[2] COVID-19 infection and mortality tracking in the US and around the world

This section analyzes COVID infections and mortality reported to local, federal and intergovernmental agencies, and are heavily influenced by testing rates and differences in government reporting standards and capabilities. As we explain in Section 4, serology tests suggest that the true number of COVID infections may be much higher than the number of reported infections. However, trends in reported infections are still important to monitor, since they influence government policy and the behavior of citizens and companies.

Table of contents:
1. What’s new: US hotspots, UK variant, California ................................................................. 2
2. What’s new: Latin America, Scandinavia, Asia, US hospital capacity ........................................ 3
3. Summary of global and US infection/mortality trends .......................................................... 4
4. COVID at a glance: infections and mortality per mm, and the falling age of infected persons ........ 5
5. Infection, mortality and hospitalization snapshots ............................................................. 6
6. US hotspot infection, hospitalization and mortality tracking ............................................... 8
7. How lethal is COVID, and for whom? .................................................................................. 11
8. Country level infection, hospitalization and mortality trends ................................................. 12

Comments on infection data. Several countries show up with almost no COVID outbreak reported. In cases like New Zealand, Taiwan, Japan, Vietnam and South Korea, we interpret the lack of a material outbreak as possible based on the quality of data reporting and testing. Other countries which report low incidence of COVID include Nigeria, Kenya, Angola, DR Congo, Tanzania and Mozambique. As per various news reports, there’s a shortage of reliable data in many of these countries, and the lack of funds to carry out broad testing. On the other hand, while infections can be obscured, it’s harder to obscure a sharp rise in mortality; even when accounting for some under-reporting of deaths, Africa mortality rates are still much lower than expected. The few antibody surveys conducted in Africa reveal COVID prevalence that is similar to other European countries; in other words, COVID is spreading in Africa as it is elsewhere. The most likely explanation for lower relative mortality is age: Africa’s median age is 18, compared to 35 in North America and 42 in Europe. Since those over age 65 experience 80% of COVID mortality, age distributions are the most likely reason for lower African COVID mortality rates.

Additional supplementary materials are available upon request: COVID mortality distributions and probabilities by age bracket and US state, COVID mortality per mm vs Case Fatality Rates by country and US state, and COVID infections by age group by US state.

On data sources. We generally use infection and mortality data from Johns Hopkins, with any exceptions noted in chart sources. While JHU data usually match sources such as covidtracking.com and Worldometers, this is not always the case. Any large differences usually work themselves out over time; even so, such differences are a warning against over-extrapolating any short term trends seen in the data. There are also patterns in some countries in which tests and infections drop over the weekend, only to rise the following week. Other anomalies: countries and US states sometimes make large one-time additions or subtractions to infections or deaths data to reflect over- or underestimations made over the course of the entire pandemic. JHU and other data providers do not amortize such adjustments over time and simply reflect them on the day they are made; we do the same.

What’s new: US hotspots, new variants in Europe, spike in Manaus/Brazil

- US “Big Sky” state COVID wave rolled over in November. Hospitalizations now leveling out or declining in some bigger US states (CA-NY-PA-TX)
- US infections rolling over from high levels (esp. in the Northeast), deaths still elevated; recent trends improving and should be helped by vaccination progress but coming mutation wave may change that
- In Europe, UK/Ireland mutations rolling over but have now spread to Spain and possibly France; Europe COVID deaths per day are above where they were in the spring of 2020
- Infection spike in Manaus (Amazon/Brazil) is worrisome given perceived high levels of acquired immunity through prior infection; new mutations need more study given possible reinfection risk
What’s new: Israel, Latin America, Scandinavia, Asia, US hospital capacity

- Sweden infections finally rolling over as gov’t finally tightens laws on store hours and public transport
- Infections remain low in Developed Asia but a new variant has been identified in Japan
- In the US, 70% of all ICU patients are now in hospitals with less than 20% spare capacity
- Israel infections slowing as vaccinations approach 30% of Israeli population; see Section 3 for early read on Pfizer vaccine efficacy in Israel
- Given uncertainty on reported infections, we show mortality rates below for Latin America and the India region. LatAm mortality had been improving at year-end but is now rising again. India region mortality rates continue to be very low.

**Scandinavia**

Daily infections, # per mm, smoothing = 7 days

Source: Johns Hopkins University, IMF, JPMAM. Jan 26, 2021.

