to be described as speculative, there are sufficient authoritative sources to support the probability that they are not that wide of the mark. If so, it might be argued that the only measure of critical importance to the general public is the relative risk of death, which in the UK might be equated to 0.96% based on all-cause mortality, where the estimated additional 50,000 Covid-19 deaths in 2020 would equate to an additional 0.08% increase to 1.04% of the UK population. If so, we might pursue a speculative risk assessment of deaths in 2021 as follows:

2021	Pop	%-Pop	ACM	Covid-19	Total	%-(D/P)	%-Age
UK	66,341,704	100%	637,057	25,000	662,057	0.998%	100.00%
Under 50	66,341,704	53.40%	22,752	893	23,645	0.036%	3.57%
Over 50	66,341,704	46.60%	614,305	24,107	638,412	0.962%	96.43%

On the top line, we see the previous estimate of all-cause mortality (ACM) plus a reduced estimate of 25,000 Covid-19 death, such that we have a total estimate of 662,057 deaths in 2021. However, previous analysis of the risk of death by age-groups suggested a 27-fold difference in the risk for those under 50 compared with those over 50 – see *The Efficacy of Lockdown* for details. If so, this equates to the %-deaths for the under-50 age groups being 3.57% compared to 96.43% for the over 50 age groups, such that we might make some ballpark estimates of the number of deaths under each heading for these two age groups, as shown in the bottom two rows.

How might the previous table support a revised herd-immunity model?

If we were to remove the lockdown restrictions on the low-risk (<50) age groups, i.e. 53.4% of the UK population, these low-risk age groups, which represent about 70% of the UK working population, could then help maintain the economy. This would also allow these younger age groups to live a more normal social life, while still being asked to maintain social-distancing with high-risk age groups in self-isolation. If so, we might assume that without too many restrictions, these low-risk age groups would acquire a higher degree of normal herd-immunity over the next year with very low-risk of the worse-case outcome.

> *Note: With reference to the previous table, the risk of all-cause mortality (ACM) would be unaffected by any lockdown policy, which only applies to the Covid-19 deaths. As such, the relaxation of the lockdown policy to the low-risk (<50) groups might lead to 893 additional Covid-19 deaths, which is 3.94% of the statistical 22,752 all-cause mortalities.*

Broadly, it would be hoped that this revised model might help 53.4% of the population develop a proportionate level of herd-immunity that starts to approach the 60-70% requirement for Covid-19 herd immunity without imposing any significant additional risk on the over-50 age groups, where self-isolation and social distancing is maintained.

> *Note: It might also be highlighted that possibly 50% of all Covid-19 deaths in 2020 were in care homes, many of which could be avoided in 2021 with better testing with rapid results along with more personal protective equipment (PPE) and better staff training in how to use it. In essence, this is where 'lockdown' might really help.*

As stressed throughout the various discussions of the Covid-19 pandemic, the debate is not about *'lockdown*' versus '*do-nothing'*, but rather '*doing something*' that is more effective. In this context, the herd-immunity model outlined suggests that risk can be mitigated by simply opening up the economy and society to the younger (<50) low-risk groups, where the risk of excess deaths and the worry of overwhelming the health services can be effectively minimised.

But what about the vaccination option?

In the context of the herd-immunity model, a vaccine is an additional option that might be very applicable for the high-risk (>50) age groups, although the question of the efficacy of any potential vaccine still needs to be considered. Again, it needs to be highlighted that we are currently dealing with speculation, as no Covid-19 vaccine exists. However, we might revise earlier estimates for the coverage of the vaccine for the high-risk age groups from an average of 40% to 60% with an additional increase of its effectiveness from 50% to 60%. If so, then this vaccine would provide a 36% increase in herd-immunity within the high-risk age groups, which might help reduce the estimated 24,107 Covid-19 deaths in these age groups by 8,679 (36%), such that the overall Covid-19 deaths estimated in 2021 would fall from 25,000 to 15,429 assuming that the vaccine was available in time. If so, we might present the revised figures for comparison.

