

A solution scan of societal options to reduce SARS-CoV-2 transmission and spread

This work is a collaboration between BioRISC (the [Biosecurity Research Initiative at St Catharine's College, Cambridge](https://www.caths.cam.ac.uk/research/biorisc/) <<https://www.caths.cam.ac.uk/research/biorisc/>>), [Conservation Evidence](https://www.conservationevidence.com/) <<https://www.conservationevidence.com/>> based in the Department of Zoology, University of Cambridge and the [Centre for the Study of Existential Risk](https://www.cser.ac.uk/) <<https://www.cser.ac.uk/>>. It was created by documenting our experience of options, consulting guidance, contacting people working in different countries to explore the range of options and crowd-sourcing ideas through social media. We welcome suggestions for options missed (especially those implemented outside of the UK), innovations for novel options or means of improving existing options. Please contact biorisc@caths.cam.ac.uk. For more information on our methods, please see our [preprint](https://doi.org/10.17605/OSF.IO/CA5RH) <<https://doi.org/10.17605/OSF.IO/CA5RH>>.

THE LIST OF OPTIONS

We have identified 313 societal options to reduce SARS-CoV-2 transmission or spread. For any particular problem or risk, this long list will quickly be winnowed down to a much shorter list of options based on relevance and practicality ([online application to help with this process](https://alecchristie888.shinyapps.io/Covid_19_options/) <https://alecchristie888.shinyapps.io/Covid_19_options/>). The bespoke shortlist will then be the subject of more detailed consideration.

We stress that the listing of a measure should not be seen as a recommendation or a suggestion that it is effective.

Actions should be based on the best available evidence and guidance: this list is a means of delivering guidance and should not replace it.

It is important to consider if the action is likely to have serious negative consequences including increasing injustice (as only available to some or impact some groups more than others).

MAIN HEADINGS group the options into seven key areas, such as physical isolation, reducing transmission through contaminated items and enhancing cleaning and hygiene. **Subheadings** identify societal features or behaviours that may help to reduce viral transmission or spread. **Bullet points** identify potential actions or measures for achieving those societal features.

1. PHYSICAL DISTANCING

It is widely accepted that the main way the virus spreads is transmission through liquid droplets (5 μm or larger) formed through people coughing, and that this is much more likely in close contact [[1](https://doi.org/10.1093/infdis/jis773)]. The risk at greater distances appears much weaker but some studies have shown droplets can travel up to 8 m [[2](https://doi.org/10.1001/jama.2020.4756)]. There is uncertainty about the possibility of much longer distance dispersal through aerosols (i.e. droplets smaller than 5 μm), which can disperse further than larger droplets, linger in the air for hours and follow airflow systems. The infectious dose, the number of virus particles required to produce an infection, is unknown [[3](https://doi.org/10.1038/d41586-020-00974-w)], which is critical as it determines the risk of low-level exposure. Physical isolation is the central component of government guidance or legislation.

1.1 Isolate infected or potentially infected individuals

Here, we consider self-isolation as not leaving your home, for any reason, for a set period. An individual may self-isolate if they have symptoms of COVID-19, or have been in contact with some that has COVID-19 or symptoms of COVID-19. For measures involving quarantine after international travel, see Section 7.2.

- Self-isolate for a given period if showing one or more main symptoms of COVID-19.

- Clearly explain the consequences of not self-isolating for self and others.
- Encourage household members to self-isolate for a period if any household member shows symptoms.
- Identify rooms for early isolation of infected persons.
- Pay staff to stay at home when infected, showing possible symptoms, or if another household member shows symptoms, to reduce risk of hiding illness at work.
- Recruit and train volunteers to facilitate self-isolation.
- Provide self-isolation spaces (e.g. hotel rooms) for front line, key workers and workers who need to travel far away from home for their work.
- Have the state pay for the sick leave of the employee instead of the employer (makes workers more likely to self-isolate while sick).
- Support self-employed who are ill.
- Routinely take temperature and prevent access of those with elevated temperatures to public buildings and workplaces. This is a routine measure in some countries, such as China [4 < http://www.xinhuanet.com/english/2020-03/30/c_138931813.htm>].

1.2 Increase home confinement across society

In many countries, there is or has been a policy to make as many people stay at home as much as possible, even if they are apparently healthy. This reduces the chance of individuals catching the virus or passing it on to others. Up to 80% of people infected by SARS-CoV-2 may be asymptomatic, at least initially [5 < <https://www.cebm.net/covid-19/covid-19-what-proportion-are-asymptomatic/>>].

- Encourage or enforce working from home for all jobs where this is possible.
- Encourage or enforce non-working for all non-essential jobs where home working is not possible.
- Develop national registries of essential jobs.
- Fine companies for encouraging or forcing non-essential workers to go into work.
- Pay staff to stay at home even when showing no signs of infection.
- Move lectures and teaching to a home-based setting, for instance via greater use of distance and online learning and self-study.
- Create ‘virtual schools’ to enable continued education.

- Increase options for home and community health care, including the provision of simple self-testing equipment for blood pressure or oxygen saturation levels for some vulnerable groups.
- Provide accommodation and support for rough sleepers and those without permanent accommodation.
- Minimise face-to-face interactions at work (including meetings, co-working, on the job training and direct supervision).
- Advise and support all workers who are unable to work from home in minimising movement and interactions outside of house and work.
- Advise people living with workers who are unable to work from home to minimise movement outside of their home.
- Encourage volunteer community groups to “adopt” health care workers, or anyone else whose work requires them to leave home, to assist with groceries, laundry, other essential tasks and otherwise facilitate minimising their movement and interactions outside of house and work.
- Advise older people and vulnerable people to strictly stay at home unless for essential reasons (“shielding”).
- Advise people who live with medically vulnerable people to reduce their own movement outside of their house.
- Create lists of people who are medically or socially vulnerable (including disabled people, key workers and those with caring responsibilities) to facilitate them in receiving deliveries (food or medicine) without exiting the house.
- Provide additional support or develop or modify platforms to be more accessible and intuitive for vulnerable and isolated groups who may be less comfortable with technology so that they can order groceries and socialise while in isolation.
- Ensure information is available to isolated groups, e.g. those without internet at home who use library services or those who don’t speak the official language.

1.3 Reduce local movement

- Encourage and facilitate minimal movement in communities.
- Require permits, self-declaration forms or letters of authority to leave the house with sanctions if not obtained, as adopted in France [[6 < https://www.thelocal.fr/20200317/lockdown-permission-form-what-is-it-and-where-do-you-find-it>](https://www.thelocal.fr/20200317/lockdown-permission-form-what-is-it-and-where-do-you-find-it)], Romania [[7 < https://www.mai.gov.ro/wp-content/uploads/2020/03/%0BMILITARY-ORDINANCE-on-measures-](https://www.mai.gov.ro/wp-content/uploads/2020/03/%0BMILITARY-ORDINANCE-on-measures-)

[to-prevent-the-spread-of-COVID-19.pdf>\]](#) and Greece [[8 < https://gr.usembassy.gov/covid-19-information/>\]](#)].

- Limit distance people can move from the house, e.g. within 1 km in France [[6 < https://www.thelocal.fr/20200317/lockdown-permission-form-what-is-it-and-where-do-you-find-it>\]](#) or 200 m in parts of Italy [[9 < https://www.thelocal.it/20200323/lombardy-new-quarantine-rules-italy>\]](#)].
- Restrict reasons for being able to leave the house, e.g. shopping for essentials, exercise, medical needs or essential work in the UK [[10 < https://www.nhs.uk/conditions/coronavirus-covid-19/staying-at-home-to-avoid-getting-coronavirus/staying-at-home-and-away-from-other-people/>\]](#)].
- Add prescriptions on outdoor activity to aid policing, e.g. requirement to keep moving when out for exercise in Belgium [[11 < https://www.euractiv.com/section/coronavirus/news/belgium-extends-covid-19-lockdown-by-two-weeks-until-19-april/>\]](#)].
- Limit frequency and duration of excursions from house, e.g. 1 km from home, for 1 hour, once per day in France [[12 < https://www.thelocal.fr/20200319/france-tightens-rules-on-jogging-during-coronavirus-lockdown>\]](#)].
- Impose a curfew, e.g. between 6pm and 5am as in Peru [[13 < https://cnnespanol.cnn.com/2020/03/18/alerta-presidente-de-peru-decreta-toque-de-queda-en-todo-el-pais/#0>\]](#)].
- Create ways for people to share shopping trips so there are fewer in number (e.g. through community groups or one shopper per community).
- Encourage or allow only one person per household out to shop.
- Prohibit travel to areas where physical distancing is likely to be difficult to maintain.
- Reduce or remove transport services so only used for essential travel.
- Use mobile phone tracking to check if restrictions are being followed.
- Encourage or require that the workforce do not go out to buy lunch.
- Use effective messaging to ensure those with symptoms do not visit doctor or hospital without prior warning.

1.4 Decrease shopping visits

- Increase delivery service from shops, food banks and other providers (e.g. veg box schemes).
- Improve infrastructure to enable people to obtain groceries, medicines, and other essential goods by delivery.

- Where the capacity is available, make home delivery more attractive, e.g. waiving delivery fee or offering discounts.
- Encourage or enforce ‘minimum spend’ or ‘minimum items’ to encourage people to combine trips to obtain goods.
- Share surveillance among shops, including CCTV and monitoring for people making ‘excessive’ visits.
- Prioritise key workers for ‘click and collect’ or delivery.
- Prioritise those at higher risk for ‘click and collect’ or delivery.
- Enable more home delivery, recruit people to act as delivery agents who can be screened and drop off shopping without contact.
- Create a special period for key workers to shop.
- Create a special period for at risk categories to shop.
- Companies who deliver to the hospitality trade convert or expand to home deliveries.
- Discourage or restrict people from buying non-essential or luxury items, including removing them from stock, limiting their availability or preventing people from only buying them, while noting that the definition of ‘non-essential’ will vary.

