

A large, detailed 3D model of a COVID-19 virus particle is centered on the left side of the cover. It is spherical with a complex, textured surface of protruding proteins. Several smaller, similar virus particles are visible in the background, some in focus and some blurred. The background is a light, neutral color. The right side of the cover is a solid blue vertical band.

# COVID-19 Global Trends and Analyses

Volume 1:  
Global Snapshots

December 2020 | Update 1  
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# SUMMARY

## COVID-19 GLOBAL TRENDS AND ANALYSES | 11 Nov - 7 Dec 2020

- The **global** total number of reported cases has surpassed 67 million - an increase of 17 million in four weeks - and more than 1.5 million deaths as of 8 December. This exceeds the leading infectious killers in 2019 - 1.4 million deaths from tuberculosis, 690,000 from HIV/AIDS and 380,000 from malaria.
- In **Europe**, the number of new daily cases has been in decline for at least two weeks. Exceptions include Russia, Turkey, Poland, Ukraine, Romania, Croatia and Sweden.
- In the **United States**, the number of cases has surpassed 15 million (six days after reaching 14 million) and the death toll is more than 290,000. More than 2,800 deaths were reported on 3 December, an all-time high. Likewise, the more than 100,000 people currently hospitalised is the highest ever.
- **Indonesia** has reported more than 580,000 cases and 17,800 deaths. The country continues to report 5,000 to 6,000 new cases daily but reached a record peak of 8,369 on 3 December.
- **Japan, South Korea and Hong Kong** are each experiencing third waves of cases.
- **Vietnam** has reported three new community cases after more than 80 days of zero local transmission. The new cases are linked to an infected flight attendant.
- **Myanmar** continues to report around 1,500 new cases daily.
- **Papua New Guinea** has reported 65 new cases in the past 14 days, with a total of 671 cases.
- **Victoria** has reported zero new cases for 36 consecutive days. Restrictions continue to be gradually eased while masks remain mandatory to carry at all times and wear on public transport, taxis and rideshares, and retail.
- **New South Wales** has reported one new locally acquired case, a hotel quarantine worker, after zero new cases for 26 days.
- **South Australia** has reported no new local cases for seven days after a cluster of more than 30 cases following the infection of a hotel quarantine worker.

## Volume 2: SARS-CoV-2 Viral Load Dynamics and Infectivity

SARS-CoV-2 viral load dynamics, shedding, and infectiousness are critical factors for viral transmission and for implementing strategies to control the COVID-19 pandemic. However, our understanding of the dynamics and duration of viral shedding for SARS-CoV-2 is incomplete and ongoing.

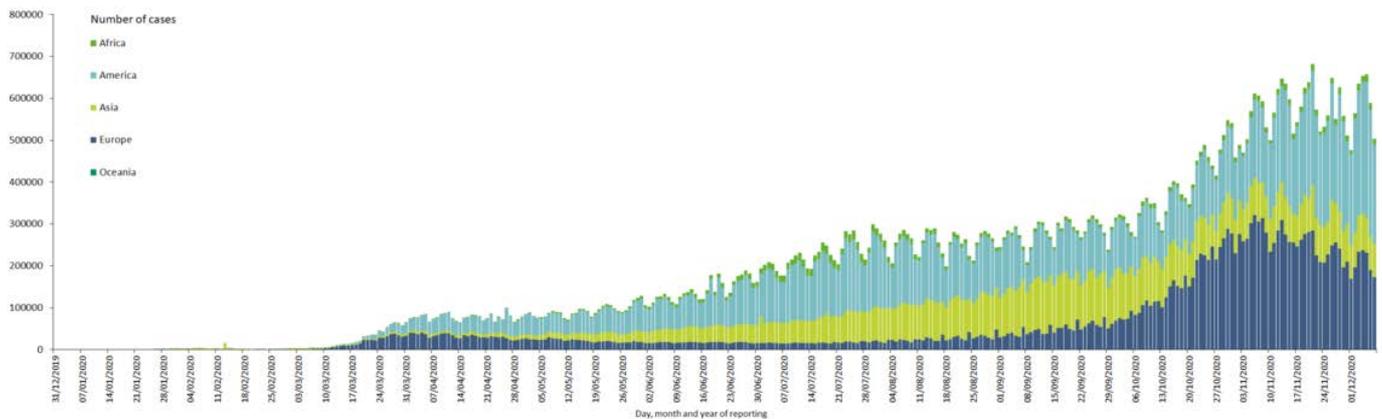
A systematic review and meta-analysis published in November 2020 of 79 studies reports that viable SARS-CoV-2 is not detected beyond nine days of illness despite persistently high viral loads and evidence of prolonged shedding in respiratory and stool samples. SARS-CoV-2 viral load peaks at the time of symptom onset or during the prodromal stage of illness. While no study in this review confirmed that viral load peaked prior to the onset of symptoms, the patient may be infectious during the pre-symptomatic phase. These data are consistent with observations in contact tracing where highest transmission risk occurs very early in the disease course spanning a few days before and within 5 days of symptom onset.

