Children's Environmental Health Collaborative

Protecting children from air pollution

unicef for every child

Durham University

Acknowledgments

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The booklet was written by Prof. Claire Horwell and Prof. Rachel Kendal (of Durham University, a partner of the Children's Environmental Health Collaborative) with members of the FACE-UP Consortium from Indonesia, Nepal, and the UK. The booklet was co-designed with parents, teachers and governmental and non-governmental agencies in Nepal and Indonesia. We thank the offices of UNICEF Indonesia and Nepal, and WHO Nepal for their partnership.

Further information on reducing children's exposure to air pollution can be found at: https://ceh.unicef.org and https://www.surrey.ac.uk/global-centre-clean-air-research/resources/guidance-for-schools

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Accompanying children's video at:
https://www.youtube.com/shorts/JIK3C3cLoF0

FACE - UP

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ISRP INTERNATIONAL SOCIETY FOR RESPIRATORY PROTECTION

Contents

You might want to lower how much air pollution your children breathe. This booklet explains what you can do.

This booklet is designed to answer any questions you may have about air pollution and how to protect your children.

What is air pollution?

Air pollution occurs when dust and smoke or gases make the air dirty. Air pollution can come from many sources including energy production, agriculture and trash burning. In cities, air pollution is higher near busy roads, factories, and construction sites.

Your children will be particularly exposed if they are walking near roads with lots of traffic or travelling on open vehicles (e.g., bicycles or motorcycles). There are also natural types of air pollution like volcano and desert dust, and wildfire smoke.

The air inside your home may be affected if outdoor air pollution comes inside or if activities inside your home make pollution. This happens if someone is smoking, cooking (especially with coal, wood and animal dung) or lighting a fire without good ventilation.

How can air pollution harm our health?

When we breathe air pollution, the particles and gases enter our body, affecting all our organs. Breathing air pollution can affect our health, both now and in the future. Because children's bodies are still developing, and they are smaller and more active than adults, they are more affected by air pollution.

In the short term, your child might experience symptoms similar to a respiratory infection if they are affected by air pollution. If your child suddenly seems unusually sleepy, dizzy or confused, there could be a build-up of carbon monoxide (CO) indoors from burning solid fuels (e.g., coal, wood or animal dung) or gas.

If you are worried that your child is very unwell from air pollution, remove them from the area immediately and get medical help.

Impacts to health

- **Babies** can miscarry, be stillborn, be born early and with low birth weights.
- **Children** may develop lung infections such as pneumonia, or diseases such as asthma (including wheezing, shortness of breath and cough). Air pollution can also affect how children's brains, lungs and hearts develop and work.
- Children who breathe polluted air are at greater risk of developing illnesses/diseases once they are **adults**. These include heart disease, stroke, lung cancer and other lung diseases, memory loss, and cataracts.

How can we know when air pollution is bad?

When the air looks smoky or dusty, it is polluted. Sometimes, you can't see air pollution. You might smell or taste smoke or fumes. You might feel unwell, with a cough, sore or watery eyes, sore throat or trouble breathing.

You can also find out about air pollution levels through announcements or alerts on mobile phone apps, social media, radio, television and from other news outlets.

Where can I get information about air quality?

You can find information about local air quality on websites like OpenAQ or through local governmental agencies (usually Ministries of Environment or Health). The air quality is often presented as an Air Quality Index (AQI) with different levels of severity.

Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 to higher	Health warning of emergency conditions: everyone is more likely to be affected.

US EPA Air Quality Index **https://www.airnow.gov/aqi/aqi-basics/**

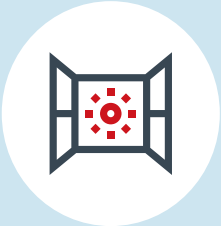
How can children breathe less polluted air?

If you think the air quality is bad, the best way to lower exposure is to avoid or leave the polluted area. If you can, go to a place that has clean indoor air, like an air-conditioned shopping mall or a home with an air purifier. If you must go outdoors, your children (and you) should limit activities like exercise or playing sports.

When air pollution is bad outside, staying at home is a good idea if you can keep air pollution low in your home. School classrooms may have less polluted air than outdoors (but children will need to lower their exposure to polluted air on the way to and from school).

Don't create air pollution in your home:

Never smoke or vape indoors and avoid cooking with fuels like wood, coal or animal dung.



If you make any smoke indoors, always open windows and doors. You can also use an extractor/exhaust fan or chimney to let the smoke out when you are cooking, burning candles, incense or oil lamps or if you light a fire indoors.

If outdoor air quality is bad, and you are sheltering indoors for a long time, with the windows closed:

- Do not use gas heaters or cookers. Don't burn anything or light any fires indoors.
- Make sure that the indoor space does not get too hot. *If it gets too hot, open the windows for a short time.* Try closing curtains/shades and using fans to keep the indoor space cool.