1.5 Reduce physical contact

- Discourage physical contact, such as shaking hands, kissing or hugging, outside household members/officially listed “bubble” of friends.
- Identify and encourage alternative methods for greeting people that reduce the risk of virus transmission such as ‘elbow bumping’ rather than shaking hands.
- Activities involving close contact, such as hairdressing, are done by a household member, but with guidance provided by a professional via video link.
- Create meeting rooms with airtight partitions, e.g. modified containers placed in the courtyards of Dutch care homes to allow safe meetings between residents and family [[14 < https://www.spiegel.de/panorama/coronavirus-besuchscontainer-gegen-einsamkeit-in-den-niederlanden-a-05722a97-b67a-4a90-8f16-32efe10ba318>](https://www.spiegel.de/panorama/coronavirus-besuchscontainer-gegen-einsamkeit-in-den-niederlanden-a-05722a97-b67a-4a90-8f16-32efe10ba318)].

1.6 Limit close interactions

- Close places of public gathering depending upon their importance to society and degree of likely close physical spacing.

- If workplaces are still open, close canteens and other non-essential common spaces.
- Deter mixing at start or end of day, for example by staggering hours or discouraging non-essential contact.
- Limit group sizes for people not from the same household in public.
- Discourage or ban public gatherings including concerts, sports events and markets.
- Limit number or type of people at essential events such as weddings or funerals. In Australia, 5 people for a wedding, 10 for a funeral [[15 < https://www.sbs.com.au/news/how-australians-are-adapting-to-strict-new-rules-for-weddings-and-funerals>](#)]. In France, less than 20 people for a funeral from 11 May [[16 < https://www.gouvernement.fr/info-coronavirus/strategie-de-deconfinement>](#)].
- Remove or exclude facilities that encourage groups to form, such as park benches.
- Avoid sharing bedrooms (except for individuals from same household).
- Discourage unnecessary speaking when people are in close contact.
- Reduce noise so people don't have to raise voices or move closer.
- Increase use of virtual reality.
- Restaurant food providers change to takeaway.
- Avoid delivering items, such as food and drink, directly to customers. Instead, place on an isolated table/counter for customers to pick up.
- Individuals alternate distancing if both need to use space, such as when serving drinks or purchasing items. For example, customer approaches counter with items while assistant distant, then customer backs off while items are scanned, then assistant backs off while customer pays and takes items.

1.7 Limit intergroup mixing

- Focus on constraining 'long' connections between people in different social groups who seldom or rarely interact (e.g. people with a shared interest, work visitors) rather than short connections between people in similar social groups who regularly interact with one another (e.g. close family, colleagues, close friends).
- Ask people to identify their bubble—everyone they live with or must have contact with during “lockdown”—and ask people to stay as much as possible within their bubble. This was advice given by the Prime Minister in New Zealand [[17 < https://www.9news.com.au/world/coronavirus-new-zealand-begins-new-life-in-lockdown-bubble/43778717-e7bb-412e-b289-a27ab8ef174f>](#)].

- Use social media to formally ask people to identify their bubble (will also help with track and tracing if applied). Already developed in Singapore; being developed elsewhere [[18 < https://cpg.doc.ic.ac.uk/blog/evaluating-contact-tracing-apps-here-are-8-privacy-questions-we-think-you-should-ask/>](https://cpg.doc.ic.ac.uk/blog/evaluating-contact-tracing-apps-here-are-8-privacy-questions-we-think-you-should-ask/)].
- Retain the same members sharing spaces (e.g. teams at work, production lines, shifts, classes in schools).
- Split and separate teams doing key work in case one team gets infected.
- Avoid or discourage sharing spaces, such as cars, except with usual contacts.

1.8 Limit contact while undertaking travel

- Restrict capacity on transport, e.g. limiting planes to 75% capacity in China [[19 < http://www.caac.gov.cn/en/XWZX/202003/t20200326_201748.html>](http://www.caac.gov.cn/en/XWZX/202003/t20200326_201748.html)].
- Restrict public transport to specified groups (e.g. key workers).
- Provide extra parking for additional cars and bicycles.
- Offer free bicycles to reduce the use of public transport, e.g. in London, UK [[20 < https://www.independent.co.uk/news/uk/home-news/coronavirus-nhs-staff-free-bikes-bicycle-brompton-buzzbike-a9423231.html>](https://www.independent.co.uk/news/uk/home-news/coronavirus-nhs-staff-free-bikes-bicycle-brompton-buzzbike-a9423231.html)].
- Widen/install new bike lanes, to encourage bike use (instead of buses/trains) and allow cyclists more physical space. This has been done in Berlin, Germany [[2 < https://www.berlin.de/ba-friedrichshain-kreuzberg/aktuelles/pressemitteilungen/2020/pressemitteilung.911780.php > 1](https://www.berlin.de/ba-friedrichshain-kreuzberg/aktuelles/pressemitteilungen/2020/pressemitteilung.911780.php)] and is being done in Paris, France [[2 < https://www.forbes.com/sites/carltonreid/2020/04/22/paris-to-create-650-kilometers-of-pop-up-corona-cycleways-for-post-lockdown-travel/> 2](https://www.forbes.com/sites/carltonreid/2020/04/22/paris-to-create-650-kilometers-of-pop-up-corona-cycleways-for-post-lockdown-travel/)].
- Encourage use of electric bikes and scooters to reduce use of public transport.
- Move public transport to reduced hours (e.g. Sunday timetable) to reduce contact for drivers.
- Encourage passengers to leave spaces between themselves.
- Block out alternate seats or alternate rows of seats.
- Restrict seats around a table, e.g. on trains or coaches, to groups traveling together.
- Fill space to minimise close interactions (e.g. fill window seats before aisle seats).
- If seats are pre-booked, distribute individuals and groups to optimise spacing.
- Install plastic shields between seats in buses, trains, rapid transit.
- Where present, use doors away from staff for entry/exit of public transport and keep passengers away from staff, to protect the driver and spread via the driver (e.g.

disabling the front doors on buses and blocking out all seats in the front half).

- Businesses plan for any staff who fall ill at work to have means to return home safely.
- Remove distinctions between first and economy class seats on public transport as a quick way of increasing capacity with spacing.

1.9 Spread out use of shared space, including canteen, shop or open space

- Stagger start and finish times of users or staff.
- Introduce a booking system to enable people to book time slots.
- Expand the phone technology used to detect congested areas (e.g. roads, shops or exercise areas).
- Allocate time slots by verifiable groups such as first letter of surname [[23 < http://www.govmu.org/English/News/Pages/Covid-19-Government-proposes-set-of-measures-to-support-households-and-communities.aspx >](http://www.govmu.org/English/News/Pages/Covid-19-Government-proposes-set-of-measures-to-support-households-and-communities.aspx)], identity card number, house number (e.g. odd/even) for spaces used by communities who know where people live, street, car registration number [[24 < https://www.nature.com/articles/srep41652 >](https://www.nature.com/articles/srep41652)], social group (e.g. families with children, retired individuals), or work group.
- Limit time inside shared space, but consider that this might result in more frequent visits. Mauritius has limited shopping visits to 30 minutes [[23 < http://www.govmu.org/English/News/Pages/Covid-19-Government-proposes-set-of-measures-to-support-households-and-communities.aspx >](http://www.govmu.org/English/News/Pages/Covid-19-Government-proposes-set-of-measures-to-support-households-and-communities.aspx)].
- Mark out train carriages on platforms, and tell passengers how to redistribute by announcement and through cameras on train (eventually done electronically).
- Divide into groups and rotate use of shared space (e.g. office staff alternating attendance, students attending classes every two or three weeks).
- Automated system that directs train passengers to less occupied carriages (already available in many countries including UK and Germany).
- Drivers wait in car when dropping off or picking up objects or people.
- Have a time period (such as 10am–12pm) in which only vulnerable people can leave their houses.
- Phase in spacing methods. For example, by initially only opening public spaces at less popular times and with stringent conditions.

- Only allow single individuals at one time to use public spaces (such as a shop), except where assistance is needed.
- Encourage vulnerable individuals to visit shared areas early in the day (especially if cleaned overnight) or at other low use times.
- Erect plastic compartments to separate groups in settings such as parks or beaches [[25 < https://news.sky.com/story/coronavirus-hope-for-holidaymakers-as-cu-urges-smart-solutions-for-tourists-11976383>](https://news.sky.com/story/coronavirus-hope-for-holidaymakers-as-cu-urges-smart-solutions-for-tourists-11976383)].
- Provide live announcements on spacing (e.g. how crowded the canteen is).

1.10 Maintain maximum number using a location

This entails setting a limit to the numbers allowed in a space (e.g. shop, canteen, doctor's surgery, park, or train carriage) and then, once achieved, limiting access to one-in one-out.

- Set security access pass system or QR codes to limit numbers.
- Use an entry and exit ticket system with barriers similar to those operated in car parks.
- Use Wi-Fi cameras in rooms or train carriages. People log onto the camera via Wi-Fi to know when to go in or where there is available space.
- Design system so doors automatically shut once numbers exceed a given threshold as detected by phone signals.
- Queue-in-your-car system where you text the supermarket you want to shop in, sit in your car, and then get an alert when it is your turn to go inside, as trialled in New Zealand [[26 < https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12322729>](https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12322729)].
- Individuals queue online and are told when their turn is to leave house, office or desk for e.g. doctor's survey or lunch.

1.11 Expand space or time for shared activities

- Provide access to nearby open spaces (e.g. playing fields, golf courses, farms, educational campuses), perhaps with compensation to the owners or neighbours, where options are limited or crowded.

