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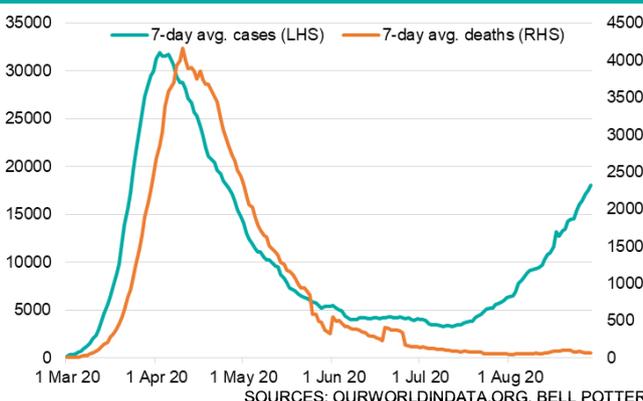
# Coronavirus analysis & outlook

Areas of Europe & USA likely reaching herd immunity

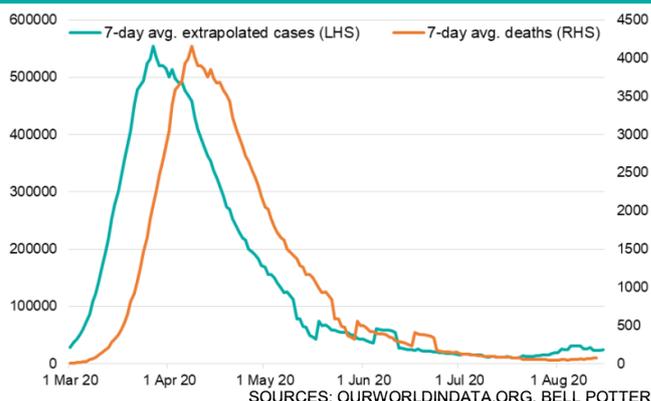
## Western Europe's 2nd wave is more like a ripple

While Western Europe's 2nd wave is garnering worldwide attention, what is being virtually unacknowledged, is that the number of COVID-19 deaths across the region remain far below prior levels. This suggests that case numbers earlier on in the outbreak were massively undercounted. In order to gain further insight into how large the undercounting may have been, we have conducted an extrapolation based upon the number of deaths recorded. While subject to infection fatality rate (IFR) assumptions, which could be above or below our input, this extrapolation should provide a more accurate picture of case numbers. Our estimate suggests Western European cases **may** have been running at over 500,000 per day at their peak, versus the ~30,000 peak recorded. Rather than being a wave, this suggests that Western Europe's current outbreak appears to be little more than a ripple.

**Figure 1: Western Europe confirmed cases & deaths**



**Figure 2: Western Europe extrapolated cases, actual deaths**



## Deaths continue sharp decline, moving in-line with seasonal flu

As seen in the above charts, deaths continue to sharply decline across Western Europe. This has seen case fatality rates (CFRs) move sharply lower across Western Europe, with a median of 0.58% recorded on 29 August. Given that cases are undercounted, the real IFR is likely to be significantly lower than this number. Some nations, including Sweden (CFR of 0.14%), are now recording CFRs not dissimilar to the seasonal flu. The extremely alarming predictions that suggested IFRs could be in whole single digit percentages, and which were used to justify lockdowns, have now been discredited by an objective analysis of the data.

## Much of Western Europe and the USA have likely hit HITs

The sharp decline in cases, case positivity, deaths and/or hospitalisations across Western Europe and the USA, suggests that much of these areas have hit their herd immunity thresholds (HITs), or will soon do so. This comes despite conventional wisdom suggesting that reaching herd immunity requires 60-70% (or more) of the population to become infected. Though these assumptions are based on vaccination theory **and not natural herd immunity. Studies instead suggest that a 10-20% infection rate may result in HITs being reached for COVID-19. This is supported by studies which show widespread pre-existing T cell immune responses to COVID-19, in up to 80% of individuals.**

## Life will likely soon return to normal in these areas

**This suggests that Western Europe and the USA will likely be largely back to normal by year's end, with herd immunity broadly obtained. This would be a major positive catalyst to livelihoods around the globe, helping to restore economic growth and reduce the death, destruction, and depression associated with social isolation, increased poverty and unemployment.**

# Western Europe's 2nd case wave remains

## Western Europe sees continued spike in cases

7-day average cases continue to grow across most of Western Europe, with major spikes recorded since 1 July 2020 in most countries.

Spain has recorded a spike of over 1900%, Ireland 900%, and France and the Netherlands of over 500%.

## An increase, but raw numbers only tell part of the story

When analysing case changes it is important to look at the change in case positivity rates, as raw numbers can be influenced by changes in the level of testing. This shows that while there has been a material increase in cases since 1 July in most nations, the change in case numbers (+336.5%) is larger than the median positivity rate increase (+86.8%). This suggests that the extent of the case increase is being amplified by a bigger increase in testing than the increase in the proportion of positive results.

## Sweden and Portugal record case & positivity reductions

Sweden and Portugal remain the only two nations to record a decline in 7-day average cases and positivity rates since 1 July 2020. Both nations saw a continued material spread of the virus over the past few months, as opposed to a severe suppression. Sweden's decline in these metrics has been particularly significant at over 70%.

On this metric we see that not only have Portugal and Sweden recorded declines in case positivity since 1 July, but so too has the UK, Finland and Norway. While severely suppressing its curve from its peak, cases continued to circulate at a notable level in the UK, as they had in Portugal and Sweden. Norway and Finland have instead seen a continued low level of transmission.

**Figure 3: Western Europe 7-day average case change from 1 Jul 20 to 29 Aug 20**

	1 Jul 7-day average cases	29 Aug 7-day average cases	% change from 1 Jul	1 Jul case positivity %	Most recent case positivity %	% change from 1 Jul
Austria	61	269	341.3%	1.01%	2.44%	142.6%
Belgium	83	362	336.5%	0.64%	2.39%	271.1%
Denmark	30	82	176.8%	0.20%	0.29%	46.7%
Finland	8	24	189.8%	<b>0.41%</b>	<b>0.26%</b>	<b>-37.7%</b>
France	505	4668	824.6%	1.27%	3.27%	157.1%
Germany	468	1272	171.8%	n/a	n/a	n/a
Ireland	12	118	904.9%	0.32%	1.48%	367.9%
Italy	249	1192	378.2%	0.96%	2.18%	126.8%
Netherlands	79	505	541.9%	n/a	n/a	n/a
Norway	16	49	203.5%	<b>0.51%</b>	<b>0.46%</b>	<b>-8.8%</b>
<b>Portugal</b>	<b>343</b>	<b>266</b>	<b>-22.5%</b>	<b>2.66%</b>	<b>1.35%</b>	<b>-49.3%</b>
Spain	368	7605	1968.9%	n/a	n/a	n/a
<b>Sweden</b>	<b>1057</b>	<b>165</b>	<b>-84.4%</b>	<b>9.27%</b>	<b>2.68%</b>	<b>-71.1%</b>
Switzerland	55	287	425.7%	0.56%	2.92%	426.9%
<b>UK</b>	<b>697</b>	<b>1190</b>	<b>70.7%</b>	<b>0.79%</b>	<b>0.66%</b>	<b>-16.8%</b>
<b>Median</b>			<b>336.5%</b>			<b>86.8%</b>
<b>Average</b>			<b>428.5%</b>			<b>112.9%</b>