**Developed Asia**

Daily infections, # per mm, smoothing = 7 days

Source: Johns Hopkins University, IMF, JPMAM. Jan 26, 2021.

**United States virus tracking**

% of ICU patients in hospitals with indicated ICU capacity

Source: HHS, JPMAM. 01/15/2021. 7 day avgs.

**Mideast**

Daily infections, # per mm, smoothing = 7 days

Source: Johns Hopkins University, IMF, JPMAM. Jan 26, 2021.

**Latin America**

Daily deaths, # per mm, smoothing = 7 days

Source: Johns Hopkins University, IMF, JPMAM. Jan 26, 2021.

**India region**

Daily deaths, # per mm, smoothing = 7 days

Source: Johns Hopkins University, IMF, JPMAM. Jan 26, 2021.
Summary of global and US infection/mortality trends

**World daily infections vs mortality**

![Graph showing world daily infections vs mortality](source)

**US daily infections vs mortality**

![Graph showing US daily infections vs mortality](source)

**Dev World ex-US daily infections vs mortality**

![Graph showing Dev World ex-US daily infections vs mortality](source)

**S America daily infections vs mortality**

![Graph showing S America daily infections vs mortality](source)

**US vs Europe infections**

Infections to date, levels, smoothing = 1 days

![Graph showing US vs Europe infections](source)

**US vs Europe mortality**

Deaths to date, levels, smoothing = 1 days

![Graph showing US vs Europe mortality](source)

Source: JHU, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, COVID Tracking, JPMAM. 01/26/2021. 7 day avg.
COVID at a glance: infections and mortality per mm, and the falling age of infected persons

Lower mortality rates in the developed world

In the US and elsewhere in the developed world, hospitalizations as a % of infected persons and deaths as a % of those hospitalized are lower than in the spring of 2020. Lower mortality appears to reflect the lower age of recently infected persons, less overcrowded hospitals and more informed standards of patient care (less unnecessary ventilation when oxygenation will suffice, and the use of steroids and blood thinners).

United States virus tracking

US vs Europe mortality

Source: Johns Hopkins University, IMF, JPMAM. January 26, 2021.
Source: COVID Tracking Project, JPMAM. 1/26/2021. 7 day avgs.
Source: Johns Hopkins University, country sources, JPMAM. Jan 26, 2021.
Infection, mortality and hospitalization snapshots

The two charts below show peak and current levels of infection (top chart) and mortality (bottom chart) for the 50 largest countries in the world based on GDP. These countries represent 94% of global GDP.

Source: Johns Hopkins University, IMF, JPMAM. Countries shown represent 94% of World GDP. January 26, 2021.
The first two charts below show peak and current levels of infection (first chart) and mortality (second chart) for the 50 US states and DC. The third chart shows current levels of hospitalization by state.

**Infection levels for US states: peak vs current**
Sorted by trailing 7 day average infection rate per mm people

**Mortality levels for US states: peak vs current**
Sorted by trailing 7 day average mortality rate per mm people

**Current hospitalization levels for US states**
Sorted by trailing 7 day average current hospitalizations per mm people

Source: Johns Hopkins University, IMF, JPMAM. January 26, 2021
US hotspot infection, hospitalization and mortality tracking

The charts below track infection, hospitalization, testing, mortality and doctor visit data for the US in aggregate and for US infection hotspots. See section 5 for a state-by-state chartpack which covers the full range of infection, mortality, hospitalization, testing and hospital capacity data.

---

**Hotspots:** AL AZ CA GA KY NV NY NC OK SC TX

- New daily infections (LHS)
- Cur Hosp (LHS)
- Daily deaths (RHS)

Source: COVID Tracking Project, JPMAM. 1/26/2021. 7 day avgs.

**United States virus tracking**

- New daily infections (LHS)
- Cur Hosp (LHS)
- Daily deaths (RHS)

Source: COVID Tracking Project, JPMAM. 1/26/2021. 7 day avgs.

---

**Hotspots:** AL AZ CA GA KY NV NY NC OK SC TX

- Daily deaths % of current hosp
- Current hosp % of daily infections

Source: COVID Tracking Project, JPMAM. 1/26/2021. 7 day avgs.