There is considerable evidence that high viral loads are associated with severe COVID-19 illness. One study showed a much higher proportion of patients on a ventilator (44%) had detectable viremia compared with those on supplemental (19%) or no oxygen (0%).

# GLOBAL EPIDEMIOLOGY AND TRENDS

The **global** total number of reported cases has surpassed 67 million and 1.5 million deaths as of 8 December<sup>1</sup>. The number of new daily cases has been trending around 600,000.

Distribution of COVID-19 cases worldwide, as of 7 December 2020 (source European CDC)<sup>2</sup>



## Per capita attack rates and death rates

Ten countries with the highest attack rates, compared to Australia (among countries reporting at least 25,000 cases).

	Cases per 1000	Tests per 1000	Population
Montenegro	56	212	628,079
Luxembourg	55	2,180	630,183
Bahrain	50.4	1,190	1,725,527
Belgium	49.7	508	11,610,688
Qatar	49.5	397	2,807,805
Czech Republic	48.8	286	10,717,297
USA	41.9	587.4	331,812,000
Panama	38.1	208.9	4,342,825
Switzerland	37.7	314.9	8,680,983
Slovenia	37	252.5	2,079,058
<b>Australia</b>	<b>1.1</b>	<b>391</b>	<b>25,622,604</b>

<sup>1</sup> <https://www.worldometers.info/coronavirus/#countries>

<sup>2</sup> <https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases>

Ten countries with the lowest attack rates (among countries reporting at least 25,000 cases).

	Cases per 1000	Tests per 1000	Population
Ethiopia	0.95	14	116,128,998
Egypt	1.1	9.7	103,129,181
<b>Australia</b>	<b>1.1</b>	<b>391</b>	<b>25,622,604</b>
Japan	1.2	27.7	126,313,686
Kenya	1.5	16.4	54,257,425
Myanmar	1.7	21.3	54,561,804
Pakistan	1.8	24.9	222,657,494
Indonesia	2.0	20.9	274,724,505
Bangladesh	2.8	16.8	165,371,024
Venezuela	3.6	80.9	28,402,074

Ten countries with the highest death rates, compared to Australia (among countries reporting at least 25,000 cases).

	Cases	Deaths	Case fatality ratio	Deaths per million
Belgium	577,345	16,645	2.9%	1,434
Peru	963,605	35,966	3.7%	1,085
Spain	1,664,945	45,069	2.7%	964
Italy	1,601,554	55,576	3.5%	920
United Kingdom	1,629,657	58,448	3.6%	859
Argentina	1,424,535	38,730	2.7%	854
North Macedonia	61,878	1,763	2.8%	846
Bosnia-Herzegovina	87,901	2681	3.0%	819
Mexico	1,113,543	105,940	9.5%	818
Brazil	6,336,278	173,165	2.7%	812
<b>Australia</b>	<b>27,912</b>	<b>908</b>	<b>3.3%</b>	<b>35</b>

Ten countries with the lowest death rates (among countries reporting at least 25,000 cases).