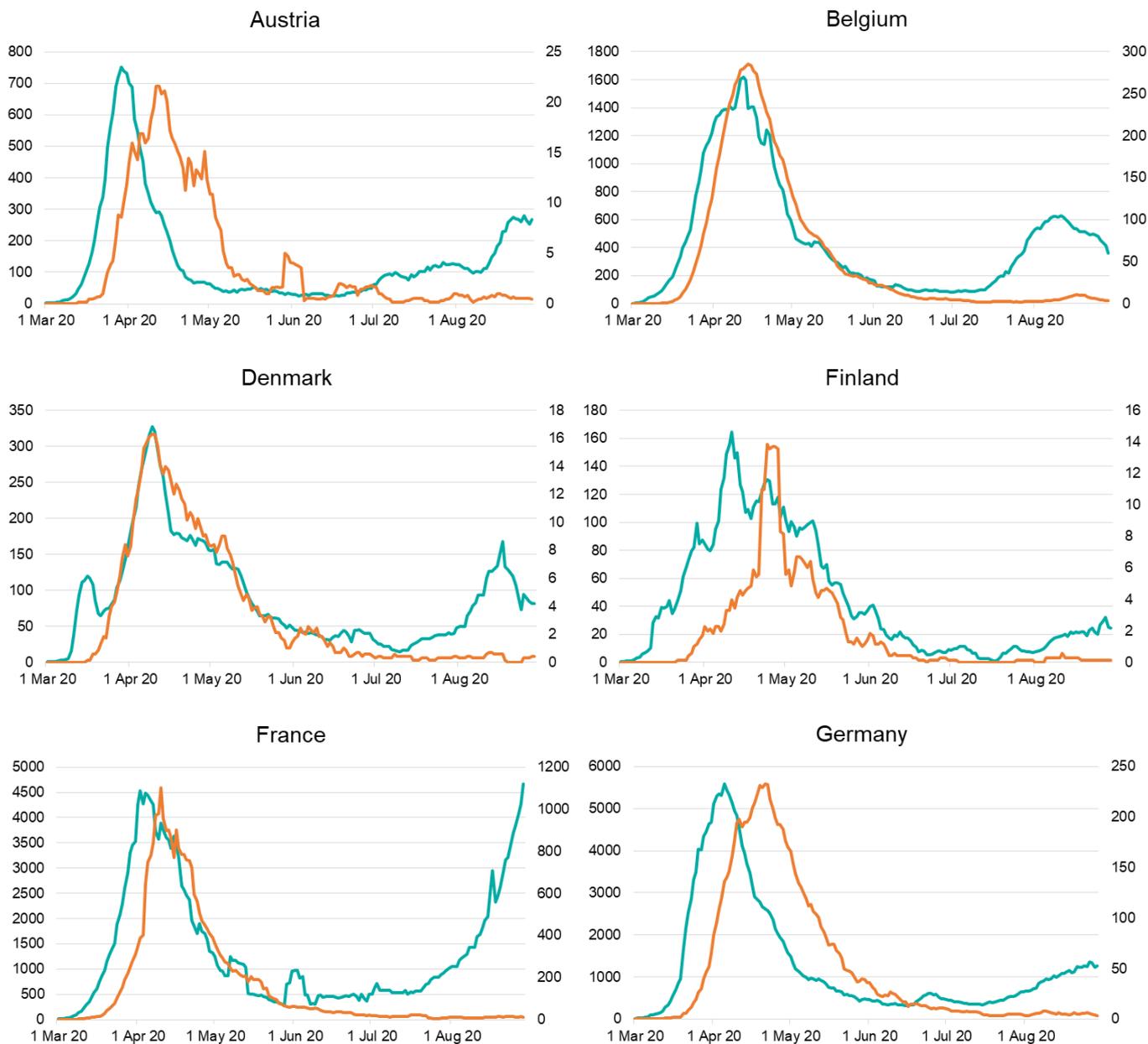
SOURCES: OURWORLDINDATA.ORG, BELL POTTER

# Remarkable decline in deaths seen

## Despite a rise in cases, remarkable death decline seen

Despite a sharp rise in cases and case positivity rates across many Western European nations, it has not led to a commensurate increase in deaths. This is even after considering a lag between cases and deaths, and can be clearly seen in the following charts, where a clear delinking between cases and deaths is seen.

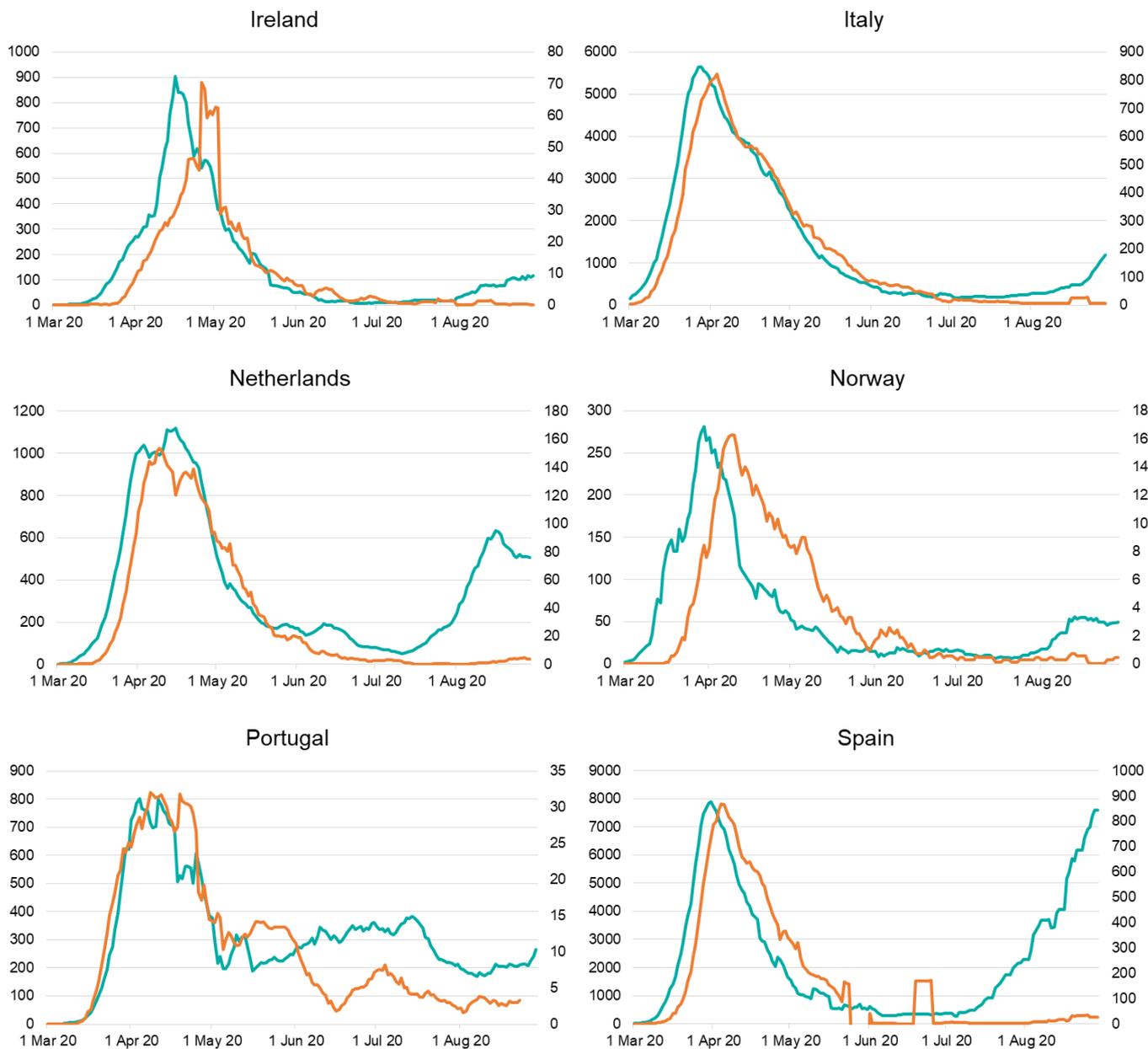
**Figure 4: 7-day average cases (GREEN LINE, LHS) vs 7-day average deaths (ORANGE LINE, RHS)**



