

Market and Volatility Commentary

Pandemic in Emerging Markets – examining the positive impact of age, prevalence of BCG immunization, and climate

The situation that is facing the global economy and financial markets is unprecedented. A sudden stop, mandated by the pandemic and governments, is a situation that is very different from the previous recession. In a simplified analogy, the economy is put in an 'induced coma,' and fiscal and monetary authorities commit to provide a sufficient amount of 'oxygen' until the economy can be reawakened from this state. If this operation is successful, the fact that many corporate earnings or economic readings will be zero during this 'induced coma' is less relevant. The risk is if this 'induced coma' lasts too long, or the amount of 'oxygen' is insufficient, some parts of the economy will suffer irreparable damage. For this reason, two questions are critical: 1) How long will the economy be shut, i.e., what is cumulative GDP loss? 2) Will the amount of stimulus be enough to plug that hole? The outcome for the economy and asset prices will be obtained by netting these 2 large numbers (GDP lost and total amount of stimulus), each having large uncertainty. If the stimulus overshoots the damage, so may the economy and financial markets in 2021; in the negative outcome the opposite would happen. One should also be aware that there is a stabilizing feedback loop – the longer the shutdown lasts and bigger the damage, the bigger will be the stimulus. Currently, there is a resolve to “act forcefully, aggressively... to make people whole” (see [here](#)).

To understand the timeline of reopening, we have focused on understanding the virus and its spread and impact across the globe. We have applied big data to successfully forecast the US timeline of peak virus growth, decline in net hospitalization and total amount of hospitalizations ahead of, and with vastly different conclusions compared to, then-accepted models (see [here](#), [here](#)). We have also closely followed immunity studies and regional reports to estimate mortality and virus attack rates. This has important implications to forecast the recovery timeline and quantify worst-case outcomes ([here](#), [here](#)).

With the virus now most acutely ravaging Europe and the US, an increasing number of clients are asking us what will happen when the virus ravages emerging markets. Are emerging markets the next imminent disaster, the next 'shoe to drop' in the global pandemic? The premise of an even bigger EM disaster would be their weaker health care systems, and the fiscal and monetary constraints in developing economies.

In this report we analyze the positive impact of age demographics and other possible mitigating factors in emerging markets. Our findings indicate that a much better outcome is likely in many emerging market countries. This is primarily due to their significantly younger populations, and the exponential decline of virus mortality for younger individuals. Our analysis also shows a statistically significant relationship between BCG (Bacillus Calmette-Guérin) vaccinations – which are prevalent in emerging economies – and reduction of both COVID-19 infection rates and mortalities. Other information on BCG vaccination links to COVID-19 can be found [here](#), [here](#), and [here](#).

See page 6 for analyst certification and important disclosures.

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Finally, we report findings from other researchers on the positive impact of warmer and more humid weather, often found in emerging market countries. Our estimate is that **the impact on many emerging countries may be 4-6 times lower compared with the most negatively affected areas of the developed world such as northern Italy.**