- Increase open access rights to private land to reduce crowding in parks.
- Incentivise well-managed access to private land for local communities.
- Create an online platform to enable use of nearby unused gardens or open space, especially where these are limited.
- Increase size of space used (e.g. meeting room).
- Increase the number or size of facilities, such as eating areas or changing rooms, to increase spacing.
- Exclude or limit traffic to certain roads/lower speed limits so that they can be used for exercise and recreation and to facilitate physical distancing while walking/cycling.
- Run activity for longer (e.g. increase canteen hours).
- Repeat events (e.g. church services or talks).

1.12 Increase physical spacing

- Use clear, colourful markings on the ground to space people out (e.g. grid to show where to eat lunch or spaces in queues), make these tactile to facilitate access for those with limited vision.
- Use effective messaging, asking people to observe physical distancing.
- Employ dedicated staff to help people observe physical distancing in queues and enforce norms where necessary.
- Avoid restocking of shops when customers are inside the building if it causes congestion.
- Maintain gaps between workspaces (e.g. only opening every second checkout, increasing space between desks in open plan offices).
- Alternate seats on each side of narrow tables (i.e. avoid seats directly opposite each other).
- Reduce the maximum capacity for rooms to allow greater distance between individuals.
- Encourage or enforce use of stairs rather than lifts for those able to do so.
- Limit number using a lift at one time e.g. one person or household or one person in each corner if large lift.
- Only allow disabled/elderly people to use lifts.
- Increase spacing on escalators (e.g. paint out alternate steps with steps shared only by people from the same household).
- Discourage or ban walking on escalators.

- Increase access points to reduce congestion.
- Separate walkers, runners and cyclists.

1.13 Reduce counterflow interactions

The logic is that a one-directional flow increases physical spacing.

- Create one-way routes around buildings, shops, exercise routes and other spaces using arrows and barriers.
- Encourage or enforce walking clockwise around shared spaces.
- Encourage or enforce walking on one side of paths, pavements or sidewalks (the precise option may depend on local traffic rules or social norms).
- If there are two staircases in a building, consider making one up and one down.
- Clearly separate entrances and exits (considering how this impacts flow outside).
- At congested entry points give directions for users to alternate who goes next from the physically-distanced queue on each side.

1.14 Hinder transmission through air

- Install barriers and/or transparent screens, e.g. in shops or public vehicles.
- Hold events outdoors where possible.
- Increase ventilation indoors to help ensure that infectious aerosols are diluted and flushed out.
- When working close to others, stay back-to-back or side-to-side rather than face-to-face.
- When exercising close to others, avoid slipstreaming [[27 < http://www.urbanphysics.net/COVID19_Aero_Paper.pdf >](http://www.urbanphysics.net/COVID19_Aero_Paper.pdf)].

2. REDUCE TRANSMISSION THROUGH CONTAMINATED ITEMS OR SURFACES

Guidance from the CDC is that the SARS-CoV-2 virus may be transmitted when people touch surfaces contaminated with the virus before touching their nose, mouth or eyes, but that this appears

less important than person-to-person spread [28 <

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

2.1 Remove objects requiring physical contact

- Where possible, remove systems that need skin contact, such as door handles or fingerprint scanners.
- Review objects touched by multiple individuals (e.g. water dispensers, public seating or magazines in aircraft) and consider removing those that are not essential, especially those difficult to clean.
- Where practical, remove or prop open doors and gates indoors and outdoors.

2.2 Improve ease of carrying out activities without contact

- Use automated, contactless, systems such as automatic doors, automatic taps, automated pedestrian crossings [29 <
<https://transportnsw.info/news/2020/automated-pedestrian-crossings-expanded-in-nsw>>] or automatic disinfectant dispensers.
- Replace bins with lids in public spaces with foot operated lids or open bins.
- Develop phone App to sign for packages without needing to use delivery courier's e-pen.
- Replace package sign-in with courier photo of delivery at address showing the door opened (already in place for most courier companies in the UK).
- Use a personal pointer when touching shared screens instead of fingertips.
- Plastic bag charge waived for online delivery to encourage leaving outside the property and reduce contact.
- Make plastic bags mandatory for online delivery with bags to be left outside property and brought in by customer.
- Develop no-plug charging for the next generation electric vehicle fleet and other appliances.
- Replace touch screen recognition with voice recognition.

2.3 Increase use of contactless payment

- Encourage or require paying by card to reduce handling money.
- Encourage or require contactless payment (including through phones) to reduce contact with payment terminals.
- Increase maximum allowance for contactless payments, as done in Estonia [[30 < https://news.err.ee/1068231/contactless-payment-limit-increased-to-50-to-limit-spread-of-coronavirus>](https://news.err.ee/1068231/contactless-payment-limit-increased-to-50-to-limit-spread-of-coronavirus)].
- Remove fee (if present) for minimum payment by contactless to encourage use.
- Make contactless payment the default option at self-checkouts to reduce the need to touch the screen.
- Print barcodes on supermarket carrier bags to enable them to be paid for by scanning.
- Enable small outlets to take payments over the phone (some banks are reluctant to allow this), for example to allow customers to collect goods outside.

2.4 Design systems to reduce shared contact

- Remove self-packaging options when purchasing food by pre-packaging at production stage (e.g. for fresh bread and vegetables).
- Create convention that different people touch different areas of objects, for example design refuse bins so collectors touch different areas from householders (e.g. centre element of handle red and marked “do not touch” or designed with separate handle)
- Use drones for delivery, as in parts of China [[31 < https://www.weforum.org/agenda/2020/03/three-ways-china-is-using-drones-to-fight-coronavirus/>](https://www.weforum.org/agenda/2020/03/three-ways-china-is-using-drones-to-fight-coronavirus/)].
- Use driverless vehicles for delivery.
- Modify supermarket trolleys so they are no longer coin operated.
- Locate bar codes so the cashier does not have to touch any goods.
- Extend the conveyor belt to move goods towards customers without the cashier pushing them.
- Use messaging to reduce unnecessary touching of items, for example items in shops unless bought (i.e. apply a “touch it and take it” rule).
- Have a ‘reject’ bin for mouldy/broken items once touched.

- All rubbish, such as waste after eating, placed straight in the bin rather than left for someone else to clear up.
- Encourage use of ‘Scan and Go’ technology in shops where items are directly scanned and bagged by the customer whilst shopping, including the use of personal mobile phones as scanners.
- Present barcode/QR codes on shelf labels so customers can obtain information (including allergy information) remotely.
- Ensure products are stacked on shelves with labels and barcodes facing outwards to remove need for touching.
- Remove unnecessary food packaging as soon as possible after purchase, and dispose of (ideally in a lidded waste bin).
- Provide each team or group with their own communal facilities (e.g. tables, washbasins or washrooms, kitchens, communal rooms).

2.5 Use tools to avoid direct contact

- Tools provided to individuals (e.g. tongs by shop) to remove direct contact with items. Tools decontaminated before the next use.
- Individuals bring their own tools, such as tongs to pick up shopping and probes to press PIN (tools ideally designed to be multifunctional). Tool decontamination available at entry and exit.
- Provide gloves before using common facilities, such as petrol pumps and upon entry to shops. Provide bins to correctly dispose of gloves at end of use.
- Eat with utensils rather than fingers.
- Cover objects that require shared contact (e.g. eyepieces on microscopes) with cling film and replace between users.

2.6 Reduce touching with palm and especially fingers

- Use a finger joint rather than fingertip to touch objects (such as doorbell or PIN keypad).
- Replace round knob-style door handles with lever handles that could be operated using probes.
- Use an elbow or back rather than hands to push heavier items (such as doors)

- Redesign or adapt objects requiring physical contact to reduce hand contact, such as foot- or elbow-operated public water dispensers, gates or doors. Could use 3D-printed parts [[32 < https://www.materialise.com/en/hands-free-door-opener >](https://www.materialise.com/en/hands-free-door-opener)].

2.7 Reduce multiple people touching objects

- Have single person touching object normally touched by many, e.g. a member of staff to refuel cars to prevent multiple handling of petrol pumps.
- Shorten production lines where feasible, or fix working relationships so that each individual in a production line only has to interact with a limited number of colleagues. For instance assign the same individual to production and packaging or always have one worker package another worker's produce.

2.8 Encourage sole use of items

- Individuals use their own rather than shared items, e.g. tools, staplers, water bottles instead of glasses (whilst considering the contamination risk from home).
- Encourage workers to bring their own food and pre-prepare items before coming to work.
- Do not provide communal utensils for eating or drinking in the workplace, unless they can be properly cleaned between uses.
- Eat at own desk where possible.
- Work at own desk rather than hotdesking.

2.9 Minimise reuse of objects

- Greater use of disposable cups, cutlery and plates so long as these can be disposed of safely.
- Stop customers from using their own, reusable food containers, e.g. in Starbucks across Europe, Middle East and Africa [[33 < https://edition.cnn.com/2020/03/04/business/starbucks-coronavirus/index.html >](https://edition.cnn.com/2020/03/04/business/starbucks-coronavirus/index.html)].
- Ban use of reusable shopping bags, e.g. in California [[34 < https://www.sfgate.com/living-in-sf/article/SF-outlaws-reusable-bags- >](https://www.sfgate.com/living-in-sf/article/SF-outlaws-reusable-bags-)].

[which-the-city-once-15178185.php>\].](#)

- Suspend or postpone plastic bag bans or charges in grocery stores, to discourage use of reusable shopping bags, e.g. in the USA [[35 < https://www.bloomberg.com/opinion/articles/2020-04-22/thanks-to-coronavirus-plastic-bags-are-making-a-comeback>\].](#)
- Replace whiteboard erasers in classrooms or offices with disposable wipes.