SOURCES: OURWORLDINDATA.ORG, BELL POTTER

# Remarkable decline in deaths seen

**Figure 5: 7-day average cases (GREEN LINE, LHS) vs 7-day average deaths (ORANGE LINE, RHS)**

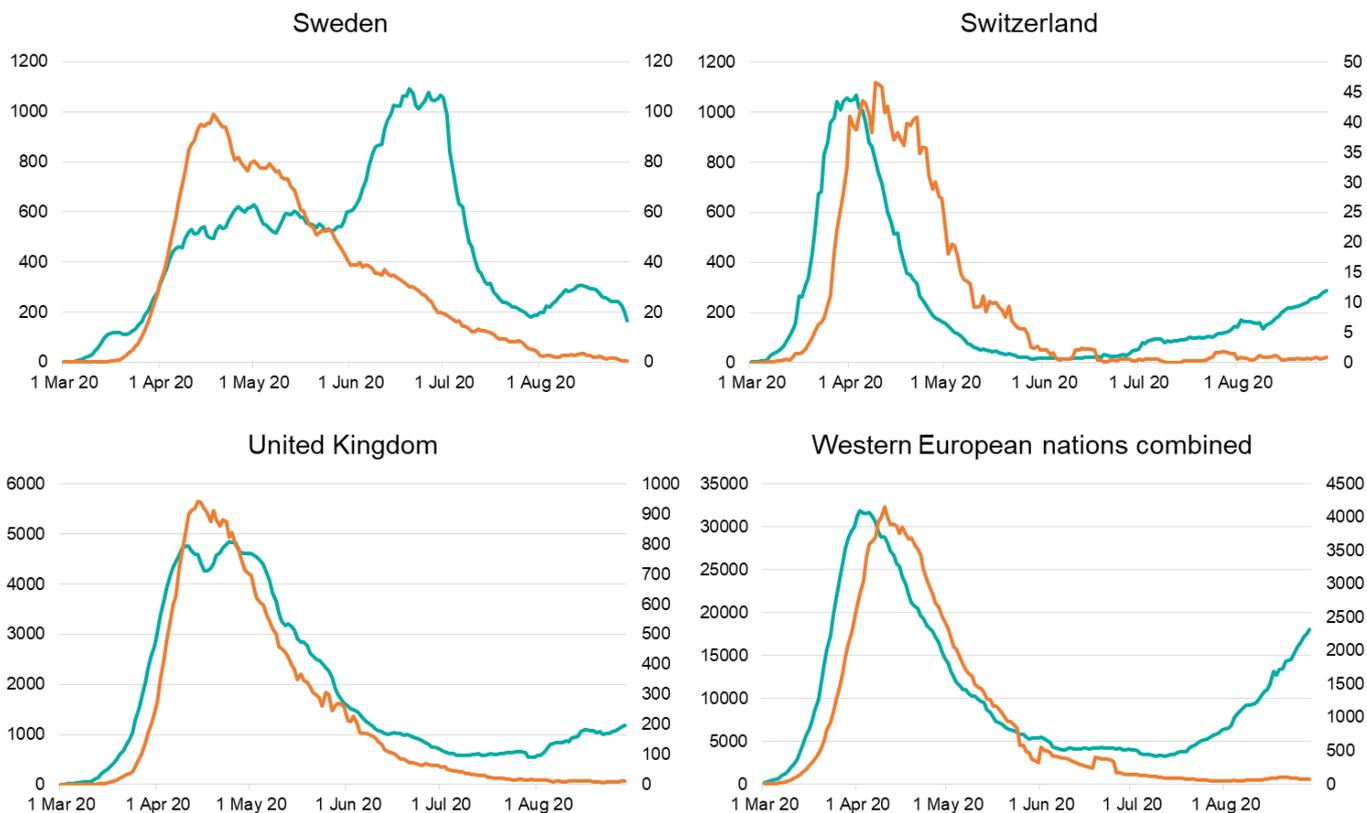


\*Spain has on occasion materially adjusted deaths downwards (in May) and upwards (in June). For the sake of visual clarity the axis remains lower bound at 0.

SOURCES: OURWORLDINDATA.ORG, BELL POTTER

# Remarkable decline in deaths seen

Figure 6: 7-day average cases (GREEN LINE, LHS) vs 7-day average deaths (ORANGE LINE, RHS)



SOURCES: OURWORLDINDATA.ORG, BELL POTTER

# Mitigation measures met with resistance

## Case spike does not lead to new lockdowns

Despite the sharp rise in cases across most Western European nations, it has **not** led to the re-introduction of broad lockdown measures. Some nations like Italy have opted to re-implement some lighter restrictions, such as the closure of nightclubs.

## Freedom over fear—more people revolt across Europe

The decision to not re-implement lockdowns comes as more and more people across Europe have become angered by draconian measures, particularly as they better understand the health risks, which as evidenced by deaths remaining low, are benign for most healthy individuals. With community push back rising sharply across the continent, it would be fair to say that most of Western Europe is now in Stage 3 of our three phases of community sentiment, as originally outlined in our 13 August Coronavirus analysis & outlook report.

Figure 7: Spain freedom protest



SOURCES: BBC

Figure 8: Spain freedom protest

Figure 9: Spain freedom protest

Figure 10: German freedom protest



SOURCES: ASSOCIATED PRESS

SOURCES: EPA

Figure 11: German freedom protest

Figure 12: German freedom protest



SOURCE: CNN

SOURCE: CNN

SOURCE: CNN

# Mitigation measures met with resistance

Figure 13: Ireland freedom protest



SOURCES: IRISHPOST

Figure 14: Ireland freedom protest



SOURCES: IRISH MIRROR

Figure 15: Ireland freedom protest



SOURCES: IRISH MIRROR

Figure 16: UK freedom protest march



SOURCES: RUPTLY

Figure 17: UK freedom protest



SOURCE: CNN

Figure 18: UK freedom protest



SOURCES: RUPTLY

# Herd immunity is likely closer than thought

## Typical herd immunity assumptions are likely wrong

While many would question the idea that herd immunity thresholds may have already been reached in many worldwide regions, this is based on incorrect assumptions. Conventional wisdom suggests that ~60-70% of a population must become infected in order for herd immunity to be built against a relatively easily spread virus.

Though this assumes a homogenous (even) spread and susceptibility amongst populations (like for a vaccine roll-out), but this is **not** how **natural** herd immunity develops. Herd immunity instead develops much faster under a natural rollout, given that a virus spreads **heterogeneously** (unevenly) in a natural environment.

## Heterogeneous spread is the key

In a natural environment, certain individuals are more prone to catching the virus than others. This could be because they are more likely to be exposed to the virus. For instance, young people who often attend bars, nightclubs and other large gatherings would generally be considered as more likely to be exposed to the virus. So too are hospital workers like doctors and nurses, who are in constant contact with infected individuals.

As later explored, studies also show COVID-19 related T cell immune responses in large portions of the uninfected population. There is thus a likely significant variation in individual susceptibility to the virus, and many may already be relatively immune.

Once the more susceptible individuals catch the virus and build immunity, the spread of the virus will decrease, as it will have a harder time spreading to others that are less susceptible or less exposed. The lockdowns illustrate this point well, with spread occurring amongst high exposure individuals (like nurses), but declining once it has finished infecting most of this high risk population.

In a population without lockdowns, spread would occur quickly amongst younger populations that have greater social exposure. Once they recover and build immunity, the ability for the virus to spread amongst these groups would fall, and so too would the virus' ability to find new hosts that easily catch and transmit the virus, reducing its pace of spread. Given enhanced hygiene and social distancing measures, particularly amongst certain groups such as the elderly, the extent of the heterogeneous spread of the virus is amplified, likely reducing the virus' ease of transmission and the HIT.

## Studies suggests herd immunity could be as low as 10%

Several studies have been conducted on the impact of COVID-19's heterogeneous spread, and the manner in which it can lower the herd immunity threshold (HIT).

A study published in May 2020 and led by **Professor Gomes of the University of Strathclyde Glasgow**, suggests that the individual variation in susceptibility or exposure to COVID-19, means that the HIT may potentially be below 20%.

Another study published in July, and led by **Dr Ricardo Aguas of the University of Oxford**, noted "our inference results in herd immunity thresholds around 10-20%, considerably lower than the minimum coverage needed to interrupt transmission by random vaccination .... These findings have profound consequences for the governance of the current pandemic given that some populations may be close to achieving herd immunity despite being under more or less strict social distancing measures."