**United States virus tracking**

- Daily deaths % of current hosp
- Current hosp % of daily infections

Source: COVID Tracking Project, JPMAM. 1/26/2021. 7 day avgs.

---

**Positive testing rate**

- Daily infections, % of total tests, smoothing = 7 days

Source: Johns Hopkins University, COVID Tracking, JPMAM. Jan 26, 2021.

---

2 We dynamically define hotspots as those states with the highest levels and increases in infection, and the highest levels and increases in hospitalization.

3 31 states report the total number of “testing encounters” or “testing specimens”; the rest only show the number of people testing each day that have never been tested before. We only compute testing rates for the 31 states that provide encounter or specimen data since unique people tested is an inaccurate denominator to use with reported infections.
Hotspots: AL AZ CA GA KY NV NY NC OK SC TX
New daily infections per mm

Source: COVID Tracking, CMU, JPMAM. 1/26/2021. 7 day avgs.

Infections by state category
Daily infections, # per mm, smoothing = 7 days

Source: Johns Hopkins University, IMF, JPMAM. Jan 26, 2021.

Hospitalizations by state category
Current hospitalizations, # per mm, smoothing = 7 days


Mortality by state category
Daily deaths, # per mm, smoothing = 7 days

Source: Johns Hopkins University, IMF, JPMAM. Jan 26, 2021.

Testing by state category
Daily tests, # per mm, smoothing = 7 days

Tracking the hotspots

The US does not have internal border controls; as a result, focusing too much on infections at the state level ignores the ease with which US citizens cross state lines. As shown below, former Hotspot states have now transmitted the infection to new Hotspot states.

Without border controls, Hotspots keep shifting


US hospital system capacity

One way that we track hospital system capacity: how many ICU patients in each state are in hospitals with spare ICU capacity of less than 10%? In the state by state file (section 5), we show how this has evolved over time.

How lethal is COVID, and for whom?

Let’s first compare it to the flu. A key issue to keep in mind: there’s a difference between case fatality rates (deaths as a % of reported cases) and infection fatality rates (deaths as a % of all infected people, whether symptomatic or not). The latter can only be derived through antibody testing and other sampling methods involving molecular assessments of infection. The IFR of the seasonal flu is reported to be well below 0.1% with other estimates ranging from 0.02% to 0.04%. In contrast, the IFR for COVID has been estimated at 0.23% by Stanford’s Metaresearch Innovation Center, and at 0.7%-0.9% by the CDC. Either way, COVID is significantly more lethal than the seasonal flu. Tracking “excess” abnormal death levels is another way to understand the incremental mortality impact of COVID (see second chart). In addition to higher mortality than the flu, COVID also appears to entail more longer-lasting medical complications (see web portal section 4).

Mortality by age in the US

The first section in the table below shows the distribution of US COVID deaths by age bracket. People over the age of 85 represent around 1/3 of all COVID fatalities to-date. However, the number of people over age 85 is much smaller than other age cohorts; as a result, fatality risks are much greater for people in this age group. The second section reflects this by showing deaths to date per mm people in each age bracket (you can divide one number by another to obtain relative mortality probabilities). The third section looks specifically at mortality risk across age brackets relative to older populations. For example, a person aged 55-64 is only around 11% as likely to die from COVID compared to someone over the age of 75, and only around 6% as likely to die as someone over the age of 85. Differences across states are generally minor.

DISTRIBUTION OF ACTUAL MORTALITY: Mortality to-date by age group, % of total mortality

<table>
<thead>
<tr>
<th>Age Group</th>
<th>&lt; 1 yr</th>
<th>1-4 yrs</th>
<th>5-14 yrs</th>
<th>15-24 yrs</th>
<th>25-34 yrs</th>
<th>35-44 yrs</th>
<th>45-54 yrs</th>
<th>55-64 yrs</th>
<th>65-74 yrs</th>
<th>75-84 yrs</th>
<th>&gt; 85</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.2%</td>
<td>0.7%</td>
<td>1.7%</td>
<td>4.7%</td>
<td>11.7%</td>
<td>21.3%</td>
<td>27.6%</td>
<td>32.1%</td>
</tr>
</tbody>
</table>