2.10 Use safer surfaces

Copper is known to inactivate viruses, including SARS-CoV-2 [[36 < http://doi.org/10.1056/NEJMc2004973>\], much more quickly than other common surface materials \[\[37 < https://doi.org/10.1111/jam.13681>\\]. SARS-CoV-2 virus is also less persistent on paper/cardboard than on plastic \\[\\[36 < http://doi.org/10.1056/NEJMc2004973>\\\].\\]\\(#\\)\]\(#\)](#)

- Add copper surfaces to communal/public spaces, healthcare facilities and other critical locations.
- Use paper instead of plastic bags.

3. ENHANCE CLEANING AND HYGIENE

Improved personal hygiene and especially handwashing is standard guidance [[38 < https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html>\]. Cloth face coverings may result in self-contamination or a false sense of security, potentially leading to less adherence to other preventive measures, such as physical distancing \[\[39 < https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-\\(2019-ncov\\)-outbreak>\\]. However, they are currently recommended by the CDC for all people over two years old while in public settings \\[\\[40 < https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html>\\\], especially to reduce transmission risk.\\]\\(#\\)\]\(#\)](#)

3.1 Improve hand washing practice

This includes increasing the frequency with which people wash their hands and/or the standard of washing.

- Encourage regular, effective, handwashing (including arms if they are kept bare) especially when changing location or after possible contamination.
- Improve access to water and soap, or sanitiser to those who lack access to basic handwashing facilities.
- Invest in low-tech handwashing stations in low-resource communities [[41 < https://doi.org/10.1186/1471-2458-13-877 >](https://doi.org/10.1186/1471-2458-13-877)], which can be installed at bus stops, etc.
- Provide information on how to effectively wash hands, accepting varying guidance [[42 < https://fivethirtyeight.com/features/20-seconds-30-seconds-45-seconds-how-long-should-you-wash-your-hands/ >](https://fivethirtyeight.com/features/20-seconds-30-seconds-45-seconds-how-long-should-you-wash-your-hands/)].
- Use signage in bathrooms that communicates the risks of not washing hands. A study showed this was effective in the UK in increasing the proportion of people that washed their hands [[43 < https://doi.org/10.2105/AJPH.2009.164160 >](https://doi.org/10.2105/AJPH.2009.164160)].
- If a sink tap is programmed to run only for a short period of time, increase that length of time (if technically feasible) to avoid having to press the tap again mid-wash (also decreases the risk that people wash their hands for too little time).
- Ensure that sink water temperature is not too hot so that hands can be held under whilst washing.
- In the absence of automated sink taps, install taps that can be switched on and off without fingers.
- Replace separate sink taps with a single mixer tap to make hand-washing more effective.
- Ensure sinks are deep enough to facilitate effective hand-washing and to avoid accidental touching of the sink while washing hands.
- Provide hand washing facilities at entrances, exits and at areas of potential contamination.
- Provide automatic alcohol-based hand sanitisers at entrances, exits and at areas of potential contamination.
- Provide automatic alcohol-based hand sanitisers on public transport.
- Encourage or require hand cleaning on arrival and departure.
- Encourage or require hand cleaning before and after dealing with potentially contaminated items.
- Encourage or require hand cleaning before and after eating.

- Provide free soap or sanitiser to key workers and volunteers, such as bin collectors and delivery drivers, to encourage regular washing.

3.2 Improve personal hygiene

- Encourage people to avoid touching face.
- Use vibrating wristband or computer applications to discourage people from touching their face (e.g. <https://donottouchyourface.com/> < <https://donottouchyourface.com/> >).
- Encourage or require people to stop spitting in public places.
- Wash hands thoroughly before and after touching the face.
- Encourage people to sneeze or cough into their elbow rather than hand (to reduce further transmission).
- Encourage people to carry tissues and place them in a bin after coughing, sneezing, or wiping their face, rather than using clothing or handkerchiefs.
- Encourage people to shower upon returning home (particularly for health care workers, bus drivers, shop workers, etc.).
- Increase the number of waste bins available for disposing of tissues in public places.
- Increase the availability of shower facilities at the workplace for health care workers, bus drivers, shop workers, etc.
- Put down the toilet seat cover before flushing to reduce the spread of aerosolised microbes, fit covers where missing.
- Restrict activities to workers who have passed a test of their knowledge of hygiene, as in the Finnish system of Hygiene passports [[44 < https://hygienepassport.fi/hygieniapassi >](https://hygienepassport.fi/hygieniapassi)].

3.3 Increase use of face masks

- Wear masks when outside the home. Currently, face masks are mandatory in areas such as the Czech Republic [[45 < https://www.praguemorning.cz/face-masks-now-mandatory-in-all-prague-shops-and-offices/ >](https://www.praguemorning.cz/face-masks-now-mandatory-in-all-prague-shops-and-offices/)], Slovakia [[46 < https://www.npr.org/sections/coronavirus-live-updates/2020/04/01/825180019/in-big-adjustment-some-european-countries-push-for-residents-to-wear-masks?t=1587397964353 >](https://www.npr.org/sections/coronavirus-live-updates/2020/04/01/825180019/in-big-adjustment-some-european-countries-push-for-residents-to-wear-masks?t=1587397964353)], some parts of China [[4 < https://doi.org/10.1016/S2213-2600\(20\)30134-X >](https://doi.org/10.1016/S2213-2600(20)30134-X) 7], and some

shops in Austria [[48 < https://www.bbc.co.uk/news/world-europe-52143873 >](https://www.bbc.co.uk/news/world-europe-52143873)].

- Provide face masks on entry to premises and facilities for safe disposal of masks on exit.
- Prioritise the supply of face masks to vulnerable groups, including those who may not be able to afford them, and facilitate the washing and/or disposal of facemasks for all after use.
- Prioritise the supply of face masks to key workers.
- Provide public information and training on the safe and effective application, wearing, removal, cleaning and disposal of face masks and other personal protective equipment.
- Ensure high standards of consumer protection against the mis-selling of inadequate, overpriced or inappropriate facemasks and other personal protective equipment.

3.4 Improve laundry practice

- Change and wash clothing on returning home or after possible contamination (particularly for health care workers, bus drivers, shop workers, etc.).
- Avoid shaking dirty laundry before washing to reduce the possibility of dispersing virus through the air.
- Wash and dry laundry bags, or disinfect basket.
- Wash laundry at an appropriate temperature and with an appropriate amount of detergent.
- Dry laundry completely before wearing.
- Fold laundry at home, rather than in public places such as a launderette.
- Support people whose access to clothes washing facilities may be limited due to economic situation or lockdown regulations.

3.5 Use of UV-C

UV-C (short-wavelength ultraviolet light that has germicidal activity) is being used in China to disinfect buses and lifts [[49 < https://www.france24.com/en/20200313-on-mission-to-eradicate-virus-germs-china-firms-see-the-uv-light >](https://www.france24.com/en/20200313-on-mission-to-eradicate-virus-germs-china-firms-see-the-uv-light)]. It cannot be used safely when humans or animals are present.

- Disinfect food with UV-C.
- Disinfect post, money and other objects (e.g. phone or keys) with UV-C.
- Disinfect rooms, vehicles or similar infrastructure with UV-C [[49 < https://www.france24.com/en/20200313-on-mission-to-eradicate-virus-germs-china-firms-see-the-uv-light>](https://www.france24.com/en/20200313-on-mission-to-eradicate-virus-germs-china-firms-see-the-uv-light)].
- Support vulnerable individuals to obtain UV-C cleaning facilities where appropriate.
- Support key workers to obtain UV-C cleaning facilities where appropriate.

3.6 Improve cleaning

A range of biocidal products are effective against SARS-CoV-2 coronavirus; sources of evidence-based guidance include the European Centre for Disease Prevention and Control [[40 < https://www.ecdc.europa.eu/sites/default/files/documents/Environmental-persistence-of-SARS-CoV-2-virus-Options-for-cleaning2020-03-26_0.pdf>](https://www.ecdc.europa.eu/sites/default/files/documents/Environmental-persistence-of-SARS-CoV-2-virus-Options-for-cleaning2020-03-26_0.pdf)] and the United States Environmental Protection Agency [[51 < https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>](https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2)].

- Make the spaces on public transport and other shared spaces easier to rapidly disinfect or wipe down, for example by using non-absorbent materials.
- Regularly treat external shared spaces, such as seats or playgrounds, with disinfectant.
- Regularly clean objects most likely to be contaminated (taps, petrol pumps, door handles, pin machines, etc.).
- Regularly clean workspaces especially high risk areas, such as desks, keyboards, door handles, canteen, toilet and washroom areas, printers, water coolers, and toys in nurseries.
- Reduce the hours that shops and public transport are open to enable cleaning to take place.
- Encourage or require individuals to use disposable wipes to clean shared surfaces and facilities before use.
- Encourage or require people to carry their own disinfectant to routinely use before touching shared objects, such as door handles.
- Provide disinfectant wipes and accompanying disposal facilities for individual use at locations where contamination is more likely, such as to wipe down cards, card machines/door entry systems.

- Deep clean any areas used by people who report feeling ill.
- Clean shared facilities between use by individuals, such as canteen tables, shopping trolleys or self-service touch screens.
- Spray outdoor spaces and vehicles with disinfectant, from drones or aircraft (as in the tropics to control mosquitoes).
- Provide clear guidance on effective ways of cleaning at home (including which disinfectants are already available at home, how to create home-made disinfectants, and which solutions are not effective).
- Provide free disinfectant sprays and refilling stations.
- Create clear industry standards and expectations regarding disinfectant use in hotels, take-away restaurants etc.
- Clean packaging like cans before storing or opening.
- Wash unpackaged produce (e.g. fruit and vegetables) thoroughly under running water before consumption.