# Herd immunity is likely closer than thought

## Herd immunity models supported by T cell immunity

The lower HIT models are finding support from other studies which suggest that there is already an enormous amount of natural immunity to COVID-19. While most of the discussion concerning immunity has revolved around antibody resistance, this is again missing the bigger picture. The ability for the body to fight off a given virus extends far beyond antibody protection, and includes various other elements. One of these elements include T cell responses.

T cells are a type of white blood cell that form an important part of the immune response, and importantly, generally provide long-lasting protection. It is important to note that there are many different coronavirus that exist. SARS-CoV-2 (COVID-19) is what people are currently focused on, and is causing widespread fear and restrictions to be placed on individuals across the globe. SARS-CoV (SARS), and MERS-CoV (MERS), were also coronaviruses. Additionally, coronaviruses are also responsible for some common colds.

A growing number of studies now show that many individuals already have pre-existing cross-reactive T cell memory to COVID-19. This suggests a substantial number of the population already has some form of protection against COVID-19, which is likely a result of prior exposure to common cold coronaviruses.

An August 2020 study published in Science magazine led by Jose Mateus from the Center for Infectious Disease and Vaccine Research suggests pre-existing immune responses to COVID-19 exist in 20-50% of unexposed individuals. This was suggested as a cause for the extensive heterogeneity observed with COVID-19.

A July 2020 study led by Nina Le Bert and Anthony T. Tan, both from the Emerging Infectious Diseases Program at Duke-NUS Medical School in Singapore, showed that those infected with SARS, possessed T cells that showed robust cross-reactivity to COVID-19, despite it being 17-years since the outbreak of SARS. The study also detected COVID-19 related T cells in 51% of individuals with no history of SARS or COVID-19, or contact with individuals who did.

A June 2020 study currently in preprint, led by Annika Nelde of University Hospital Tübingen in Germany, showed cross reactive T cell responses in 81% of unexposed individuals.

A May 2020 study led by Alba Grifoni of the Center for Infections Disease and Vaccine Research, showed cross reactive T cell responses in ~40-60% of unexposed individuals, suggesting cross-reactive T cell recognition between common cold coronaviruses and COVID-19.

# Herd immunity is likely closer than thought

## T cells may help explain varying outbreak severities

The different T cell responses across different ethnic and age groups, may help explain why certain regions and age groups have fared better or worse than others. For instance, Asian and the Middle Eastern countries have often seen lower mortality rates and deaths per million people than Europe and the Americas. While officially thought to not be as widespread as COVID-19, perhaps this is a result of higher past exposure to SARS and MERS, which are thought to have been predominately located in Asia and the Middle East respectively.

T cell responses may also explain why older age groups, and particularly those in aged care settings, are particularly vulnerable to the virus. This is because ones immune system, and its T cell response, weakens in older individuals. Those in aged care settings are likely to be particularly vulnerable, given their more fragile average state, and likely weakened immune systems, which make them vulnerable to not just COVID-19, but a whole host of illnesses that are otherwise mild for the general population.

# Herd immunity is likely closer than thought

## Studies supported by real-world incubation environments

It is one thing for studies to suggest and support a given hypothesis, but it is another for them to be seen in a real world environment. To recap these studies, key points that they show are 1) herd immunity thresholds for COVID-19 may be achieved much more easily than conventional vaccination theory suggests, and potentially occur after ~10-20% of a population becomes infected, and 2) this hypothesis is supported by studies which show up to 80% of a population may already have cross-reactive T cell responses to COVID-19.

Importantly, we have data on real world incubation type environments which allow us to test such a hypothesis. **These environments occurred on cruise ships. Two key examples include the Diamond Princess in Japan, and Ruby Princess in Sydney.**

**Despite being confined to an extremely dense and crowded environment, and an environment that is perhaps the most likely to result in rapid spread and herd immunity, nowhere near all of the passengers and crew became infected.**

On the Diamond Princess, only 19.2% of passengers and crew tested positive, and almost half of these positive tests were asymptomatic cases. The number of crew testing positive was lower at 13.9%, while the number of passengers testing positive was higher at 21.3%. Both of these numbers suggest widespread immunity was present.

On the Ruby Princess, a total of 29.7% of Australian passengers and crew recorded a positive test. Again, the number of crew testing positive was lower, at 16.6%, while the number of Australian passengers testing positive was higher, at 39.4%. These numbers again suggest widespread immunity was present.

Some further points to consider include:

- The difference in case positivity rates amongst passengers versus crew is likely due to the older average age of passengers on cruise ships. Older passengers are likely to have a weakened immune response versus the younger crew members. Crew members are likely to have also built strong immune responses as a result of being regularly exposed to virus' on cruise ships.
- **This hypothesis is supported by official age data from the Diamond Princess, which shows a median crew age of 36 versus a median passenger age of 69.**
- The difference in case positivity rates between both passengers and crew of the Diamond Princess versus the Ruby Princess suggests potential variation in immunity between different ethnic groups. The Diamond Princess was a round-trip from Yokohama, Japan, with Japanese passengers representing the largest cohort, and a predominately Asian crew on board. The Ruby Princess was instead a round-trip from Sydney, Australia, and consisted primarily of Australian passengers.

These statistics are tabulated from official data from Japan's Ministry of Health, Labour and Welfare, a study conducted by the CDC entitled "Public Health Responses to COVID-19 Outbreaks on Cruise Ships—Worldwide, February—March 2020", and the Special Commission of the Inquiry into the Ruby Princess conducted in NSW.

# Is Western Europe seeing herd immunity?

## Working out the real number of infections is critical

Given that studies have shown a potential 10%-20% HIT, other studies have shown widespread cross-reactive T cell memory, and real-world incubation environments have shown case positivity rates of between ~13.9%-39.4%, the key question to now determine, is what are the number of infections present in nations. Once we determine this figure, we can extrapolate the infection rate as a percentage of the overall population, and determine whether a HIT may have been reached.

## Official positive cases not a good yardstick

Whilst one may assume the number of positive cases is a good yardstick, it is not. This is because of the large number of asymptomatic and minor infections that are unlikely to be tested, with true cases likely many multiples of confirmed cases. This is seen in regions that have conducted seroprevalence studies (which involves studying blood samples from a given population to ascertain the number of people that have built antibodies and have thus been exposed to COVID-19). Seroprevalence studies conducted by the CDC in some regions of the USA have at times indicated actual positive case numbers are more than 20x greater than the recorded number.

A further indication of the massive undercounting of cases includes the extremely high CFRs reported by many nations, including some that have been close to 20% in Western Europe. We now know that such rates were completely inaccurate. This is shown not only by the current CFRs across Europe (as later detailed), but also through the cruise ship example. Despite 336 crew members being infected across the Diamond and Ruby Princess, no deaths were recorded. Of the 1230 passengers that tested positive, 34 deaths were recorded, resulting in a CFR of 2.8%, and this is amongst a cohort that had a median age of 69 on the Diamond Princess, and a likely similar age distribution on the Ruby Princess. Given the extremely high skew in deaths towards older patients (with younger patients having extremely low mortality rates), and the likely less effective overall treatment protocols at this early stage of the outbreak, we know for a fact that the IFR must be significantly below this 2.8% figure.

## Seroprevalence studies also likely to undercount cases

**Seroprevalence studies are also likely to undercount the true level of infection as many asymptomatic to mild cases do not show detectable antibodies, and many quickly lose their antibodies.** This is seen in the CDC's studies, with antibodies declining over time in some areas. While this raised concern about the long-term immunity to COVID-19, this argument failed to analyse the T cell response.

## Using deaths as the base likely the best method

The likely best method to try and extrapolate the real number of cases is to use the number of deaths as the base. This is likely to be a fairly accurate indicator given the very liberal definitions of COVID-19 deaths used. Namely that probable or suspected deaths are generally labelled as COVID-19 deaths, as well as deaths **with** COVID-19, as opposed to being **from** COVID-19. It is thus highly likely that the number of deaths **from** COVID-19, is over, as opposed to underinflated. **For instance, amongst other comorbidities, CDC data shows that the USA has recorded ~5k poisonings/suicides/unintentional injuries, ~14k sepsis, ~14k renal failures and ~20k cardiac arrests as COVID-19 deaths.**

Assuming that the death number is thus comprehensive, in order to determine the number of infections, we need to determine the IFR. The IFR uses the total number of **estimated infections** as the denominator, whereas the CFR uses the number of **confirmed cases**.