	Cases	Deaths	Case fatality ratio	Deaths per million
China	86,542	4,634	5.4%	3
Singapore	58,228	29	0.05%	5
South Korea	34,652	526	1.5%	10
Malaysia	67,515	363	0.5%	11
Ethiopia	110,074	1,706	1.5%	15
Japan	146,760	2,119	1.4%	17
Kenya	83,618	1,469	1.8%	27
Venezuela	102,394	897	0.9%	32
<b>Australia</b>	<b>27,192</b>	<b>908</b>	<b>3.3%</b>	<b>35</b>
Pakistan	400,482	8,091	2%	36

## European Region

- Most European countries have reported a steady decline in daily new cases in the past 2-3 weeks. Exceptions include Russia, Turkey, Sweden, Poland, Ukraine, Romania and Croatia, which have yet to reach the peaks of their second waves.
- The latest weekly report on Europe by the Institute for Health Metrics and Evaluation (IHME) at the University of Washington predicts that daily deaths from COVID-19 in Europe will continue to rise in the coming weeks, reaching a peak of over 7,000 deaths per day around mid-January 2021<sup>3</sup>. COVID-19 is currently the second leading cause of death in the region—29,858 weekly deaths (ischaemic heart disease killed 44,253 people across Europe during the same period).
- The effective reproduction number,  $R$ , remains above 1 in most countries. There is still a large susceptible population—IHME estimates that only 7% of Europeans have been infected with the coronavirus so far.
- European publics remain resistant to public health advice. Mask use is less than 50% in Sweden, Norway, Denmark, Finland, the Netherlands, Belarus, Bulgaria, Croatia, and Latvia.

## North America

- The **United States** is reporting around 200,000 new cases per day and they are dispersed across every region of the country. Three states (Texas, California and Florida) have each reported more than one million cases.
- The number of people hospitalised has reached 100,000, the highest since the pandemic began. On 3 December, 2,885 people died of the virus, also the highest ever, and a 30 per cent increase over two weeks ago.
- In **Los Angeles**, hospitals are at 85 per cent capacity and a total lockdown has been ordered for the city.
- Modelling by the University of Washington predicts that deaths will reach 450,000 before March.
- **New York City's** seven-day average daily positive test rate rose above 5 per cent, to 5.19, for the first time since 28 May.
- **Canada's** second wave continues to surge with daily new cases exceeding 6,000 for the past week. The number of active cases doubled during November. Central Canada and the West are carrying the main burden of this phase of the pandemic, with the four most populous provinces -- Ontario, British Columbia, Alberta and Quebec - all reporting record single-day infection totals this week.

## Asia-Pacific Region

- Daily new cases in **India, Nepal and the Philippines** are in steady decline. The total numbers of cases in these countries are 9.7 million, 242,000 and 442,000, respectively.
- **Sri Lanka** now has a severe second wave, reaching an all-time peak of 878 cases on 2 December. More than 28,000 cases have been reported since the beginning of the pandemic.
- **Pakistan and Bangladesh** appear to be heading for second waves. The total numbers of cases are 420,000 and 480,000, respectively.
- **Indonesia** has reported more than 580,000 cases, the second highest in Asia, and almost 18,000 deaths. The country reported an all-time peak of 8,369 new daily cases on 3 December. On the same day, Papua province reported a record 1,755 new cases.
- **Myanmar's** daily new cases have stagnated at around 1,500-1,600 for the past two weeks and has surpassed a total of more than 100,000 cases and 2,000 deaths.
- **Papua New Guinea** has reported 65 new cases in the past two weeks for a total of 671. The 18 cases recorded on 24 November was the highest daily number since August.
- **Japan, South Korea and Hong Kong** are the first countries in the world to experience a clear third wave.

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<sup>3</sup> [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)32530-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32530-7/fulltext)

- **Vietnam** has reported three new local cases after more than 80 days of zero cases. The new cases were linked to an infected flight attendant.

## Australia

- **Victoria** has reported zero new cases for 36 consecutive days. Restrictions continue to be gradually eased while masks remain mandatory to carry at all times and wear on public transport, taxis and rideshares, and retail.
- **New South Wales** has reported one new locally acquired case, a hotel quarantine worker, after zero new cases for 26 days.
- **South Australia** has reported no new local cases for five days after a cluster of more than 30 cases following the infection of a hotel quarantine worker.

# GLOBAL SNAPSHOTS

## | SCIENCE AND RESEARCH

### Airborne Transmission of SARS-CoV-2 – update by US CDC

In its most recent scientific update on modes of transmission, the CDC has modified its advice about airborne spread of the virus<sup>4</sup>. However, the CDC reiterates that the evidence suggests that SARS-CoV-2 most commonly spreads through close contact (1.5 metres). They conclude as follows:

- When people with COVID-19 cough, sneeze, sing, talk, or breathe they produce respiratory droplets. These droplets can range in size from larger droplets (some of which are visible) to smaller droplets. Small droplets can also form particles when they dry very quickly in the airstream.
- Infections occur mainly through exposure to respiratory droplets when a person is in close contact with someone who has COVID-19.