MORTALITY RATES FOR EACH AGE BRACKET: COVID deaths to-date per mm population in each age group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>&lt; 1 yr</th>
<th>1-4 yrs</th>
<th>5-14 yrs</th>
<th>15-24 yrs</th>
<th>25-34 yrs</th>
<th>35-44 yrs</th>
<th>45-54 yrs</th>
<th>55-64 yrs</th>
<th>65-74 yrs</th>
<th>75-84 yrs</th>
<th>&gt; 85</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>50</td>
<td>145</td>
<td>399</td>
<td>960</td>
<td>2,346</td>
<td>6,002</td>
<td>16,877</td>
</tr>
</tbody>
</table>

RELATIVE MORTALITY RISK: risk of dying across age brackets

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Relative to 85+</th>
<th>Relative to 75+</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 yr</td>
<td>0.1%</td>
<td>0.1%</td>
</tr>
<tr>
<td>1-4 yrs</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>5-14 yrs</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>15-24 yrs</td>
<td>0.1%</td>
<td>0.1%</td>
</tr>
<tr>
<td>25-34 yrs</td>
<td>0.3%</td>
<td>0.5%</td>
</tr>
<tr>
<td>35-44 yrs</td>
<td>0.9%</td>
<td>1.6%</td>
</tr>
<tr>
<td>45-54 yrs</td>
<td>2.4%</td>
<td>4.4%</td>
</tr>
<tr>
<td>55-64 yrs</td>
<td>5.7%</td>
<td>10.5%</td>
</tr>
<tr>
<td>65-74 yrs</td>
<td>13.9%</td>
<td>25.6%</td>
</tr>
<tr>
<td>&gt; 85</td>
<td>35.6%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: CDC, JPMAM. January 16, 2021.
Country level infection, hospitalization and mortality trends

This section contains infection, hospitalization and mortality trends for the 68 countries that are among the Top 50 Countries by GDP, or among the Top 50 by Population. The charts appear in descending order of country GDP and are scaled relative to the US for comparability purposes. Note that high frequency hospitalization data is only available for a subset of countries. See section 5 for detailed reports on each US state, and see page 1 in this section for caveats regarding interpretation of reported infection rates in certain developing countries.

US daily infections vs mortality

China daily infections vs mortality

Japan daily infections vs mortality

Germany daily infections vs mortality

India daily infections vs mortality

United Kingdom daily infections vs mortality

France daily infections vs mortality

Italy daily infections vs mortality

Brazil daily infections vs mortality

Source: JHU, COVID Tracking, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, ECDC, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, ECDC, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, ECDC, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, JPMAM. 01/26/2021. 7 day avg.

Source: JHU, ECDC, JPMAM. 01/26/2021. 7 day avg.
Poland daily infections vs mortality

Iran daily infections vs mortality

Thailand daily infections vs mortality

Sweden daily infections vs mortality

Belgium daily infections vs mortality

Argentina daily infections vs mortality

Austria daily infections vs mortality

United Arab Emirates daily infections vs mortality

Norway daily infections vs mortality

Nigeria daily infections vs mortality

Israel daily infections vs mortality

Ireland daily infections vs mortality

Source: JHU, ECDC, JPMAM. 01/26/2021. 7 day avg.
IMPORTANT INFORMATION
The views, opinions and estimates expressed herein constitute Michael Cembalest’s judgment based on current market conditions and are subject to change without notice. Information herein may differ from those expressed by other areas of J.P. Morgan. This information in no way constitutes J.P. Morgan Research and should not be treated as such.

The views contained herein are not to be taken as advice or a recommendation to buy or sell any investment in any jurisdiction, nor is it a commitment from J.P. Morgan or any of its subsidiaries to participate in any of the transactions mentioned herein. Any forecasts, figures, opinions or investment techniques and strategies set out are for information purposes only, based on certain assumptions and current market conditions and are subject to change without prior notice. All information presented herein is considered to be accurate at the time of production. This material does not contain sufficient information to support an investment decision and it should not be relied upon by you in evaluating the merits of investing in any securities or products. In addition, users should make an independent assessment of the legal, regulatory, tax, credit and accounting implications and determine, together with their own professional advisers, if any investment mentioned herein is believed to be suitable to their personal goals. Investors should ensure that they obtain all available relevant information before making any investment. It should be noted that investment involves risks, the value of investments and the income from them may fluctuate in accordance with market conditions and taxation agreements and investors may not get back the full amount invested. Both past performance and yields are not reliable indicators of current and future results.