# Is Western Europe seeing herd immunity?

If we look at the current CFRs across Europe, we see that the **median has now fallen to 0.58%**. This has been calculated by taking 7-day average cases, and 7-day average deaths, and then lagging the deaths by 14 days to take into account the time between symptom onset and average fatality.

**Figure 19: Western Europe 7-day average CFR rate on 29 August 2020**

	CFR
Austria	0.27%
Belgium	0.72%
Denmark	0.32%
Finland	0.68%
France	0.65%
Germany	0.29%
Ireland	0.19%
Italy	1.47%
Netherlands	0.58%
Norway	0.00%
Portugal	1.61%
Spain	0.61%
Sweden	0.14%
Switzerland	0.43%
United Kingdom	1.10%
<b>Average</b>	<b>0.60%</b>
<b>Median</b>	<b>0.58%</b>

SOURCES: OURWORLDINDATA.ORG, BELL POTTER

Again, the CFR rate is **likely to overestimate the real mortality rate**, as large numbers of cases are undiagnosed, with many individuals unaware that they have been infected. **Though it does show that the real IFR should now be no higher than 0.58%.**

The CDC currently estimates that the IFR is between 0.5% and 0.8%, with a current best estimate of 0.65%. The CDC assumes a 40% asymptomatic transmission rate in its best estimate. **This best estimate was also completed in July, when CFRs were far higher than they are now. Indeed, Western Europe's median CFR is now below the CDC's best estimate.**

Other modelers of the pandemic, such as Youyang Gu, an independent data scientist and creator of the website *covid19-predictions*, estimates that since August 2020, **the IFR in most of the US and Europe is between 0.2-0.4%. With CFRs already falling to 0.58% in Western Europe, it would appear that IFRs could be at the low end or even below this range (as evidenced by some Western European CFRs already being below this estimate).**

When trying to estimate the total number of infections, it is important to note that IFRs may have been higher at the beginning of the outbreak, and have improved since. **This comes as treatment methods have likely improved (i.e. less use of ventilators), and as vulnerable people may be self-isolating. The end of lockdown restrictions also means that heterogenic transmission can occur amongst young individuals who have a very low risk of mortality.** Places such as Western Europe and New York, which had early outbreaks and strict lockdowns, are thus likely to have a higher IFR than areas with recent outbreaks, like Texas.

# Is Western Europe seeing herd immunity?

Given that we can not definitively say what the IFR has been for Western Europe, we will examine a range of scenarios. While it is possible that the current IFR may be at 0.2% or below, we note that for some Western Europe nations who saw significant deaths early in the pandemic, their IFRs may be materially higher. At rates from 0.2% to 0.7% (above the CDC estimate, and well above Western Europe's actual current CFR), we see the following:

**Figure 20: Western Europe estimated infections as a percentage of population at 29 August**

	Total Deaths - 29 Aug	Estimated infections - 0.2% IFR	Estimated infections - 0.3% IFR	Estimated infections - 0.4% IFR	Estimated infections - 0.5% IFR	Estimated infections - 0.6% IFR	Estimated infections - 0.7% IFR	Population	% of pop. 0.2% IFR	% of pop. 0.3% IFR	% of pop. 0.4% IFR	% of pop. 0.5% IFR	% of pop. 0.6% IFR	% of pop. 0.7% IFR
Austria	733	366,500	244,333	183,250	146,600	122,167	104,714	8,901,100	4.12%	2.74%	2.06%	1.65%	1.37%	1.18%
Belgium	9,889	4,944,500	3,296,333	2,472,250	1,977,800	1,648,167	1,412,714	11,549,900	42.81%	28.54%	21.40%	17.12%	14.27%	12.23%
Denmark	624	312,000	208,000	156,000	124,800	104,000	89,143	5,822,800	5.36%	3.57%	2.68%	2.14%	1.79%	1.53%
Finland	335	167,500	111,667	83,750	67,000	55,833	47,857	5,525,300	3.03%	2.02%	1.52%	1.21%	1.01%	0.87%
France	30,596	15,298,000	10,198,667	7,649,000	6,119,200	5,099,333	4,370,857	67,098,800	22.80%	15.20%	11.40%	9.12%	7.60%	6.51%
Germany	9,289	4,644,500	3,096,333	2,322,250	1,857,800	1,548,167	1,327,000	83,166,700	5.58%	3.72%	2.79%	2.23%	1.86%	1.60%
Ireland	1,777	888,500	592,333	444,250	355,400	296,167	253,857	4,963,800	17.90%	11.93%	8.95%	7.16%	5.97%	5.11%
Italy	35,472	17,736,000	11,824,000	8,868,000	7,094,400	5,912,000	5,067,429	60,244,600	29.44%	19.63%	14.72%	11.78%	9.81%	8.41%
Netherlands	6,211	3,105,500	2,070,333	1,552,750	1,242,200	1,035,167	887,286	17,407,600	17.84%	11.89%	8.92%	7.14%	5.95%	5.10%
Norway	264	132,000	88,000	66,000	52,800	44,000	37,714	5,367,600	2.46%	1.64%	1.23%	0.98%	0.82%	0.70%
Portugal	1,815	907,500	605,000	453,750	363,000	302,500	259,286	10,295,900	8.81%	5.88%	4.41%	3.53%	2.94%	2.52%
Spain	29,011	14,505,500	9,670,333	7,252,750	5,802,200	4,835,167	4,144,429	47,330,000	30.65%	20.43%	15.32%	12.26%	10.22%	8.76%
Sweden	5,821	2,910,500	1,940,333	1,455,250	1,164,200	970,167	831,571	10,327,600	28.18%	18.79%	14.09%	11.27%	9.39%	8.05%
Switzerland	1,724	862,000	574,667	431,000	344,800	287,333	246,286	8,606,000	10.02%	6.68%	5.01%	4.01%	3.34%	2.86%
UK	41,486	20,743,000	13,828,667	10,371,500	8,297,200	6,914,333	5,926,571	67,025,500	30.95%	20.63%	15.47%	12.38%	10.32%	8.84%

SOURCES: OURWORLDINDATA.ORG, EUROSTAT, BELL POTTER

## Sweden appears likely to have achieved herd immunity

Sweden has achieved a sharp reduction in cases and case positivity rates since 1 July, far in advance of the next closest nation in Portugal, while most others have recorded sharp increases in both metrics over this time period. Given that no broad lockdowns were ever in place, this would suggest Sweden has hit its HIT. At an IFR of 0.5% or below, Sweden has had infections of at least 10% of its population.

This HIT would correlate with the published studies earlier mentioned. Given that Sweden did not lockdown and allowed controlled spread, it is likely to have seen a relatively significant spread of cases across the nation, further bolstering its chances of reaching herd immunity. **Sweden critically appears to have hit its HIT some time ago, and now appears close to achieving a high level of herd immunity as cases and deaths continue to both trend towards zero.**

## Portugal & United Kingdom appear to be around HIT

Portugal has also recorded a material decline in cases and case positivity rates since 1 July. While Portugal has not achieved a 10% population infection rate across any of the estimated IFR rates, Portugal was noted in the University of Oxford study as likely having a HIT below 10%. The movement in Portugal's numbers since July adds weight to this conclusion.

With the UK also recording a decline in its case positivity rate since 1 July, as a well as a strong reduction in deaths, it appears as if the nation may have hit its HIT. This comes on the back of the UK reaching a 10% population infection rate at all IFRs of 0.6% or below. The assumption of the UK reaching herd immunity is strengthened by what appears to be a relatively broad spread of cases across the nation, indicating that most regions may have built a good level of immunity.