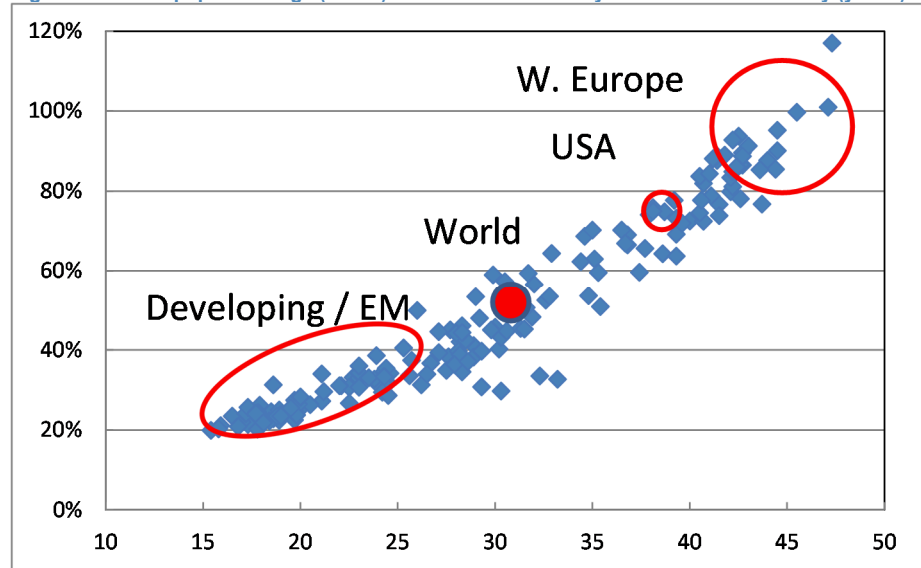
We first start with an anecdote (not a proof but rather a motivation for our research). If one looks at COVID-19 deaths per million of population, within the top 20 countries, there is only 1 emerging market country – Iran. All other countries are from the developed world and typically have older populations relative to EM. Iran is under harsh sanctions, and has a relatively cold climate and relatively older population for an emerging market country. If we go down the list of countries with the most fatalities per million of population, again we encounter countries from the developed world, and the next emerging market country is Ecuador. Ecuador is the only country in the developing world (across South America, Asia, and Africa) that does not have a universal BCG vaccination policy. Finally, if we look at the bottom of the mortality table, we find that nearly all are countries from emerging markets, with one notable exception – Japan. While Japan has one of the oldest populations in the world (and hence high expected COVID-19 mortality), Japan is also the only developed world country with a long running BCG vaccination program.

Moving away from this anecdote, we analyze the impact of population age on COVID-19 mortality. This can be done by taking the age distribution of each country, and integrating the age distribution and COVID-19 mortality (i.e., sum-product of age and mortality bins). Mortality distributions are obtained from hospital reported data from Italy, China and USA (see [here](#) and [here](#)).

The average age in EM countries is much younger than in the developed world. For instance, the average age in Africa is 19.7 years, MENA and India 26.8y, and Latin America 31y, which can be compared with, for example, an average age in Europe of 43.1y. For an exponentially increasing mortality curve, this makes a huge difference.

Figure 1, below, shows expected COVID-19 mortality for different regions, normalized to 1 for Western Europe (e.g., Italy). One can see that expected mortality in developing countries (emerging markets) may be reduced by a factor of 3 compared with Western Europe (ranging from 2.5 to 5 times). This is a highly important result when estimating the worst-case scenarios for developing countries.

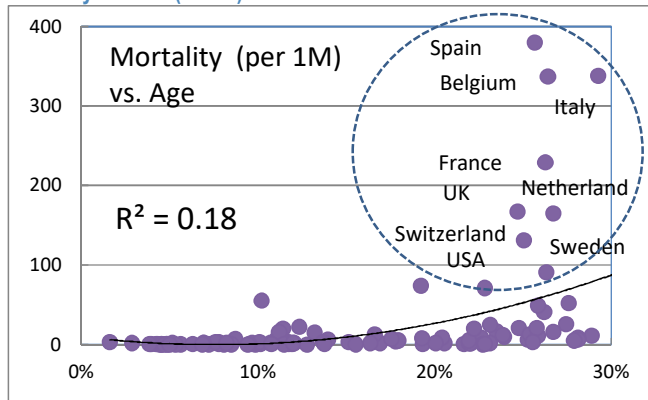
Figure 1: Median population age (x-axis) vs. COVID-19 mortality normalized to 1 for Italy (y-axis)