3.7 Leave items or areas to decontaminate

Experiments on SARS-CoV-2 show an exponential decay in viral load. The longest viability expressed as median half-lives was approximately 5.6 hours on stainless steel and 6.8 hours on plastic [34 < <https://doi.org/10.1056/NEJMc2004973>>] but lower on cardboard and much lower on copper. Another report [52 < <https://doi.org/10.15585/mmwr.mm6912e3>>] found that SARS-COV-2 could be detected on surfaces for up to 17 days. Research on the influenza virus showed all viable virus was gone after 24 hours on all surfaces tested (plastic, wood, steel and cloth), yet the amount of inert viral material (genetic material) changed very little (only 10–100 times less after 24 hours [53 < <https://doi.org/10.1371/journal.pone.0027932>>]).

- Place non-urgent, non-perishable post-delivered items (letters and packages) in bags and wait before opening.
- Use boxes to collect mail, with the opportunity to inspect without touching so the recipient can decide whether to open or leave to disinfect.
- Deliver items into storage lockers, perhaps with an enforced or encouraged delay between delivery and collection.
- Double bag personal protective equipment and leave to decontaminate before disposal.
- Store items that could be contaminated (e.g. shopping bags) so the one stored longest is taken first.

- As a principle select the least recently used first for anything shared (e.g. hotel rooms or vehicle fleet).
- Where multiple options occur (bus seats on relatively empty buses) or can be created (line of chairs in front of someone running a series of one-to-one meetings) allocate seats to minimise overlap and maximise time since last used.

4. REDUCE TRANSMISSION THROUGH WASTE WATER

4.1 Maintaining wastewater systems

The World Health Organization consensus document on a superspreading SARS event in a housing block in Hong Kong concluded that transmission occurred due to defects in the wastewater plumbing system [54 < <https://apps.who.int/iris/handle/10665/70863>>]. A comment piece on mitigating SARS-CoV-2 transmission via wastewater plumbing systems [55 < [https://doi.org/10.1016/S2214-109X\(20\)30112-1](https://doi.org/10.1016/S2214-109X(20)30112-1)>] suggested the following options for reducing this risk.

- Explore causes of foul smells in bathrooms, kitchens, or wash areas.
- Fit functioning U-bends on water appliances in bathrooms and kitchens.
- Open a tap on all water appliances for at least 5 seconds twice a day (morning and evening) paying special attention to floor drains in bathrooms and wetrooms to prevent the loss of the water-trap seal within a U-bend.
- If the wastewater pipework from an appliance appears to be disconnected or open, seal it immediately (i.e. use an elastic rubber glove to cover the end; a plastic bag and some tape will suffice, ensuring the bag has no holes).
- If there appears to be any crack or leak in pipework, seal with tape or glue.
- Continuously monitor whole system performance (for large or tall buildings).

5. REDUCE TRANSMISSION THROUGH AIR CONDITIONING

One study in China showed that SARS-CoV-2 virus particles were found in the ventilation systems of hospital rooms of patients with COVID-19 [56 < <https://doi.org/10.1001/jama.2020.3227>>].

5.1 Clean or modify use of air conditioning systems

- Ensure air conditioning has an effective filtration system.
- Regularly clean and maintain ventilation systems.
- Keep properties well ventilated to reduce need for air conditioning systems.
- Ensure that air conditioning exhaust vents are located away from public areas.
- Ensure that air conditioning vents cannot feed in through open windows.
- Avoid recirculating air to reduce concentration of infectious aerosols within a system.

6. REDUCE TRANSMISSION THROUGH NON-HUMAN ANIMALS IN THE COMMUNITY

The latest guidance from the Office International des Epizooties (World Organisation for Animal Health) states that “to date, there is no evidence that companion animals play a significant role in spreading SARS-CoV-2” [57 < <https://www.oie.int/en/scientific-expertise/specific-information-and-recommendations/questions-and-answers-on-2019-novel-coronavirus/>>]. However, a study has found that the virus that causes COVID-19 in people can be transmitted, at least experimentally and with high viral doses, to cats and ferrets [58 < <https://doi.org/10.1126/science.abb7015>>]. Some infected cats were then able to pass on the infection to another cat via airborne transmission. Juvenile cats appeared most susceptible to infection, dogs (3 months old) appeared to have low disease susceptibility and pigs, chickens and ducks appeared to have no susceptibility. In April 2020, eight lions and tigers in the Bronx Zoo, New York City and four domestic cats and dogs in Belgium, Hong Kong and the USA have all tested positive for SARS-COV-2 [59 < <https://www.nationalgeographic.com/animals/2020/04/tiger-coronavirus-covid19-positive-test-bronx-zoo/>>].

The CDC advises, as a precautionary measure, that people suffering or suspected to have contracted COVID-19 should restrict their contact with pets [60 < <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/animals.html>>]. Current advice in the UK is to keep cats indoors if someone in the household has shown symptoms of COVID-19 [61 <

<https://www.bbc.com/news/science-environment-52204534>>]. *The possible actions listed here are precautionary options for responding to this potential risk.*

6.1 Physical distancing involving non-human animals

- Encourage physical distancing measures for both wild and pet animals when risk of infection.
- Minimise touching, food sharing and direct contact of suspected infected persons with pet animals, such as cats, to reduce risks of disease transmission.
- Reduce contact between pet animals (e.g. separate food and water bowls; keeping in separate rooms) that have been in contact with people that may/do have COVID-19.
- Keep pet cats indoors when there is a risk of infection.
- Rescue, treat and rehome feral animals.

6.2 Improve hygiene involving non-human animals

- Disinfect and safely dispose of potentially contaminated matter (e.g. cat litter with urine and faeces) from pets that have been in close contact with people with COVID-19 infection.
- Encourage washing of pets, where possible by an intermediary, before handing to veterinarians.

7. RESTRICT DISEASE SPREAD BETWEEN AREAS

Restricting movement is an element in containment within the initial stages of a pandemic and in preventing movement to areas with limited capacity to cope. At later stages it is likely to be used both to prevent spread to isolated communities and between regions with very different levels of infection.

7.1 Reduce movement that exacerbates problem

- Restrict or discourage movement in relation to country of origin of the virus and any confirmed outbreaks.
- Impose regional travel restrictions or closures in response to regional indicators of infection load.
- Prohibit or discourage travel from urban centres to second/family homes in rural communities, to reduce burden on rural health infrastructure. For example, Norwegians have been banned from summer cottages [62 < <https://www.reuters.com/article/health-coronavirus-norway-cabins/government-bans-norwegians-from-travelling-to-cabins-amid-coronavirus-idUSL8N2BC7JV>>].
- Stop or restrict contact with societies that currently have minimal contact and so unlikely to be infected.
- Make information readily available on infection risk and travel restrictions.
- Restrict long-distance travel to specific purposes (e.g. essential work, family emergency, care of relatives) with a clear and enforceable definition of what constitutes long-distance (e.g. a maximum travel radius, crossing local authority boundaries, moving between settlements or going further than strictly necessary for a given task).
- Establish punishments for not obeying rules/guidelines on travel including falsely providing travel history, e.g. in Singapore [63 < <https://www.straitstimes.com/singapore/courts-crime/coronavirus-china-couple-charged-after-allegedly-giving-false-info-to-moh>>].
- Provide incentives for avoiding travel (e.g. refunds for booked tickets, coupons for choosing to cancel tickets).

7.2 Reduce transmission risk of those travelling

- Apply the options described in sections above on identifying infected individuals (physical isolation, reducing contamination, personal hygiene and cleaning) to transport systems.
- Encourage or enforce mandatory quarantine after international travel (e.g. when arriving in Canada [64 < <https://nationalpost.com/pm/news-pmn/canada-news-pmn/what-you-need-to-know-about-the-quarantine-act-as-isolation-becomes-mandatory-for-returning-travellers>>] or New Zealand [65 < <https://www.rnz.co.nz/news/national/413866/covid-19-quarantine-or-managed-isolation-compulsory-for-all-arrivals-into-nz-pm-says>>]) or

between certain cities (e.g. when arriving in Beijing, even from other cities in China [[66 < https://hongkongfp.com/2020/04/14/fearful-of-virus-return-beijing-turns-into-virtual-fortress-with-quarantine-for-all-visitors/ >](https://hongkongfp.com/2020/04/14/fearful-of-virus-return-beijing-turns-into-virtual-fortress-with-quarantine-for-all-visitors/)]).

- Use thermal screening at airports to intercept infected, symptomatic individuals. Note that the effectiveness of this has been questioned [[67 < https://dx.doi.org/10.1126/science.367.6483.1177 >](https://dx.doi.org/10.1126/science.367.6483.1177)].
- Conduct testing before international flights, which also avoids transmission to others on the flight (requires faster testing times, or strict quarantine between tests and result).
- Encourage or mandate quarantine periods prior to essential travel.
- Provide special travel passports/stamps for essential travel for those who can. This requires robust evidence that certain people have developed persistent immunity *and* are not infected.
- Provide people travelling with personal protective equipment.
- Encourage or require people to use their own personal protective equipment when travelling.
- Encourage or require that windows are left open (where appropriate) on shared transport.
- Leave a gap between passengers (unless from the same family/household) whilst travelling (e.g. one seat width).
- Charter entire coaches, trains or planes for a group travelling together, such as sports teams [[6 < https://www.formula1.com/en/latest/article.brawn-2020-fl-season-likely-to-start-in-europe-could-be-behind-closed-doors.4lZy8iGwIkOyiO8QhLVt4k.html >](https://www.formula1.com/en/latest/article.brawn-2020-fl-season-likely-to-start-in-europe-could-be-behind-closed-doors.4lZy8iGwIkOyiO8QhLVt4k.html) 8].