# Is Western Europe seeing herd immunity?

## Belgium could be next to reach HIT

While Belgium has achieved an infection rate of at least 10% up to an IFR of 0.7%, the country has seen an increase in both cases and case positivity rates since 1 July. This suggests that its IFR may be above 0.7% and/or that its HIT is significantly higher than other nations.

Interestingly, the country has seen improved trends over the past 2 weeks, with both cases **and** case positivity rates falling. This has seen cases fall from a peak 7-day average of 631 on 11 August, to 363 on 29 August, and positivity rates fall from 3.1% to 2.4%. A continuation of this trend would suggest that Belgium may have hit its HIT.

It is also noted that Belgium's recent decline may also be being influenced by the introduction of new social distancing measures, which were announced in late July.

## France, Italy and Spain may have higher IFR and/or HIT

France, Italy and Spain, who have all recorded 10% infection thresholds at a range of IFR rates, have still seen a rise in cases and case positivity rates (with the exception of Spain, as Our World in Data does not publish the number of Spanish tests conducted in its dataset) since 1 July. This suggests that these nations, who all suffered material deaths early on in the pandemic, may have IFRs at the higher end of the range.

It also suggests that their HITs may have overshot levels seen in other Western European nations, as a result of very high levels of spread early on in the pandemic, when nations were first coming to terms with the virus. This may have meant the heterogeneity of spread was lower and more homogenous as vulnerable people were unaware of the virus. Backing a potential HIT overshoot is that cases in these nations appear to have generally been clustered in certain areas. For instance, Italy's northern region, including tourist hotspots such as Milan, were hardest hit, and likely had material spread occurring for months before it was noticed in March.

Regions with fewer tourists, such as the south of Italy, have seen lower infections. These lower infections were likely reinforced by strict lockdown measures, leaving significant parts of Italy potentially open to infection before broad herd immunity is reached. It appears as if a similar phenomenon is occurring in both France and Spain, who are two other widely visited tourist destinations, and appear to have seen certain regions hit harder than others.

## But lower deaths suggest solid immunity has been achieved

Despite this, deaths continue to remain far lower than their earlier peaks in each of France, Italy and Spain. This suggests the increase in case numbers versus July is relatively tame, and is mainly occurring amongst low risk groups. It also suggests that a decent level of immunity has built in each of these countries, as the increase in cases since July is likely to be extremely far below the actual case levels from earlier in the year. This is discussed further in the next section.

# Is Western Europe seeing herd immunity?

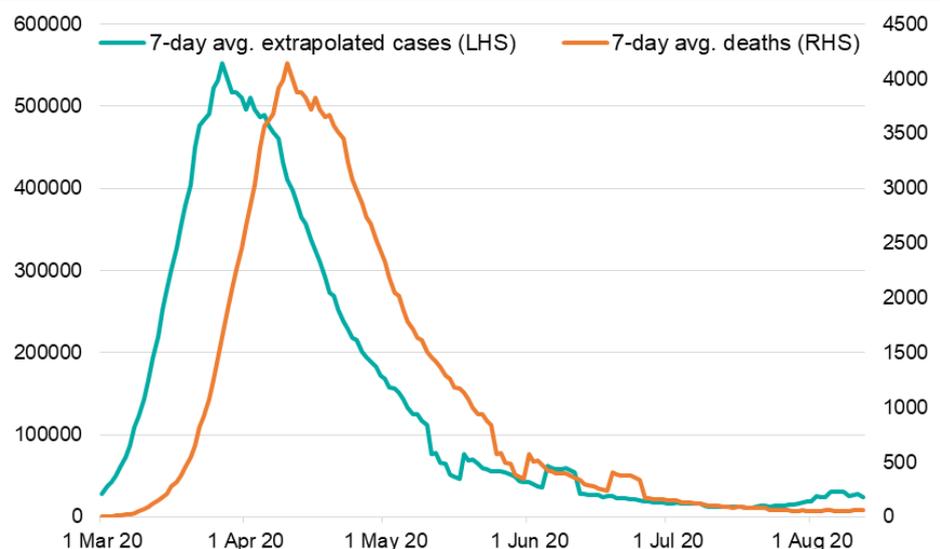
## But deaths suggests HIT may have broadly been achieved

While the above analysis seems like a set of reasonable assumptions, focusing too greatly on the change in confirmed cases is likely to be causing too pessimistic a view on whether HITs have been hit.

This focus on confirmed cases suggests that the current 2nd wave is rivalling the 1st wave in many Western European nations. Though this is simply not accurate. We know this because of the extremely low number of deaths being recorded versus the first outbreak. As previously detailed, case numbers during the larger March, April and May death tolls were likely to be enormously higher than what were confirmed.

If we were to extrapolate Western Europe's case numbers based on the number of deaths recorded (like in Figure 18) the combined historical graph for all Western European countries included in our analysis, would instead look like this:

**Figure 21: Western Europe extrapolated cases vs actual deaths**



SOURCES: OURWORLDINDATA.ORG, BELL POTTER

This graph assumes an IFR of 0.75% (above the CDC's 0.65% estimate and well above Western Europe's current CFR) up to 31 May, before declining by 0.05% each day to reach 0.30% by 29 August 2020. **While the exact IFR rates can be subject to debate, this chart is likely to provide a far more accurate representation of Western Europe's outbreak versus official numbers, and suggests that the 7-day average daily cases may have peaked well above 500,000 per day in March. This likely explains why Western European COVID-19 deaths are so much lower now despite a second "wave" of new cases - the wave is barely a ripple.**

This would indicate cases spreading in some areas that did not reach herd immunity, but at a far lower rate than the original outbreak. This is likely a result of an additional level of immunity now existing versus that during the first wave. Better hygiene and increased social distancing may also be playing a part, particularly in areas where immunity may be lower. Note there are now no lockdowns in Western Europe so this **cannot** be a reason for the reduced transmission. Nordic nations that have seen low deaths rates also have some of the lowest mask usage in the world, so this would suggest that the use of masks in some nations is not a critical factor.

# What about areas with low transmission?

## Areas with low transmission in Europe still have low deaths

One further point to note is that areas in Western Europe which have lower death tolls, continue to not see a flare up in deaths. This may indicate several things, all of which are positive:

- Older and at-risk individuals are **choosing to self-isolate (no Western European countries are under forced stay-at-home lockdowns)** and are doing so effectively;
  - **This will add heterogeneity and allow the virus to spread across younger and less at risk individuals, reducing the HIT, protecting the vulnerable, and drastically lowering the CFR.**
  - This is a major flaw in the lockdown strategy, in that it reduces heterogeneity and forces all people to adopt the same measures. This likely makes it harder to hit the HIT, places populations in long-term encampment, and still puts vulnerable people at risk of eventual transmission.
    - This is being seen very clearly in regions like Victoria in Australia, **where lockdowns are preventing spread amongst healthy individuals, and thus the build-up of immunity and heterogenic spread, while still failing to protect the most vulnerable groups.**
- Continued case suppression and low death rates in some regions, are likely being further aided by an increased focus on hygiene, and general social distancing, meaning that even regions with relatively low spreads (such as several Nordic nations), are able to continue seeing a controlled spread and low numbers of deaths.
  - Face masks are likely not a required input, as Nordic nations have some of the lowest mask wearing rates in the world.
  - This all shows that **aggressive lockdowns are NOT a necessary input**, and that the **virus can be managed without them. Indeed NO lockdowns are ESSENTIAL to building herd immunity and returning to normal. Regions that continue to implement lockdowns appear to be doing so out of fear, as opposed to any sound scientific basis.**
- Treatment protocols may have improved; and
- The virus may simply be weakening and becoming less of an aggressive strain.

Despite each of these scenarios presenting benefits and reasons for significant optimism, regions that have not reached herd immunity remain exposed to the potential for future aggressive flare-ups in transmission well beyond current levels. Risks thus remain in such areas of a material increase in deaths. **These risks may become more prominent as Western Europe moves out of summer and into autumn and winter.**

# Is the USA seeing herd immunity?

## Many regions in USA likely reached or nearing HIT

The same phenomenon underpinning our Western European analysis is playing out in the USA, whereby regions which have achieved a ~10-20% level of infections are seeing new cases significantly decline. This occurred earlier on in states like New York, and more recently in states including Texas, Florida and Arizona. As active cases decline, the death rate will be expected to soon follow.