Source: J.P. Morgan Quantitative and Derivatives Strategy

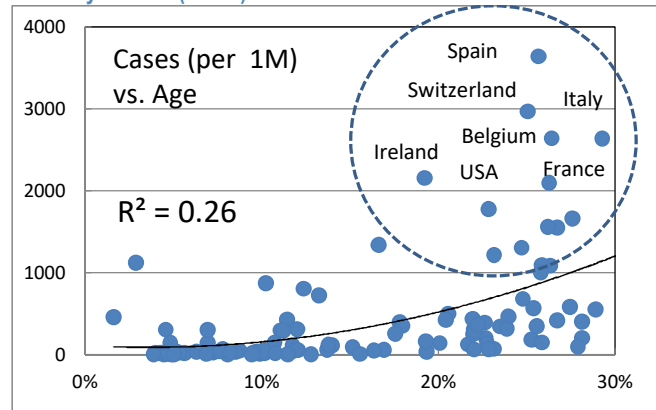
Next we look at the actual country data for the number of COVID-19 fatalities and cases (per million of population) as a function of age demographics. The figures below show COVID-19 mortality and number of cases (per 1Mn) as a function of percentage of population older than 60 years old for a sample of ~100 of the most affected countries. We find a significant relationship between the COVID-19 impact and population age (note that taking the % of the population greater than 80y, for example, would produce an even more significant correlation).

Figure 2: COVID-19 mortality per 1Mn (y-axis) vs. % of the population over 60 years old (x-axis)



Source: J.P. Morgan Quantitative and Derivatives Strategy

Figure 3: COVID-19 cases per 1Mn (y-axis) vs. % of the population over 60 years old (x-axis)



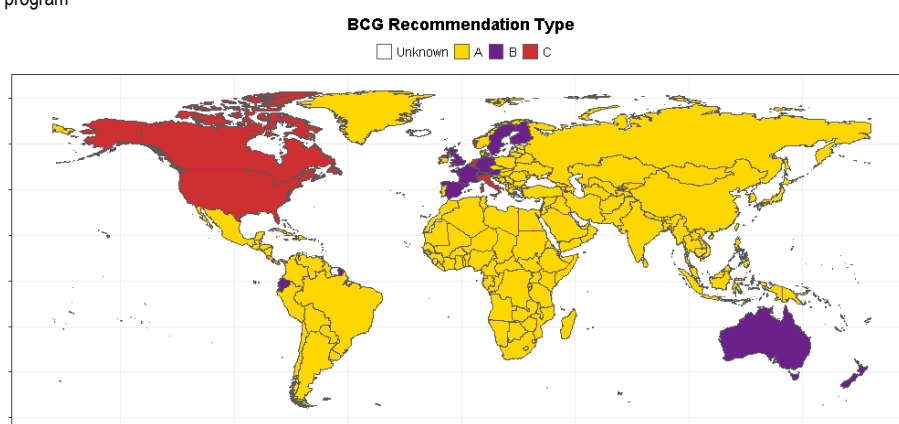
Source: J.P. Morgan Quantitative and Derivatives Strategy

However, there is a significant dispersion in these charts, showing that some countries have higher and others lower incidence relative to the age trend line. The relationship between COVID-19 and age is even stronger if we remove these outliers. Next we examine the hypothesis that the BCG vaccination is driving these outliers to the COVID-19 vs. age relationship.

It is striking that outliers above trend line are virtually all countries that either never had BCG vaccination programs (Italy, Netherlands, Belgium, USA) or discontinued it some time ago (Spain, Sweden, UK, Switzerland, France). A map of the BCG vaccination status is shown in Figure 4, below. One can notice that virtually all countries disproportionally impacted by COVID-19 do not have current BCG programs. Also note that virtually all emerging market countries have BCG programs (notable exceptions are Ecuador with the highest EM COVID-19 mortality, and Japan – the oldest developed world country with lowest mortality and a long-lasting BCG program).