REFERENCES

1. Bischoff W.E., Swett K., Leng I. & Peters T.R. (2013) Exposure to influenza virus aerosols during routine patient care. *The Journal of Infectious Diseases*, 207, 1037–1046. doi:10.1093/infdis/jis773
2. Bourouiba L. (2020). Turbulent gas clouds and respiratory pathogen emissions: potential implications for reducing transmission of COVID-19. *JAMA*. Published online 26 March 2020. doi:10.1001/jama.2020.4756
3. Lewis D. (2020) Is the coronavirus airborne? Experts can't agree. *Nature*, 580, 175. doi:10.1038/d41586-020-00974-w
4. Xiao Z., Leijing H. & Qun Z. (2020) *Schools begin to reopen in China amid strict measures*. Available at: <http://www.xinhuanet.com/english/2020->

- [03/30/c_138931813.htm](http://www.xinhuanet.com/english/2020-03/30/c_138931813.htm) > http://www.xinhuanet.com/english/2020-03/30/c_138931813.htm < http://www.xinhuanet.com/english/2020-03/30/c_138931813.htm > . Published 30 March 2020. Accessed 14 April 2020.
5. Heneghan C., Brassey J. & Jefferson T. (2020) *COVID-19: What proportion are asymptomatic?* Available at: < <https://www.cebm.net/covid-19/covid-19-what-proportion-are-asymptomatic/> > <https://www.cebm.net/covid-19/covid-19-what-proportion-are-asymptomatic/> < <https://www.cebm.net/covid-19/covid-19-what-proportion-are-asymptomatic/> > . Published 6 April 2020. Accessed 24 April 2020.
 6. Anon (2020) *This is how France's new coronavirus lockdown permission form works.* Available at: < <https://www.thelocal.fr/20200317/lockdown-permission-form-what-is-it-and-where-do-you-find-it> > <https://www.thelocal.fr/20200317/lockdown-permission-form-what-is-it-and-where-do-you-find-it> < <https://www.thelocal.fr/20200317/lockdown-permission-form-what-is-it-and-where-do-you-find-it> > . Published 25 March 2020. Updated 31 March 2020. Accessed 21 April 2020.
 7. Romanian Ministry of Home Affairs (2020) *Military ordinance on measures to prevent the spread of COVID-19, 21 March 2020.* Available at: < <https://www.mai.gov.ro/wp-content/uploads/2020/03/MILITARY-%0bORDINANCE-on-measures-to-prevent-the-spread-of-COVID-19.pdf> > <https://www.mai.gov.ro/wp-content/uploads/2020/03/MILITARY-ORDINANCE-on-measures-to-prevent-the-spread-of-COVID-19.pdf> > . Accessed 22 April 2020.
 8. US Embassy & Consulate in Greece (2020) *COVID-19 information, version 22 April 2020.* Available at: <https://gr.usembassy.gov/covid-19-information/> < <https://gr.usembassy.gov/covid-19-information/> > . Accessed 24 April 2020.
 9. Anon (2020) *No jogging, no hotels, no long dog walks: Lombardy's new quarantine rules.* Available at: < <https://www.thelocal.it/20200323/lombardy-new-quarantine-rules-italy> > <https://www.thelocal.it/20200323/lombardy-new-quarantine-rules-italy> < <https://www.thelocal.it/20200323/lombardy-new-quarantine-rules-italy> > . Published 23 March 2020. Accessed 24 April 2020.
 10. National Health Service (2020) *Staying at home and away from other people (social distancing).* Available at: < <https://www.nhs.uk/conditions/coronavirus-covid-19/staying-at-home-to-avoid-getting-coronavirus/staying-at-home-and-away-from-other-people/> > <https://www.nhs.uk/conditions/coronavirus-covid-19/staying-at-home-to-avoid-getting-coronavirus/staying-at-home-and-away-from-other-people/> < <https://www.nhs.uk/conditions/coronavirus-covid-19/staying-at-home-to-avoid-getting-coronavirus/staying-at-home-and-away-from-other-people/> < <https://www.nhs.uk/conditions/coronavirus-covid-19/staying-at-home-to-avoid-getting-coronavirus/staying-at-home-and-away-from-other-people/> <

- [avoid-getting-coronavirus/staying-at-home-and-away-from-other-people>](#)
/. Last reviewed 22 April 2020. Accessed 22 April 2020.
11. Brzozowski A. (2020) *Belgium extends COVID-19 lockdown by two weeks until 19 April*. Available at: [< https://www.euractiv.com/section/coronavirus/news/belgium-extends-covid-19-lockdown-by-two-weeks-until-19-april/>](#)
[https://www.euractiv.com/section/coronavirus/news/belgium-extends-covid-19-lockdown-by-two-weeks-until-19-april/>](#)
[https://www.euractiv.com/section/coronavirus/news/belgium-extends-covid-19-lockdown-by-two-weeks-until-19-april/<](#)
[https://www.euractiv.com/section/coronavirus/news/belgium-extends-covid-19-lockdown-by-two-weeks-until-19-april/>](#). Published 27 March 2020. Accessed 24 April 2020.
 12. Anon (2020) *UPDATE: What are France's rules on jogging and cycling during coronavirus lockdown?* Available at: [< https://www.thelocal.fr/20200319/france-tightens-rules-on-jogging-during-coronavirus-lockdown>](#)
[https://www.thelocal.fr/20200319/france-tightens-rules-on-jogging-during-coronavirus-lockdown](#) [< https://www.thelocal.fr/20200319/france-tightens-rules-on-jogging-during-coronavirus-lockdown>](#). Published 19 March 2020. Updated 24 March 2020. Accessed 22 April 2020.
 13. Cucalón A. (2020) *El Presidente de Perú decreta toque de queda en todo el país*. Available at: [< https://cnnespanol.cnn.com/2020/03/18/alerta-presidente-de-peru-decreta-toque-de-queda-en-todo-el-pais/#0>](#)
[https://cnnespanol.cnn.com/2020/03/18/alerta-presidente-de-peru-decreta-toque-de-queda-en-todo-el-pais/#0](#) [< https://cnnespanol.cnn.com/2020/03/18/alerta-presidente-de-peru-decreta-toque-de-queda-en-todo-el-pais/#0>](#). Published 18 March 2020. Accessed 14 April 2020.
 14. Der Spiegel (2020) *Plaudern hinter Plexiglas*. Available at: [https://www.spiegel.de/panorama/coronavirus-besuchscontainer-gegen-einsamkeit-in-den-niederlanden-a-05722a97-b67a-4a90-8f16-32efe10ba318](#) [< https://www.spiegel.de/panorama/coronavirus-besuchscontainer-gegen-einsamkeit-in-den-niederlanden-a-05722a97-b67a-4a90-8f16-32efe10ba318>](#). Published 15 April 2020. Accessed 10 May 2020.
 15. Bianchi C. & Kwan B. (2020) *How Australians are adapting to strict new rules for weddings and funerals*. Available at: [< https://www.sbs.com.au/news/how-australians-are-adapting-to-strict-new-rules-for-weddings-and-funerals>](#)
[https://www.sbs.com.au/news/how-australians-are-adapting-to-strict-new-rules-for-weddings-and-funerals](#) [< https://www.sbs.com.au/news/how-](#)

- [australians-are-adapting-to-strict-new-rules-for-weddings-and-funerals>](#). Updated 26 March 2020. Accessed 24 April 2020.
16. Gouvernement France (2020) *Stratégie de déconfinement*. Available at: <https://www.gouvernement.fr/info-coronavirus/strategie-de-deconfinement> < <https://www.gouvernement.fr/info-coronavirus/strategie-de-deconfinement>>. Accessed 10 May 2020.
 17. Australian Associated Press (2020) *New Zealand now in a lockdown 'bubble' to control COVID-19 spread*. Available at: < <https://www.9news.com.au/world/coronavirus-new-zealand-begins-new-life-in-lockdown-bubble/%0b43778717-e7bb-412e-b289-a27ab8ef174f>> <https://www.9news.com.au/world/coronavirus-new-zealand-begins-new-life-in-lockdown-bubble/43778717-e7bb-412e-b289-a27ab8ef174f> < <https://www.9news.com.au/world/coronavirus-new-zealand-begins-new-life-in-lockdown-bubble/43778717-e7bb-412e-b289-a27ab8ef174f>>. Published 26 March 2020. Accessed 24 April 2020.
 18. de Montjoye Y.-A., Houssiau F., Gadotti A. & Guepin F. (2020) *Evaluating COVID-19 contact tracing apps? Here are 8 privacy questions we think you should ask*. Available at: <https://cpg.doc.ic.ac.uk/blog/evaluating-contact-tracing-apps-here-are-8-privacy-questions-we-think-you-should-ask/> < <https://cpg.doc.ic.ac.uk/blog/evaluating-contact-tracing-apps-here-are-8-privacy-questions-we-think-you-should-ask/>>. Published 2 April 2020. Accessed 14 April 2020.
 19. Civil Aviation Administration of China (2020) *Notice on further reducing international passenger flights during the epidemic prevention and control period, 26 March 2020*. Available at: < http://www.caac.gov.cn/en/XWZX/%0b202003/t20200326_201748.html> http://www.caac.gov.cn/en/XWZX/202003/t20200326_201748.html < http://www.caac.gov.cn/en/XWZX/202003/t20200326_201748.html>. Accessed 24 April 2020.
 20. Sullivan R. (2020) *How bike rental companies are helping NHS staff get to work and avoid public transport*. Available at: < <https://www.independent.co.uk/news/uk/home-news/coronavirus-nhs-staff-free-bikes-bicycle-brompton-buzzbike-a9423231.html>> <https://www.independent.co.uk/news/uk/home-news/coronavirus-nhs-staff-free-bikes-bicycle-brompton-buzzbike-a9423231.html> < <https://www.independent.co.uk/news/uk/home-news/coronavirus-nhs-staff-free-bikes-bicycle-brompton-buzzbike-a9423231.html>>. Published 29 March 2020. Accessed 22 April 2020.