The outcomes seen in states like Texas, Florida and Arizona are important as these states did not implement the same aggressive lockdown measures as states like New York, yet have likely achieved the same outcome—herd immunity. Assuming the latter six states in the table below have an IFR of between 0.2-0.4%, suggests the potentially key 10-20% infection level has been reached. With each of these states recording declines in cases and hospitalisations, this provides evidence that a HIT has been reached. It also provides evidence of the futility of lockdowns and the importance of adopting sustainable measures that allow for gradual transmission in a manner that does not overload hospital systems, while still allowing for relative normality. This allows heterogeneity (reducing the HIT), lessens the broader cost to mental health as well as the health impacts of poverty through job losses caused by lockdowns.

Places like New York and New Jersey, which were the first to have material outbreaks, likely suffered from a far higher fatality rate versus states that have had more recent outbreaks. Exact reasons for this are unclear, but reasons could include better patient treatment (i.e. ventilators may have been used too aggressively earlier on in the outbreak). Some states, including New York, also banned treatments such as hydroxychloroquine for outpatient use, but it remains available in many other states.

Given that New York, New Jersey and Massachusetts likely hit HITs in April, their total number of infected is now likely to be materially above the 10-20% HIT. This notes that case transmission doesn't stop once HIT is reached, but it instead begins to slow.

**Figure 22: Estimated percentage of population infected across US states at 30 August**

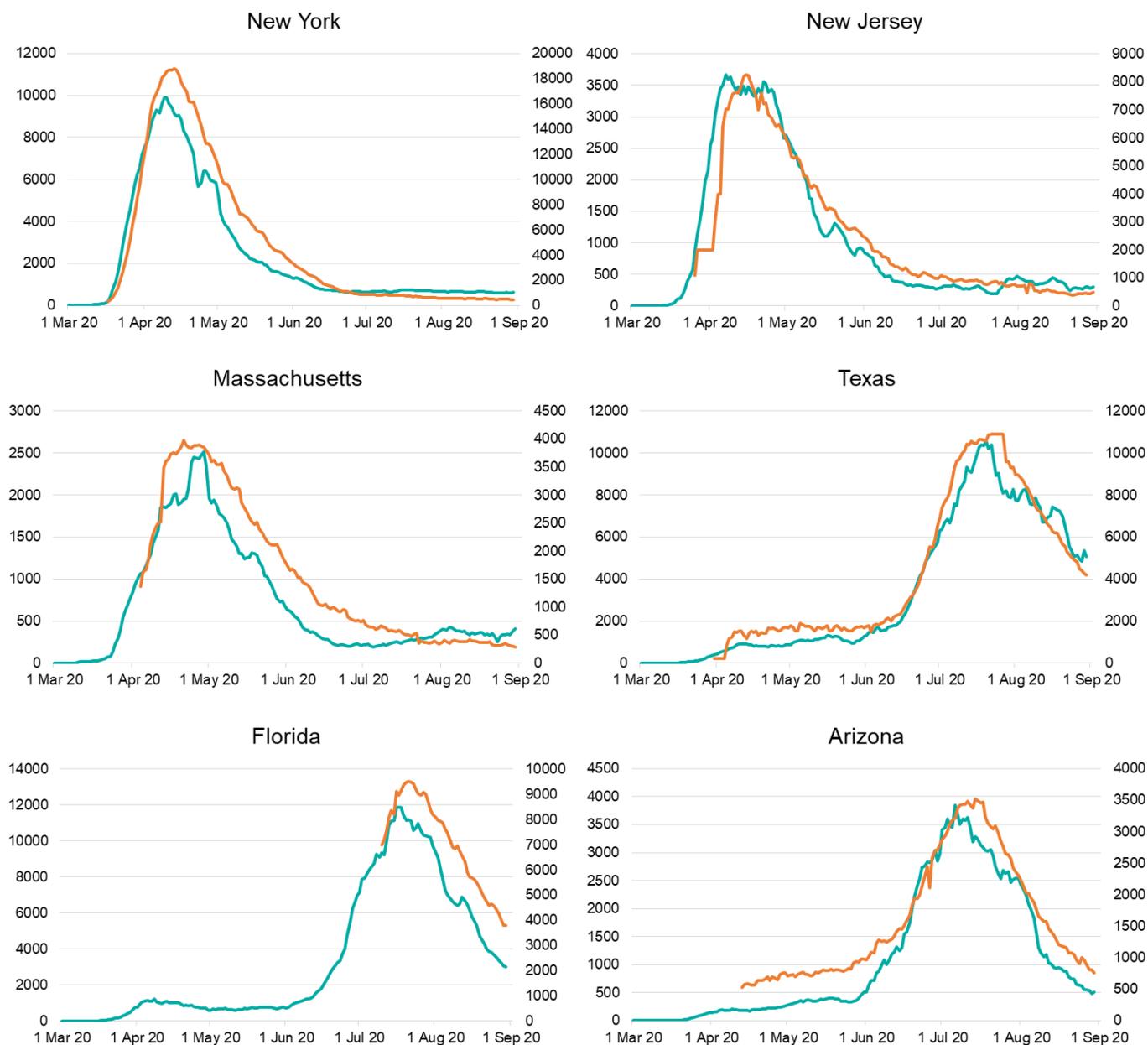
	New York	New Jersey	Massachusetts	Texas	Florida	Arizona	South Carolina	Georgia	California
Deaths	32,951	15,937	9,049	12,683	11,119	5,030	2,709	5,604	12,937
Infections at 0.2% IFR	16,475,500	7,968,500	4,524,500	6,341,500	5,559,500	2,515,000	1,354,500	2,802,000	6,468,500
Infections at 0.3% IFR	10,983,667	5,312,333	3,016,333	4,227,667	3,706,333	1,676,667	903,000	1,868,000	4,312,333
Infections at 0.4% IFR	8,237,750	3,984,250	2,262,250	3,170,750	2,779,750	1,257,500	677,250	1,401,000	3,234,250
Infections at 0.5% IFR	6,590,200	3,187,400	1,809,800	2,536,600	2,223,800	1,006,000	541,800	1,120,800	2,587,400
Infections at 0.6% IFR	5,491,833	2,656,167	1,508,167	2,113,833	1,853,167	838,333	451,500	934,000	2,156,167
Infections at 0.7% IFR	4,707,286	2,276,714	1,292,714	1,811,857	1,588,429	718,571	387,000	800,571	1,848,143
Infections at 0.8% IFR	4,118,875	1,992,125	1,131,125	1,585,375	1,389,875	628,750	338,625	700,500	1,617,125
Infections at 0.9% IFR	3,661,222	1,770,778	1,005,444	1,409,222	1,235,444	558,889	301,000	622,667	1,437,444
Infections at 1.0% IFR	3,295,100	1,593,700	904,900	1,268,300	1,111,900	503,000	270,900	560,400	1,293,700
Population	19,453,561	8,882,190	6,892,503	28,995,881	21,477,737	7,278,717	5,148,714	10,617,423	39,512,223
% of pop. at 0.2% IFR	84.7%	89.7%	65.6%	21.9%	25.9%	34.6%	26.3%	26.4%	16.4%
% of pop. at 0.3% IFR	56.5%	59.8%	43.8%	14.6%	17.3%	23.0%	17.5%	17.6%	10.9%
% of pop. at 0.4% IFR	42.3%	44.9%	32.8%	10.9%	12.9%	17.3%	13.2%	13.2%	8.2%
% of pop. at 0.5% IFR	33.9%	35.9%	26.3%	8.7%	10.4%	13.8%	10.5%	10.6%	6.5%
% of pop. at 0.6% IFR	28.2%	29.9%	21.9%	7.3%	8.6%	11.5%	8.8%	8.8%	5.5%
% of pop. at 0.7% IFR	24.2%	25.6%	18.8%	6.2%	7.4%	9.9%	7.5%	7.5%	4.7%
% of pop. at 0.8% IFR	21.2%	22.4%	16.4%	5.5%	6.5%	8.6%	6.6%	6.6%	4.1%
% of pop. at 0.9% IFR	18.8%	19.9%	14.6%	4.9%	5.8%	7.7%	5.8%	5.9%	3.6%
% of pop. at 1.0% IFR	16.9%	17.9%	13.1%	4.4%	5.2%	6.9%	5.3%	5.3%	3.3%