CDC states that COVID-19 can sometimes be spread by **airborne transmission** (via small droplets or "aerosol"). Airborne transmission is an important way that infections like tuberculosis, measles, and chicken pox are spread. The CDC update goes on to say: "There is evidence that under certain conditions, people with COVID-19 seem to have infected others who were more than 1.5 metres away. These transmissions occurred within enclosed spaces that had inadequate ventilation. Sometimes the infected person was breathing heavily, for example while singing or exercising."

One of the best documented examples was the high SARS-CoV-2 attack rate after a **choir practice** in Washington State in the US<sup>5</sup>. Following a 2.5-hour choir practice attended by 61 persons, including a symptomatic index patient, 32 confirmed and 20 probable secondary COVID-19 cases occurred (attack rate = 53.3% to 86.7%); three patients were hospitalised, and two died. A separate paper by a group of engineers modelled likely transmission routes based on the seating arrangements, heating and ventilation<sup>6</sup>. They concluded that inhalation of respiratory aerosol most likely dominated infection transmission during this event, as other modes of transmission are unlikely to account for the high secondary attack rate.

The CDC report goes on to clarify the term "aerosol". In the healthcare setting, **aerosol** is used with respect to "aerosol-generating procedures" (e.g., intubation, bronchoscopy) that produce small droplets and particles and require distinct engineering controls to prevent occupational transmission of infectious pathogens like SARS-CoV-2. In community settings, aerosol was the term used to describe the sewage system-generated cloud of small droplets and particles that was believed to have spread SARS-CoV-1 during the 2003 Amoy Gardens outbreak in Hong Kong<sup>7</sup>.

In a linked scientific brief, CDC suggests that if SARS-CoV-2 were spread *primarily* through airborne transmission like measles, experts would expect to have observed considerably more rapid global spread of infection in early 2020 and

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<sup>4</sup> <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html#edn1>

<sup>5</sup> <https://www.cdc.gov/mmwr/volumes/69/wr/pdfs/mm6919e6-H.pdf>

<sup>6</sup> <https://www.medrxiv.org/content/10.1101/2020.06.15.20132027v2.full.pdf>

<sup>7</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC539564/>

higher percentages of prior infection measured by serosurveys. Available data indicate that SARS-CoV-2 has spread more like most common respiratory viruses, primarily through respiratory droplet transmission within a short range.

Circumstances under which **airborne transmission** of SARS-CoV-2 appears to have occurred include:

- Enclosed spaces within which an infectious person either exposed susceptible people at the same time or to which susceptible people were exposed shortly after the infectious person had left the space.
- Prolonged exposure to respiratory particles, often generated with expiratory exertion (e.g., shouting, singing, exercising) that increased the concentration of suspended respiratory droplets in the air space.
- Inadequate ventilation or air handling that allowed a build-up of suspended small respiratory droplets and particles.

## Immunological Memory to SARS-CoV-2 Assessed for Greater than Six Months

Understanding immune memory to SARS-CoV-2 is critical for improving diagnostics and vaccines, and for assessing the likely future course of the pandemic. In a recently published preprint study, 185 individuals with COVID-19 were recruited<sup>8</sup>. Participants (43 per cent male, 57 per cent female) represented a range of asymptomatic, mild, moderate, and severe COVID-19 cases, and were recruited from multiple sites throughout the United States. The majority of participants were from California or New York. The majority of participants had a mild case of COVID-19, not requiring hospitalisation; 92 per cent were never hospitalised for COVID-19; 7 per cent were hospitalised, some of whom required intensive care unit care, consistent with the COVID-19 disease severity distribution in the USA. The majority (97 per cent) reported symptomatic disease.

**Spike IgG was relatively stable over 6+ months. Spike-specific memory B cells were more abundant at 6 months than at 1 month.** SARS-CoV-2-specific CD4+ T cells and CD8+ T cells declined with a half-life of 3-5 months. By studying antibody, memory B cell, CD4+ T cell, and CD8+ T cell memory to SARS-CoV-2 in an integrated manner, they observed that each component of SARS-CoV-2 immune memory exhibited distinct kinetics.