21. Bezirksamt Friedrichshain-Kreuzberg von Berlin (2020) *Temporäre einrichtung und erweiterung von eadverkehrsanlagen während der pandemie-krise*. Available at: <https://www.berlin.de/ba-friedrichshain-kreuzberg/aktuelles/pressemitteilungen/2020/pressemitteilung.911780.php> < <https://www.berlin.de/ba-friedrichshain-kreuzberg/aktuelles/pressemitteilungen/2020/pressemitteilung.911780.php> >. Published 25 March 2020. Accessed 14 April 2020.
22. Reid C. (2020) *Paris to create 650 kilometers of post-lockdown cycleways*. Available at: < <https://www.forbes.com/sites/carltonreid/2020/04/22/paris-to-create-650-kilometers-of-pop-up-corona-cycleways-for-post-lockdown-travel/> > <https://www.forbes.com/sites/carltonreid/2020/04/22/paris-to-create-650-kilometers-of-pop-up-corona-cycleways-for-post-lockdown-travel/> < <https://www.forbes.com/sites/carltonreid/2020/04/22/paris-to-create-650-kilometers-of-pop-up-corona-cycleways-for-post-lockdown-travel/> >. Published 22 April 2020. Accessed 24 April 2020.
23. Government of Mauritius (2020) *COVID-19: Government proposes set of measures to support households and communities*. Available at: <http://www.govmu.org/English/News/Pages/Covid-19-Government-proposes-set-of-measures-to-support-households-and-communities.aspx> < <http://www.govmu.org/English/News/Pages/Covid-19-Government-proposes-set-of-measures-to-support-households-and-communities.aspx> >. Published 31 March 2020. Accessed 14 April 2020.
24. Davis L.W. (2017) Saturday driving restrictions fail to improve air quality in Mexico City. *Scientific Reports*, 7, 41652. doi:10.1038/srep41652
25. Anon (2020) *Coronavirus: Sunbathing in perspex boxes? EU looking at 'smart solutions' for holidaymakers*. Available at: < <https://news.sky.com/story/coronavirus-hope-for-holidaymakers-as-eu-urges-smart-solutions-for-tourists-11976383> > <https://news.sky.com/story/coronavirus-hope-for-holidaymakers-as-eu-urges-smart-solutions-for-tourists-11976383> < <https://news.sky.com/story/coronavirus-hope-for-holidaymakers-as-eu-urges-smart-solutions-for-tourists-11976383> >. Published 21 April 2020. Accessed 24 April 2020.
26. Feek B. (2020) *Covid 19 Coronavirus: Pak'nSave, new world supermarkets trial Queue in Your Car system*. Available at: https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12322729 < https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12322729 >. Published 6 April 2020. Accessed 14 April 2020.

27. Blocken B., Malizia F., van Druenen T. & Marchal T. (2020) Towards aerodynamically equivalent COVID-19 1.5 m social distancing for walking and running. Self-archived Preprint. http://www.urbanphysics.net/COVID19_Aero_Paper.pdf < http://www.urbanphysics.net/COVID19_Aero_Paper.pdf> .
28. Centers for Disease Control and Prevention (2020) *How COVID-19 spreads, version 13 April 2020*. Available at: < <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html>> <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html> < <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html>> . Accessed 10 May 2020.
29. Transport for NSW (2020) *Automated pedestrian crossings expanded in NSW*. Available at: < <https://transportnsw.info/news/2020/automated-pedestrian-crossings-expanded-in-nsw>> <https://transportnsw.info/news/2020/automated-pedestrian-crossings-expanded-in-nsw> < <https://transportnsw.info/news/2020/automated-pedestrian-crossings-expanded-in-nsw>> . Published 17 April 2020. Accessed 22 April 2020.
30. Baltic News Service (2020) *Contactless payment limit increased to €50 to limit spread of coronavirus*. Available at: < <https://news.err.ee/1068231/contactless-payment-limit-increased-to-50-to-limit-spread-of-coronavirus>> <https://news.err.ee/1068231/contactless-payment-limit-increased-to-50-to-limit-spread-of-coronavirus> < <https://news.err.ee/1068231/contactless-payment-limit-increased-to-50-to-limit-spread-of-coronavirus>> . Published 24 March 2020. Accessed 21 April 2020.
31. Yang J. & Reuter T. (2020) *3 ways China is using drones to fight coronavirus*. <https://www.weforum.org/agenda/2020/03/three-ways-china-is-using-drones-to-fight-coronavirus/> < <https://www.weforum.org/agenda/2020/03/three-ways-china-is-using-drones-to-fight-coronavirus/>> . Published 16 March 2020. Accessed 23 April 2020.
32. Materialise (2020) *Hands-free 3D-printed door openers to help against the spread of coronavirus*. Available at: < <https://www.materialise.com/en/hands-free-door-opener.%20Accessed%202014%20April%202020>> <https://www.materialise.com/en/hands-free-door-opener> < <https://www.materialise.com/en/hands-free-door-opener>> . Accessed 14 April 2020.
33. Alcorn C. (2020) You can't get your own mug filled at Starbucks anymore because of coronavirus. Available at: < [https://www.abcnews.com/health/2020/03/20/starbucks-mug-coronavirus/](#)> .

- <https://edition.cnn.com/2020/03/04/business/starbucks-coronavirus/index.html>>
<https://edition.cnn.com/2020/03/04/business/starbucks-coronavirus/index.html> <
<https://edition.cnn.com/2020/03/04/business/starbucks-coronavirus/index.html>>. Published 6 March 2020. Accessed 22 April 2020.
34. Moffitt M. (2020) *SF outlaws reusable bags, which the city once championed*. Available at: <https://www.sfgate.com/living-in-sf/article/SF-outlaws-reusable-bags-which-the-city-once-15178185.php> < <https://www.sfgate.com/living-in-sf/article/SF-outlaws-reusable-bags-which-the-city-once-15178185.php>>. Published 3 April 2020. Accessed 22 April 2020.
35. Minter A. (2020) *Plastic bags are making a comeback. Will it last?* Available at: <https://www.bloomberg.com/opinion/articles/2020-04-22/thanks-to-coronavirus-plastic-bags-are-making-a-comeback> < <https://www.bloomberg.com/opinion/articles/2020-04-22/thanks-to-coronavirus-plastic-bags-are-making-a-comeback>>. Published 22 April 2020. Accessed 22 April 2020.
36. van Doremalen N., Bushmaker T., Morris D.H., Holbrook M.G., Gamble A., Williamson B.N. et al. (2020) Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *New England Journal of Medicine*. doi:10.1056/NEJMc2004973
37. Vincent M., Duval R.E., Hartemann P. & Engels-Deutsch M. (2018) Contact killing and antimicrobial properties of copper. *Journal of Applied Microbiology*, 124, 1032–1046. doi:10.1111/jam.13681.
38. Centers for Disease Control and Prevention (2020) *How to protect yourself and others, version 24 April 2020*. Available at: < <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html.%20Accessed%2024%20April%202020>>
<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html> < <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html>>. Accessed 10 May 2020.
39. World Health Organization (2020) *Advice on the use of masks in the context of COVID-19, version 6 April 2020*. Available at: < [https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-\(2019-ncov\)-outbreak](https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-(2019-ncov)-outbreak)> [https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-\(2019-ncov\)-outbreak](https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-(2019-ncov)-outbreak) < [https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-\(2019-ncov\)-outbreak](https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-(2019-ncov)-outbreak)>

- [the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-\(2019-ncov\)-outbreak>](#). Accessed 24 April 2020.
40. Centers for Disease Control and Prevention (2020) *Recommendation regarding the use of cloth face coverings, especially in areas of significant community-based transmission, version 3 April 2020*. Available at: <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html.%20Accessed%2024%20April%202020> <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html> <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html>. Accessed 10 May 2020.
41. Hulland K.R., Leontsini E., Dreibelbis R., Unicomb L., Afroz A., Dutta N.C. et al. (2013) Designing a handwashing station for infrastructure-restricted communities in Bangladesh using the integrated behavioural model for water, sanitation and hygiene interventions (IBM-WASH). *BMC Public Health*, 13, 877. doi:10.1186/1471-2458-13-877
42. Koerth M. (2020) *Hand-washing technique is surprisingly controversial*. Available at: <https://fivethirtyeight.com/features/20-seconds-30-seconds-45-seconds-how-long-should-you-wash-your-hands/> <https://fivethirtyeight.com/features/20-seconds-30-seconds-45-seconds-how-long-should-you-wash-your-hands/>. Published 31 March 2020. Accessed 14 April 2020.
43. Judah G., Aunger R., Schmidt W.P., Michie S., Granger S. & Curtis V. (2009) Experimental pretesting of hand-washing interventions in a natural setting. *American Journal of Public Health*, 99(S2), S405–S411. doi:10.2105/AJPH.2009.164160
44. Finnish Service (2020) *Hygiene passport*. Available at: <https://hygienepassport.fi/hygeniapassi> <https://hygienepassport.fi/hygeniapassi>. Accessed 24 April 2020.
45. Anon (2020) *Face masks now mandatory in all Prague shops and offices*. Available at: <https://www.praguemorning.cz/face-masks-now-mandatory-in-all-prague-shops-and-offices/> <https://www.praguemorning.cz/face-masks-now-mandatory-in-all-prague-shops-and-offices/>. Published 18 March 2020. Accessed 24 April 2020.
46. Dwyer C. (2020) *In 'big adjustment,' some European countries push for residents to wear masks*. Available at: <https://www.npr.org/sections/coronavirus-live-updates/2020/04/01/825180019/in-big-adjustment-some-european-countries-push-for-residents-to-wear-masks?t=1587397964353&t=1587736491975>