SOURCES: JHU CSSE COVID-19 DATA, US CENSUS BUREAU, BELL POTTER

# Is the USA seeing herd immunity?

With most of these states likely exceeding or approaching the ~10-20% threshold, cases have or are now declining. In addition to a decline in cases, the reduction in the virus' spread is being correlated with a reduction in hospitalisations. This shows that the decline in cases is not simply related to testing, but to solid evidence of a decline in community spread and increase in immunity. Hospitalisations are used instead of deaths as hospitalisation numbers are more up to date, whereas death recordings are lagged and thus take a longer time to see a drop-off. Noting that hospitalisations exceed 7-day average cases in some areas, this is likely a result of hospitalisations representing an accumulated build-up of COVID-19 cases, as well as the likely very significant number of COVID-19 cases that are never diagnosed and confirmed.

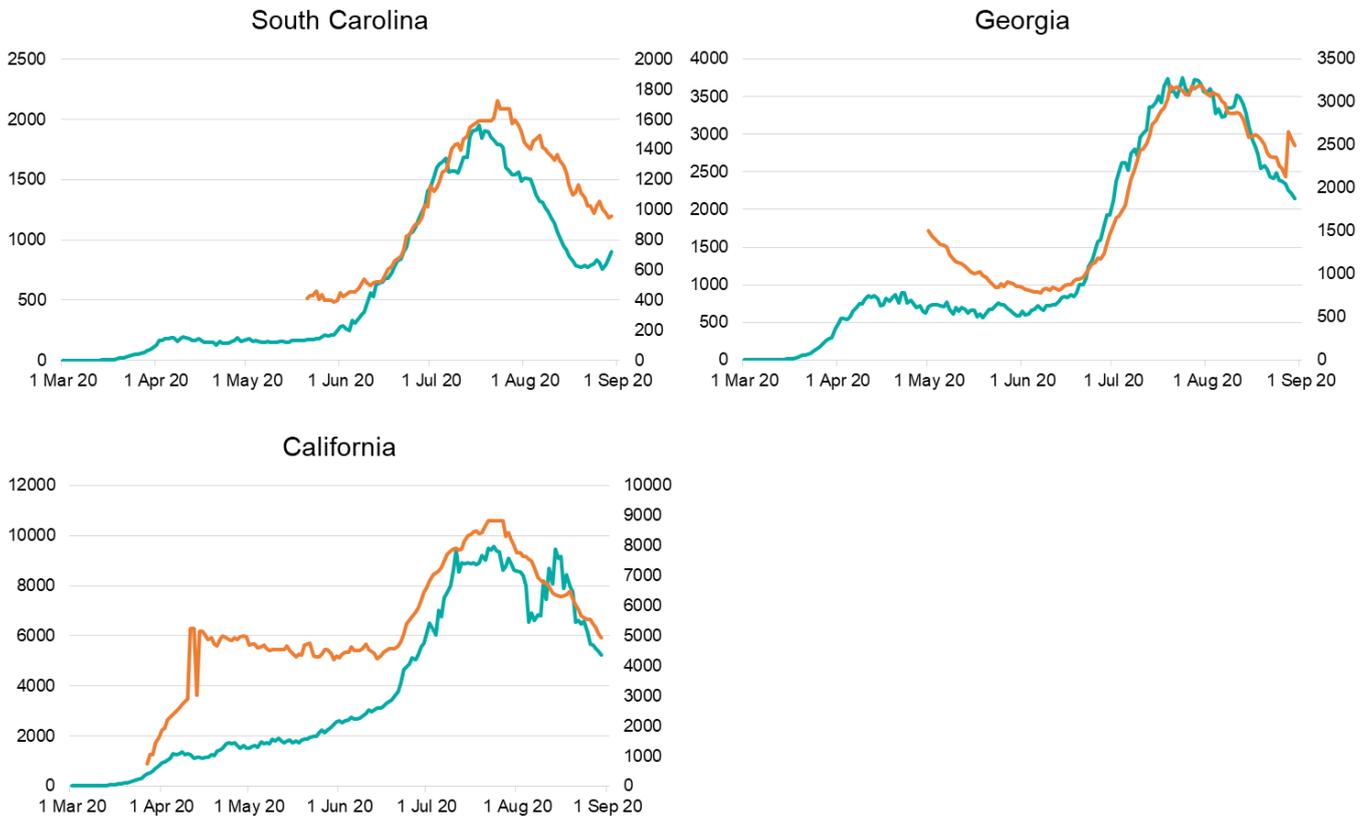
**Figure 23: 7-day average cases (GREEN LINE, LHS) vs COVID-19 hospitalisations (ORANGE LINE, RHS)**



SOURCES: JHU CSSE COVID-19 DATA, THE COVID TRACKING PROJECT, BELL POTTER

# Is the USA seeing herd immunity?

Figure 24: 7-day average cases (GREEN LINE, LHS) vs 7-day average hospitalisations (ORANGE LINE, RHS)



SOURCES: JHU CSSE COVID-19 DATA, THE COVID TRACKING PROJECT, BELL POTTER

# COVID likely to soon pass in Europe, USA

## Western Europe either in or fast approaching Stage 3

This analysis suggests that Western Europe is either in or fast approaching the final stage of community sentiment (as outlined in our 13 August 2020 Coronavirus analysis & outlook report), being a realisation of the inevitable and drive for normality. This is being evidenced by growing protest movements across the region, and a continued decline in deaths across most nations, which suggests that many countries have achieved a sense of herd immunity, or are at least fast approaching it.

Other nations, such as several Nordic nations, which have a much lower spread, so far appear to be getting on well with hygiene and very light overall measures (which include some of the lowest rates of mask use in the world), with such nations not yet seeing a spike in COVID-19 deaths, **despite being out of what were generally lighter lockdowns, for months.** Though such countries that have not developed a strong level of community immunity remain at risk of further outbreaks in the fall and winter.

## United States outbreak likely largely over by the election

The same analysis suggests that the United States is also fast approaching herd immunity. With many regions in the North East already likely having achieved herd immunity several months back, the South now also appears to have largely achieved the same. California also appears to have potentially reached its HIT. While some regions in the US are yet to experience major outbreaks (and thus may see one in the weeks or months ahead), much of the country, including the major states of California, Florida, Texas and New York, each appear to have hit HITs.

This is likely to have been hastened by widespread protests across the nation, which given the younger demographic involved, is likely to have resulted in widespread heterogeneity in case transmission, reducing the threshold required to achieve herd immunity.

**The end result of this is that the outbreak in the United States appears as if it may be largely over by the time of the US presidential election.**

## USA and Europe likely largely back to normal by year's end

With China already effectively being in normal mode for some months, we are likely to see the world's three major economies, being the USA, China and Europe, all up and running without the burden of lockdowns and other cumbersome restrictions by the end of the year.

**This would be a major positive catalyst to livelihoods around the globe, helping to restore economic growth and reduce the death, destruction, and depression associated with social isolation, increased poverty and unemployment.**

**Recommendation structure**

**Buy:** Expect >15% total return on a 12 month view. For stocks regarded as 'Speculative' a return of >30% is expected.

**Hold:** Expect total return between -5% and 15% on a 12 month view

**Sell:** Expect <-5% total return on a 12 month view

*Speculative Investments are either start-up enterprises with nil or only prospective operations or recently commenced operations with only forecast cash flows, or companies that have commenced operations or have been in operation for some time but have only forecast cash flows and/or a stressed balance sheet.*

*Such investments may carry an exceptionally high level of capital risk and volatility of returns.*

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