The source of heterogeneity in immune memory to SARS-CoV-2 is unknown and worth further examination. It is possible that some of that heterogeneity is a result of low cumulative viral load. Nevertheless, immune memory consisting of at least three immunological compartments was measurable in ~90 per cent of subjects greater than 5 months post-infection indicating that durable immunity against COVID-19 disease is a possibility in most individuals.

## A Randomised Trial of Convalescent Plasma in COVID-19 Severe Pneumonia

The researchers in **Argentina** randomly assigned hospitalised adult patients with severe COVID-19 pneumonia in a 2:1 ratio to receive convalescent plasma or placebo. The primary outcome was the patient's clinical status 30 days after the intervention, as measured on a six-point ordinal scale ranging from total recovery to death<sup>9</sup>.

A total of 228 patients were assigned to receive convalescent plasma and 105 to receive placebo. The median time from the onset of symptoms to enrolment in the trial was 8 days (interquartile range, 5 to 10), and hypoxemia was the most frequent severity criterion for enrolment. The infused convalescent plasma had a median titre of 1:3200 of total SARS-CoV-2 antibodies (interquartile range, 1:800 to 1:3200). No patients were lost to follow-up. At day 30, no significant difference was noted between the convalescent plasma group and the placebo group in the distribution of clinical

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<sup>8</sup> <https://www.biorxiv.org/content/10.1101/2020.11.15.383323v1>

<sup>9</sup> <https://www.nejm.org/doi/full/10.1056/NEJMoa2031304>

outcomes according to the ordinal scale (odds ratio, 0.83 (95 per cent confidence interval [CI], 0.52 to 1.35; P=0.46). Overall mortality was 10.96 per cent in the convalescent plasma group and 11.43 per cent in the placebo group, for a risk difference of -0.46 percentage points (95 per cent CI, -7.8 to 6.8). Total SARS-CoV-2 antibody titres tended to be higher in the convalescent plasma group at day 2 after the intervention. Adverse events and serious adverse events were similar in the two groups.

### CONCLUSION

No significant differences were observed in clinical status or overall mortality between COVID-19 patients treated with convalescent plasma and those who received placebo.

## Global Health Impact | Air Pollution and COVID-19 Mortality

An international study estimates that about 15 per cent of COVID-19 deaths worldwide could be attributed in part to long-term exposure to air pollution, specifically ambient fine particulate air pollution<sup>10</sup>. In Australia, study estimates show air pollution contributed to 3 per cent of COVID-19 deaths and just 1 per cent in New Zealand, compared to 27 per cent in China, 26 per cent in Germany, 18 per cent in France, 16 per cent in Sweden, 15 per cent in Italy and 12 per cent in Brazil.

The findings are based on epidemiological data from previous US and Chinese studies of air pollution and COVID-19 and the SARS outbreak in 2003, supported by additional data from Italy. Researchers combined that with satellite data showing global exposure to fine particles known as PM2.5, information on atmospheric conditions and ground-based pollution-monitoring networks to create a model to calculate the fraction of coronavirus deaths that could be attributable to long-term exposure to PM2.5.

According to co-author and vascular biologist Professor Thomas Münzel, when people inhale polluted air the PM2.5 migrate from the lungs to the blood and blood vessels causing inflammation and severe oxidative stress, resulting in an imbalance between free radicals and oxidants in the body that normally repair damage to cells<sup>11</sup>. This causes damage to the inner lining of arteries, the endothelium, and leads to the narrowing and stiffening of the arteries.

If both long-term exposure to air pollution and infection with the COVID-19 virus come together then there is an additive adverse effect on health, particularly with respect to the heart and blood vessels, which leads to greater vulnerability and less resilience to COVID-19.

## Global Health Impact | Pacific Remittances Less Affected Than Predicted

At the start of the pandemic, it was thought that remittance flows would contract sharply. In April 2020, the World Bank predicted a near 20 per cent drop in remittances to low- and middle-income countries in 2020<sup>12</sup>. Studies have shown that remittances alleviate poverty in low- and middle-income countries, improve nutritional outcomes, are associated with higher spending on education, and reduce child labour in disadvantaged households. It was feared that a fall in

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<sup>10</sup> <https://academic.oup.com/circvascres/article/116/14/2247/5940460>

<sup>11</sup> <https://www1.racgp.org.au/newsgp/clinical/air-pollution-may-have-increased-covid-19-deaths-b#:~:text=An%20international%20study%20estimates%20that,%2C%20and%203%25%20in%20Oceania>

<sup>12</sup> <https://www.worldbank.org/en/news/press-release/2020/04/22/world-bank-predicts-sharpest-decline-of-remittances-in-recent-history>

remittances would affect families' ability to spend on these areas as more of their finances would be directed to solve food shortages and immediate livelihoods needs.