Figure 4: Map of BCG vaccination status

A=current universal vaccination program, B=prior universal vaccination program, C=never had a universal vaccination program

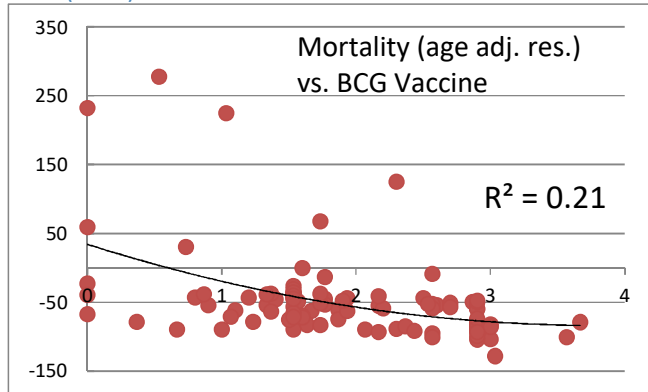


Source: J.P. Morgan Quantitative and Derivatives Strategy, BCG World Atlas.

To test the BCG link hypothesis statistically, we have correlated mortality and COVID-19 prevalence adjusted for age (i.e., residuals above or below the trend line in the charts above) to BCG vaccination status. For the BCG status score we assigned 0 if the country never had a program, and a fractional score if the country has or had a program in the past. The fractional score was calculated as the number of years the program was in place expressed as a percentage of the average population age. Multiple/Booster BCG vaccines were added to the score as an additional number of years based on the age when administered (data from [here](#)).

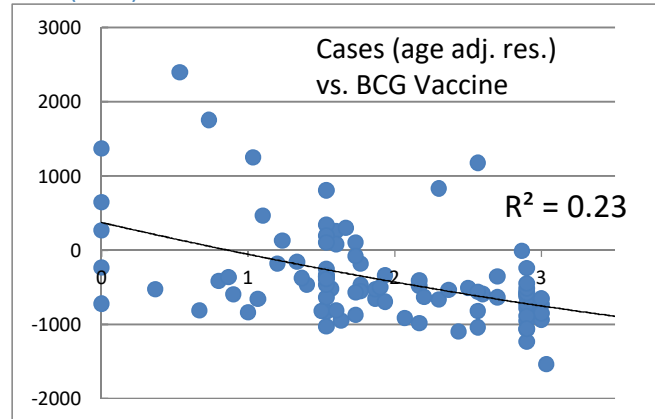
Results of these regressions are shown in Figure 5 and Figure 6, below, and they are both statistically significant. This proves that BCG vaccination status significantly correlates with excess COVID-19 prevalence and mortality, and provides an indication that BCG status may be driving COVID-19 prevalence and mortality. The reduction that can be linked to BCG status in our analysis is estimated to be a factor of ~2 (i.e., ~50% reduction of prevalence and mortality). Results from another study ([here](#)) indicates a much larger positive impact.

Figure 5: COVID-19 mortality age-adjusted residuals (y-axis) vs. BCG score (x-axis)



Source: J.P. Morgan Quantitative and Derivatives Strategy

Figure 6: COVID-19 cases age-adjusted residuals (y-axis) vs. BCG score (x-axis)



Source: J.P. Morgan Quantitative and Derivatives Strategy

Finally, most emerging market countries are in tropical and sub-tropical regions characterized by higher average temperature and humidity. There are a number of research papers that indicate that higher temperature and humidity may reduce COVID-19 infection rates (e.g., see, [here](#), [here](#), and [here](#)). While we have not conducted our own analysis, to us the result appears plausible and would further mitigate COVID-19 worst-case outcomes in many EM countries.

In conclusion, we find that all else equal, the younger EM demographic would reduce COVID-19 mortality by a factor of ~3 compared with the most affected regions in Europe. Our analysis does not prove, but indicates that BCG status may further reduce the negative impact of COVID-19 in emerging market countries. Regression of residuals indicates an additional mortality rate reduction by a factor of ~2. Finally, based on recently published literature (rather than our own research), we believe that climate parameters are another likely mitigating factor to the COVID-19 pandemic in emerging markets. Despite a likely and very significant reduction of COVID-19 mortality in emerging markets relative to Western Europe hotspots like Italy, common sense social distancing, prevention and tracking measures need to be implemented across emerging markets to reduce the impact of the pandemic.

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