2021	Pop	ACM	Covid-19	Total
No Vaccine	66,341,704	637,057	25,000	662,057
Vaccine	66,341,704	637,057	15,429	652,486

However, while the saving of 8,679 lives is obviously a possibility worth pursuing, it is highlighted that the reduction in Covid-19 deaths due to the vaccine relative to all-cause mortality would only amount to 1.45%. Likewise, if the younger (<50) age groups had achieve a degree of herd-immunity, as described, then the efficacy of a 36% reduction on the estimated 893 Covid-19 deaths would save 321 lives, but again would only equate to 1.41% reduction of the 22,752 lives lost to all-cause mortality. While no argument will be made against pursuing a vaccine, if it might save some lives, this risk assessment might question its efficacy as the only solution.

But what wider concerns and implications also need to be considered?

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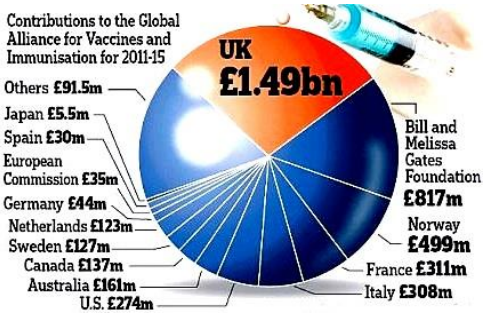
Up until this point, this discussion has simply attempted to rationalise the risk of all-cause mortality in terms of various comparative percentages. While these risk percentages can appear to be small, they can still translate into large numbers of lives lost when considered in terms of national population. However, as outlined, the efficacy of a vaccine may depend on the nature of virus and the risk demographics of the age groups most affected, where in the case of the Covid-19 virus, the worst-case risks have been shown to be heavily weighted against older age groups with existing health conditions. However, both these criteria correlate to a deterioration of the immune system to fight infections, which might have been helped throughout life by better dietary nutrition, exercise and sensible exposure to UVB sunshine along with certain vitamin and mineral supplements. In 2017, five papers on life expectancy, detailing causes and risk factors of death and ill health were published by the Lancet medical journal. While they reported on the general increase in life expectancy, they also reported that diet was the second highest risk factor for early death after smoking. Other risks associated with diet include diabetes, high blood pressure and obesity, all of which have also been shown to increase Covid-19 risks. As a consequence, it was estimated that 20% of all deaths might be related to poor diet, which in terms of the 637,057 UK all-cause deaths would equate to 127,411 preventable deaths. This figure might also be compared with the estimated 25,000 Covid-19 deaths in 2021 and used as another comparative measure of the efficacy of any Covid-19 vaccine. However, again, it possibly needs to be highlighted that this commentary is not anti-vaccine, as it has simply tried to provide an assessment of the efficacy of a Covid-19 vaccine in terms of all-cause mortality.

> *Note: Historically, vaccines have proved themselves to be an effective weapon against various infectious diseases, such that they have undoubtedly saved millions of lives. However, it needs to be recognised that they do not represent a 'magic bullet' against all viral infections in terms of effectiveness or the lack of side-effects. In this context, concern has been raised about the possible risk of fast-tracking the approval of any potential Covid-19 vaccine for use in the wider population, especially when if used on younger children whose immune system is still developing or older age groups who might have weaken immune systems.*

While this discussion will not repeat all the concerns previously raised in the *Propaganda and the Covid-19 Pandemic*, it might highlight that pharmaceutical companies might perceive the development of a multitude of vaccines as a '*big business opportunity*' and not just an altruistic obligation, which might be reflected in the following chart.



Concern might also be raised about the scope of the goals of some of these organisations, which appear to be pushing the idea of digital identification and vaccination for all *'global citizens'* by the year 2030 – see *Degrees of Freedom* for wider issues. Finally, as stated at the outset, this discussion was not about adding further controversy surrounding a growing number of anti-vaccination campaigns. However, the track record of the pharmaceutical and food industries in providing good health advice to the general public might still be questioned – see *Prevention versus Cure* for more details.

> *Note: Finally, the interested readers might wish to review the following videos,* The Amazing Immunology*, dated 7-Jun-2020, and* Immunology Deep Dive*, dated 29-May-2020. Clearly, science is only just beginning to understand the real complexity of the human immune system, such that the efficacy of any vaccine has to also be seen in this context.*