Non-affiliated entities mentioned are for informational purposes only and should not be construed as an endorsement or sponsorship of J.P. Morgan Chase & Co. or its affiliates.

For J.P. Morgan Asset Management Clients:
J.P. Morgan Asset Management is the brand for the asset management business of JPMorgan Chase & Co. and its affiliates worldwide.
To the extent permitted by applicable law, we may record telephone calls and monitor electronic communications to comply with our legal and regulatory obligations and internal policies. Personal data will be collected, stored and processed by J.P. Morgan Asset Management in accordance with our privacy policies at https://am.jpmorgan.com/global/privacy.

ACCESSIBILITY
For U.S. only: If you are a person with a disability and need additional support in viewing the material, please call us at 1-800-343-1113 for assistance. This communication is issued by the following entities:
In the United States, by J.P. Morgan Investment Management Inc. or J.P. Morgan Alternative Asset Management, Inc., both regulated by the Securities and Exchange Commission; in Latin America, for intended recipients’ use only, by local J.P. Morgan entities, as the case may be; in Canada, for institutional clients’ use only, by JPMorgan Asset Management (Canada) Inc., which is a registered Portfolio Manager and Exempt Market Dealer in all Canadian provinces and territories except the Yukon and is also registered as an Investment Fund Manager in British Columbia, Ontario, Quebec and Newfoundland and Labrador. In the United Kingdom, by JPMorgan Asset Management (UK) Limited, which is authorized and regulated by the Financial Conduct Authority; in other European jurisdictions, by JPMorgan Asset Management (Europe) S.à r.l. In Asia Pacific (“APAC”), by the following issuing entities and in the respective jurisdictions in which they are primarily regulated: JPMorgan Asset Management (Asia Pacific) Limited, or JPMorgan Funds (Asia) Limited, or JPMorgan Asset Management Real Assets (Asia) Limited, each of which is regulated by the Securities and Futures Commission of Hong Kong; JPMorgan Asset Management (Singapore) Limited (Co. Reg. No. 197601586K), which this advertisement or publication has not been reviewed by the Monetary Authority of Singapore; JPMorgan Asset Management (Taiwan) Limited; JPMorgan Asset Management (Japan) Limited, which is a member of the Investment Trusts Association, Japan, the Japan Investment Advisers Association, Type II Financial Instruments Firms Association and the Japan Securities Dealers Association and is regulated by the Financial Services Agency (registration number “Kanto Local Finance Bureau (Financial Instruments Firm) No. 330”); in Australia, to wholesale clients only as defined in section 761A and 761G of the Corporations Act 2001 (Commonwealth), by JPMorgan Asset Management (Australia) Limited (ABN 55143832080) (AFSL 376919). For all other markets in APAC, to intended recipients only.

For J.P. Morgan Private Bank Clients:
ACCESSIBILITY
J.P. Morgan is committed to making our products and services accessible to meet the financial services needs of all our clients. Please direct any accessibility issues to the Private Bank Client Service Center at 1-866-265-1727.

LEGAL ENTITY, BRAND & REGULATORY INFORMATION
In the United States, bank deposit accounts and related services, such as checking, savings and bank lending, are offered by JPMorgan Chase Bank, N.A. Member FDIC. JPMorgan Chase Bank, N.A. and its affiliates (collectively “JPMCB”) offer investment products, which may include bank-managed investment accounts and custody, as part of its trust and fiduciary services. Other investment products and services, such as brokerage and advisory accounts, are offered through J.P. Morgan Securities LLC (“JPM Securities”), a member of FINRA and SIPC. Annuities are made available through Chase Insurance Agency, Inc. (CIA), a licensed insurance agency, doing business as Chase Insurance Agency Services, Inc. in Florida. JPMCB, JPM and CIA are affiliated companies under the common control of JPMorgan Chase & Co. Products not available in all states.