In terms of remittance dependence, half of the 10 most dependent economies are Pacific Island countries<sup>13</sup>. Those five countries are Tonga (remittances account for 39 per cent of GDP), Samoa (18 per cent), Marshall Islands (14 per cent), Kiribati (10 per cent) and Tuvalu (8 per cent). A recent analysis of data from Fiji, Samoa and Tonga shows that there was a dip in remittances in the early months of the pandemic, compared to last year, but certainly **no sign of a sustained fall**<sup>14</sup>. In fact, in Tonga, monthly remittances have increased by \$3 million compared with 2019. Fiji's monthly remittances in July were the highest for a decade, and Tonga's were the highest since monthly records began in 2015. The World Bank now says that, worldwide, "remittances have held steady and in some cases, even gone up"<sup>15</sup>.

## Validation of SARS-CoV-2 Antigen Rapid Diagnostic Tests

An evaluation of the Panbio™ COVID-19 Ag Rapid Test (Abbott) and the Standard Q COVID-19 Rapid Antigen Test (SD Biosensor/Roche) was performed by the Hôpitaux Universitaires de Genève (HUG), Geneva, Switzerland, between 9 and 23 October<sup>16</sup>.

During the study period a total of 1,064 volunteers fulfilling the local testing criteria for SARS-CoV-2 testing were enrolled in this investigation. The majority were presenting with symptoms compatible with a SARS-CoV-2 infection and a minority were asymptomatic but with a known positive contact or were asymptomatic healthcare workers. The daily positivity rate by RT-PCR during the study period ranged between 15 and 31 per cent. After the reference screening, a second and contralateral nasopharyngeal swab was then performed by the same nurse to be used for the RDT. Reference methods for comparison were cycle threshold (Ct) values of the current diagnostic routine SARS-CoV-2 RT-PCR assay (Cobas, Roche).

### Rapid diagnostic test validation for Panbio™ COVID-19 Ag Rapid Test (Abbott), compared to RT-PCR assays

Number of individuals tested: 535

**Sensitivity: 85.48% (95% C.I: 78.03 – 91.16)**

**Specificity: 100% (95% C.I: 99.11 – 100.0)**

Positive Predictive Value: 100%

Negative Predictive Value: 95.80% (95% C.I: 93.71 – 97.22)

### Rapid diagnostic test validation for Standard Q COVID-19 Rapid Antigen Test (SD Biosensor/Roche), compared to RT-PCR assays

Number of individuals tested: 529

**Sensitivity: 89.0% (95% C.I: 83.69 – 93.06)**

**Specificity: 99.70% (95% C.I: 98.36 – 99.99)**

Positive Predictive Value\*: 99.42% (95% C.I: 96.00 – 99.92)

Negative Predictive Value\*: 94.13% (95% C.I: 91.47 – 96.00)

<sup>13</sup> <https://www.asiapacific.ca/publication/impact-covid-19-remittance-dependent-economies>

<sup>14</sup> [https://devpolicy.org/pacific-remittances-covid-19-20201116/?utm\\_source=rss&utm\\_medium=rss&utm\\_campaign=pacific-remittances-covid-19-20201116](https://devpolicy.org/pacific-remittances-covid-19-20201116/?utm_source=rss&utm_medium=rss&utm_campaign=pacific-remittances-covid-19-20201116)

<sup>15</sup> <https://www.npr.org/2020/10/23/927249563/the-great-remittance-mystery>

<sup>16</sup> [https://www.hug.ch/sites/interhug/files/structures/laboratoire\\_de\\_virologie/documents/Centre\\_maladies\\_virales\\_infectieuses/ofsp\\_rdt\\_report\\_gcevd\\_27.10.2020.pdf](https://www.hug.ch/sites/interhug/files/structures/laboratoire_de_virologie/documents/Centre_maladies_virales_infectieuses/ofsp_rdt_report_gcevd_27.10.2020.pdf)



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