- <https://www.npr.org/sections/coronavirus-live-updates/2020/04/01/825180019/in-big-adjustment-some-european-countries-push-for-residents-to-wear-masks?t=1587397964353&t=1587736491975> <
<https://www.npr.org/sections/coronavirus-live-updates/2020/04/01/825180019/in-big-adjustment-some-european-countries-push-for-residents-to-wear-masks?t=1587397964353&t=1587736491975>>. Published 1 April 2020. Accessed 24 April 2020.
47. Feng S., Shen C., Xia N., Song W., Fan M. & Cowling B.J. (2020) Rational use of face masks in the COVID-19 pandemic. *The Lancet Respiratory Medicine*. doi:10.1016/S2213-2600(20)30134-X.
48. Bell B. (2020) *Coronavirus: Why you now have to wear a mask in Austrian shops*. <https://www.bbc.com/news/world-europe-52143873> <
<https://www.bbc.com/news/world-europe-52143873>>. Published 6 April 2020. Accessed 24 April 2020.
49. Agence France-Presse (2020) *On mission to eradicate virus germs, China firms see the UV light*. Available at: < <https://www.france24.com/en/20200313-on-mission-to-eradicate-virus-germs-china-firms-see-the-uv-light>>
<https://www.france24.com/en/20200313-on-mission-to-eradicate-virus-germs-china-firms-see-the-uv-light> <
<https://www.france24.com/en/20200313-on-mission-to-eradicate-virus-germs-china-firms-see-the-uv-light>>. Published 13 March 2020. Accessed 23 April 2020.
50. European Centre for Disease Prevention and Control (2020) *Disinfection of environments in healthcare and non-healthcare settings potentially contaminated with SARS-CoV-2*. Available at: https://www.ecdc.europa.eu/sites/default/files/documents/Environmental-persistence-of-SARS-CoV-2-virus-Options-for-cleaning2020-03-26_0.pdf <
https://www.ecdc.europa.eu/sites/default/files/documents/Environmental-persistence-of-SARS-CoV-2-virus-Options-for-cleaning2020-03-26_0.pdf>. Accessed 14 April 2020.
51. United States Environmental Protection Agency (2020) *List N: Disinfectants for use against SARS-CoV-2, Version 7 May 2020*. Available at: <https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2> < <https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>>. Accessed 10 May 2020.

52. Moriarty L.F., Plucinski M.M., Marston B.J., Kurbatova E.V., Knust B., Murray E.L. et al. (2020) Public health responses to COVID-19 outbreaks on cruise ships — worldwide, February–March 2020. *MMWR Morbidity and Mortality Weekly Report*, 69, 347–352. doi:10.15585/mmwr.mm6912e3
53. Greatorex J.S., Digard P., Curran M.D., Moynihan R., Wensley H., Wreghitt T. et al. (2011) Survival of influenza A (H1N1) on materials found in households: implications for infection control. *PloS ONE*, 6, e27932. doi:10.1371/journal.pone.0027932
54. World Health Organization 200) 3) *Consensus Document on the Epidemiology of Severe Acute Respiratory Syndrome (SARS)*. Available at: <https://apps.who.int/iris/handle/10665/70863.%20Accessed%209%20April%202020> <https://apps.who.int/iris/handle/10665/70863> <https://apps.who.int/iris/handle/10665/70863>. Accessed 9 April 2020.
55. Gormley M., Aspray T.J. & Kelly D.A. (2020). COVID-19: mitigating transmission via wastewater plumbing systems. *The Lancet Global Health*. doi:10.1016/S2214-109X(20)30112-1
56. Ong S.W.X., Tan Y.K., Chia P.Y., Lee T.H., Ng O.T., Wong M.S.Y. et al. (2020) Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient. *JAMA*. doi:10.1001/jama.2020.3227
57. Office International des Epizooties (2020) *Questions and answers on the 2019 coronavirus disease (COVID-19), version 8 May 2020*. Available at: <https://www.oie.int/en/scientific-expertise/specific-information-and-recommendations/questions-and-answers-on-2019novel-coronavirus/> <https://www.oie.int/en/scientific-expertise/specific-information-and-recommendations/questions-and-answers-on-2019novel-coronavirus/>. Accessed 10 May 2020.
58. Shi J., Wen Z., Zhong G., Yang H., Wang C., Huang B. et al. (2020) Susceptibility of ferrets, cats, dogs, and other domesticated animals to SARS–coronavirus 2. *Science*. doi:10.1126/science.abb7015
59. Daly N. (2020) *Seven more big cats test positive for coronavirus at Bronx Zoo*. Available at: <https://www.nationalgeographic.com/animals/2020/04/tiger-coronavirus-covid19-positive-test-bronx-zoo/> <https://www.nationalgeographic.com/animals/2020/04/tiger-coronavirus-covid19-positive-test-bronx-zoo/> <https://www.nationalgeographic.com/animals/2020/04/tiger-coronavirus-covid19-positive-test-bronx-zoo/>. Published 22 April 2020. Accessed 23 April 2020.

60. Centers for Disease Control and Prevention (2020) *If you have pets, version 30 April 2020*. Available at: < <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/animals.html.%20Accessed%2024%20April%202020>> <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/pets.html> < <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/pets.html>> . Accessed 10 May 2020.
61. Gill V. (2020) *Coronavirus: 'Pets no risk to owners' vets stress*. Available at <https://www.bbc.com/news/science-environment-52204534> < <https://www.bbc.com/news/science-environment-52204534>> . Published 8 April 2020. Accessed 14 April 2020.
62. Reuters (2020) *Government bans Norwegians from travelling to cabins amid coronavirus*. Available at: < <https://www.reuters.com/article/health-coronavirus-norway-cabins/government-bans-norwegians-from-travelling-to-cabins-amid-coronavirus-idUSL8N2BC7JV>> <https://www.reuters.com/article/health-coronavirus-norway-cabins/government-bans-norwegians-from-travelling-to-cabins-amid-coronavirus-idUSL8N2BC7JV> < <https://www.reuters.com/article/health-coronavirus-norway-cabins/government-bans-norwegians-from-travelling-to-cabins-amid-coronavirus-idUSL8N2BC7JV>> . Published 19 March 2020. Accessed 14 April 2020.
63. Alkhatib S. (2020) *Coronavirus: Couple from China charged with giving false info to MOH officials*. Available at: < <https://www.straitstimes.com/singapore/courts-crime/coronavirus-china-couple-charged-after-allegedly-giving-false-info-to-moh>> <https://www.straitstimes.com/singapore/courts-crime/coronavirus-china-couple-charged-after-allegedly-giving-false-info-to-moh> < <https://www.straitstimes.com/singapore/courts-crime/coronavirus-china-couple-charged-after-allegedly-giving-false-info-to-moh>> . Published 28 February 2020. Updated 29 February 2020. Accessed 24 April 2020.
64. McQuigge M. (2020) *What you need to know about the Quarantine Act as isolation becomes mandatory for returning travellers*. Available at: <https://nationalpost.com/pmnl/news-pmnl/canada-news-pmnl/what-you-need-to-know-about-the-quarantine-act-as-isolation-becomes-mandatory-for-returning-travellers> < <https://nationalpost.com/pmnl/news-pmnl/canada-news-pmnl/what-you-need-to-know-about-the-quarantine-act-as-isolation-becomes-mandatory-for-returning-travellers>> . Published 25 March 2020. Accessed 24 April 2020.
65. Anon (2020) *Covid-19: Quarantine or 'managed isolation' compulsory for all arrivals into NZ, PM says*. Available at: <

- <https://www.rnz.co.nz/news/national/413866/covid-19-quarantine-or-managed-isolation-compulsory-for-all-arrivals-into-nz-pm-says>>
<https://www.rnz.co.nz/news/national/413866/covid-19-quarantine-or-managed-isolation-compulsory-for-all-arrivals-into-nz-pm-says> <
<https://www.rnz.co.nz/news/national/413866/covid-19-quarantine-or-managed-isolation-compulsory-for-all-arrivals-into-nz-pm-says>>. Published 9 April 2020. Accessed 24 April 2020.
66. Chen L. & Teng J.X. (2020) *Fearful of virus return, Beijing turns into virtual fortress with quarantine for all visitors*. Available at: <
<https://hongkongfp.com/2020/04/14/fearful-of-virus-return-beijing-turns-into-virtual-fortress-with-quarantine-for-all-visitors/>>
<https://hongkongfp.com/2020/04/14/fearful-of-virus-return-beijing-turns-into-virtual-fortress-with-quarantine-for-all-visitors/> <
<https://hongkongfp.com/2020/04/14/fearful-of-virus-return-beijing-turns-into-virtual-fortress-with-quarantine-for-all-visitors/>>. Published 14 April 2020. Accessed 14 April 2020.
67. Normille D. (2020) Airport screening is largely futile, research shows. *Science*, 367, 1177–1178. doi:10.1126/science.367.6483.1177
68. Anon (2020) *Brawn: 2020 F1 season likely to start in Europe, could be behind closed doors*. Available at: < <https://www.formula1.com/en/latest/article.brawn-2020-f1-season-likely-to-start-in-europe-could-be-behind-closed-doors.4lZy8iGWlkOyiO8QhLVt4k.html>>
<https://www.formula1.com/en/latest/article.brawn-2020-f1-season-likely-to-start-in-europe-could-be-behind-closed-doors.4lZy8iGWlkOyiO8QhLVt4k.html> <
<https://www.formula1.com/en/latest/article.brawn-2020-f1-season-likely-to-start-in-europe-could-be-behind-closed-doors.4lZy8iGWlkOyiO8QhLVt4k.html>>. Published 8 April 2020. Accessed 24 April 2020.