In Luxembourg, this material is issued by J.P. Morgan Bank Luxembourg S.A. (JPMLB), with registered office at European Bank and Business Centre, 6 route de Treves, L-2633, Senningerberg, Luxembourg, R.C.S Luxembourg B180.958. Authorised and regulated by Commission de Surveillance du Secteur Financier (CSSF) and jointly supervised by the European Central Bank (ECB) and the CSSF. J.P. Morgan Bank Luxembourg S.A. is authorized as a credit institution in accordance with the Law of 5th April 1993. In the United Kingdom, this material is issued by J.P. Morgan Bank Luxembourg S.A.– London Branch. Prior to Brexit,(Brexit meaning that the UK leaves the European Union under Article 50 of the Treaty on European Union, or, if later, loses its ability to passport financial services between the UK and the remainder of the EEA), J.P. Morgan Bank Luxembourg S.A.– London Branch is subject to limited regulation by the Financial Conduct Authority and the Prudential Regulation Authority. Details about the extent of our regulation by the Financial Conduct Authority and the Prudential Regulation Authority are available from us on request. In the event of Brexit, in the UK, J.P. Morgan Bank Luxembourg S.A.– London Branch is authorised by the Prudential Regulation Authority, subject to regulation by the Financial Conduct Authority and limited regulation by the Prudential Regulation Authority. Details about the extent of our regulation by the Prudential Regulation Authority are available from us on request. In Spain, this material is distributed by J.P. Morgan Bank Luxembourg S.A., Sucursal en España, with registered office at Paseo de la Castellana, 31, 28046 Madrid, Spain. J.P. Morgan Bank Luxembourg S.A., Sucursal en España is registered under number 1516 within the administrative registry of the Bank of Spain and supervised by the Spanish Securities Market Commission (CNMV). In Germany, this material is distributed by J.P. Morgan Bank Luxembourg S.A., Frankfurt Branch, registered office at Taunustor 1 (TaunusTurm), 60310 Frankfurt, Germany, jointly supervised by the Commission de Surveillance du Secteur Financier (CSSF) and the European Central Bank (ECB), and in certain areas also supervised by the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin). In Italy, this material is distributed by J.P. Morgan Bank Luxembourg S.A.– Milan Branch, registered office at Via Catena Adalberto 4, Milano 20121, Italy and regulated by Bank of Italy and the Commissione Nazionale per le Società e la Borsa (CONSOB). In the Netherlands, this material is distributed by J.P. Morgan Bank Luxembourg S.A., Amsterdam Branch, with registered office at World Trade Centre, Tower B, Strawinskylaan 1135, 1077 XX, Amsterdam, The Netherlands. J.P. Morgan Bank Luxembourg S.A., Amsterdam Branch is authorised and
regulated by the Commission de Surveillance du Secteur Financier (CSSF) and jointly supervised by the European Central Bank (ECB) and the CSSF in Luxembourg; J.P. Morgan Bank Luxembourg S.A., Amsterdam Branch is also authorised and supervised by De Nederlandsche Bank (DNB) and the Autoriteit Financiële Markten (AFM) in the Netherlands. Registered with the Kamer van Koophandel as a branch of J.P. Morgan Bank Luxembourg S.A. under registration number 71651845. In Denmark, this material is distributed by J.P. Morgan Bank Luxembourg, Copenhagen Br, filial af J.P. Morgan Bank Luxembourg S.A. with registered office at Kalvebod Brygge 39-41, 1560 København V, Denmark. J.P. Morgan Bank Luxembourg, Copenhagen Br, filial af J.P. Morgan Bank Luxembourg S.A.is authorised and regulated by Commission de Surveillance du Secteur Financier (CSSF) and jointly supervised by the European Central Bank (ECB) and the CSSF. J.P. Morgan Bank Luxembourg, Copenhagen Br, filial af J.P. Morgan Bank Luxembourg S.A. is also subject to the supervision of Finanstilsynet (Danish FSA) and registered with Finanstilsynet as a branch of J.P. Morgan Bank Luxembourg S.A. under code 29009. In Sweden, this material is distributed by J.P. Morgan Bank Luxembourg S.A. - Stockholm Bankfilial, with registered office at Hamngatan 15, Stockholm, 11147, Sweden. J.P. Morgan Bank Luxembourg S.A. - Stockholm Bankfilial is authorised and regulated by Commission de Surveillance du Secteur Financier (CSSF) and jointly supervised by the European Central Bank (ECB) and the CSSF. J.P. Morgan Bank Luxembourg, Copenhagen Br, filial af J.P. Morgan Bank Luxembourg S.A. is also subject to the supervision of Finansinspektionen (Swedish FSA). Registered with Finansinspektionen as a branch of J.P. Morgan Bank Luxembourg S.A. In France, this material is distributed by JPMorgan Chase Bank, N.A. ("JPMCB"), Paris branch, which is regulated by the French banking authorities Autorité de Contrôle Prudentiel et de Résolution and Autorité des Marchés Financiers. In Switzerland, this material is distributed by J.P. Morgan (Suisse) SA, which is regulated in Switzerland by the Swiss Financial Market Supervisory Authority (FINMA).

In Hong Kong, this material is distributed by JPMCB, Hong Kong branch. JPMCB, Hong Kong branch is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission of Hong Kong. In Hong Kong, we will cease to use your personal data for our marketing purposes without charge if you so request. In Singapore, this material is distributed by JPMCB, Singapore branch. JPMCB, Singapore branch is regulated by the Monetary Authority of Singapore. Dealing and advisory services and discretionary investment management services are provided to you by JPMCB, Hong Kong/Singapore branch (as notified to you). Banking and custody services are provided to you by JPMCB Singapore Branch. The contents of this document have not been reviewed by any regulatory authority in Hong Kong, Singapore or any other jurisdictions. This advertisement has not been reviewed by the Monetary Authority of Singapore. JPMorgan Chase Bank, N.A., a national banking association chartered under the laws of the United States, and as a body corporate, its shareholder’s liability is limited. JPMorgan Chase Bank, N.A. (JPMCBNA) [ABN 43 074 112 011/AFS Licence No: 238367] is regulated by the Australian Securities and Investment Commission and the Australian Prudential Regulation Authority. Material provided by JPMCBNA in Australia is to “wholesale clients” only. For the purposes of this paragraph the term “wholesale client” has the meaning given in section 761G of the Corporations Act 2001 (Cth). Please inform us if you are not a Wholesale Client now or if you cease to be a Wholesale Client at any time in the future.

JPM is a registered foreign company (overseas) (ARBN 109293610) incorporated in Delaware, U.S.A. Under Australian financial services licensing requirements, carrying on a financial services business in Australia requires a financial service provider, such as J.P. Morgan Securities LLC (JPMS), to hold an Australian Financial Services Licence (AFSL), unless an exemption applies. JPMS is exempt from the requirement to hold an AFSL under the Corporations Act 2001 (Cth) (Act) in respect of financial services it provides to you, and is regulated by the SEC, FINRA and CFTC under US laws, which differ from Australian laws. Material provided by JPMS in Australia is to “wholesale clients” only. The information provided in this material is not intended to be, and must not be, distributed or passed on, directly or indirectly, to any other class of persons in Australia. For the purposes of this paragraph the term “wholesale client” has the meaning given in section 761G of the Act. Please inform us immediately if you are not a Wholesale Client now or if you cease to be a Wholesale Client at any time in the future.

This material has not been prepared specifically for Australian investors. It:

- may contain references to dollar amounts which are not Australian dollars;
- may contain financial information which is not prepared in accordance with Australian law or practices;
- may not address risks associated with investment in foreign currency denominated investments; and
- does not address Australian tax issues.

With respect to countries in Latin America, the distribution of this material may be restricted in certain jurisdictions. We may offer and/or sell to you securities or other financial instruments which may not be registered under, and are not the subject of a public offering under, the securities or other financial regulatory laws of your home country. Such securities or instruments are offered and/or sold to you on a private basis only. Any communication by us to you regarding such securities or instruments, including without limitation the delivery of a prospectus, term sheet or other offering document, is not intended by us as an offer to sell or a solicitation of an offer to buy any securities or instruments in any jurisdiction in which such an offer or a solicitation is unlawful. Furthermore, such securities or instruments may be subject to certain regulatory and/or contractual restrictions on subsequent transfer by you, and you are solely responsible for ascertaining and complying with such restrictions. To the extent this content makes reference to a fund, the Fund may not be publicly offered in any Latin American country, without previous registration of such fund’s securities in compliance with the laws of the corresponding jurisdiction. Public offering of any security, including the shares of the Fund, without previous registration at Brazilian Securities and Exchange Commission–CVM is completely prohibited. Some products or services contained in the materials might not be currently provided by the Brazilian and Mexican platforms.

This material is intended for your personal use and should not be circulated to or used by any other person, or duplicated for non-personal use, without our permission. If you have any questions or no longer wish to receive these communications, please contact your J.P. Morgan representative.

© 2020 JPMorgan Chase & Co. All rights reserved.