When the outdoor air quality is bad, you can try to stop the air pollution from getting inside:

- Don't burn trash.
- Don't start up your vehicle directly outside your home or leave it running when parked.
- Close doors and windows, where possible, unless advised not to do so.
- If possible, seal up large gaps and spaces to the outdoors. You could use tape and plastic sheeting or cloth.
- If you have an air conditioner, turn it off, unless it has a 'recirculate' mode so that it only uses air from indoors and does not suck in polluted air from outside.
- If travelling in a vehicle with air conditioning, close the windows and turn the air conditioning to 'recirculate' mode (so that only internal air is cooled) for a short time.

You can also try to clean the air:

- If you have one, an air *purifier* (cleaner) can be used in an enclosed indoor space (perhaps one room in your home).
- If you have an *air conditioner*, please note that they usually just cool the air rather than clean it. Some models can have a particle filter added (sometimes called HEPA; check the model instructions), which will clean the air.

You can also try to avoid air pollution:

- If your children need to be outdoors, like when walking to school, take a route with fewer vehicles, if there is one.
- Another option is for your children to wear a facemask. This is a covering over the mouth and nose which helps people breathe fewer particles (or viruses).
    - Most facemasks used by the public are only designed to filter particles (including viruses), not gases. There is no easy way to protect your children from polluting gases, except by moving to a cleaner air space.

Is it safe for children to wear facemasks?

Most children can wear facemasks, and it is not dangerous for healthy children. Studies show that wearing facemasks does not affect healthy children's hearts or lungs. But, if a child says they are having difficulty breathing while wearing a facemask, they should take it off (and ideally move to a cleaner air space). If your child has a lung or heart illness, ask your healthcare provider if a facemask is suitable.

Some types of facemasks may be uncomfortable. They may be sweaty and hot, pull on the ears, or cause skin irritation. These things are not dangerous. If possible, try different facemasks to find the one that fits your child best and is the most comfortable.

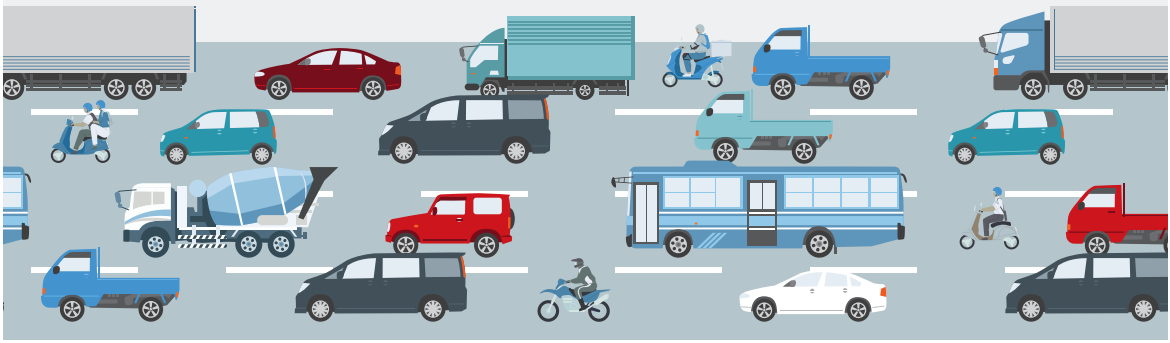
Children under three years old should not wear facemasks. The facemask or its accessories could be choked on. Also, the child may not be able to remove the facemask themselves or tell you if they are uncomfortable.

When should children wear facemasks?

It is a good idea for your children to wear facemasks when they are in very polluted outdoor areas like walking along a busy road, on a motorbike or in a vehicle with the windows open. When the air quality is very bad, your child could also wear a facemask indoors.

If you have access to real-time air quality data which is linked to an Air Quality Index (AQI), you could ask your children to wear a facemask when the air quality is in, or above, the 'unhealthy for sensitive groups' (or equivalent) rating on the AQI.

It is **not** recommended that you or your children wear a facemask while sleeping or doing exercise. The facemask will probably not stay fitted to the face and it can feel harder to breathe.



What types of facemasks are most effective?

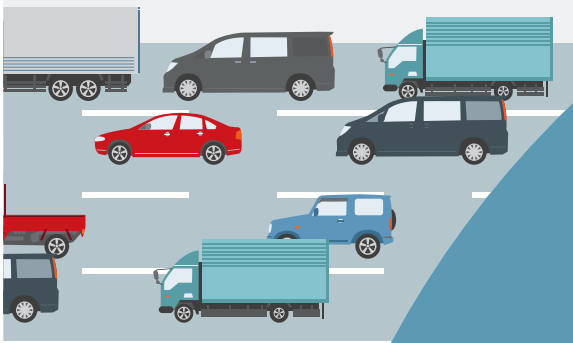
The following information will help you with decisions on which type of facemasks to use. Other factors, such as cost and availability, will need to be considered.

When you or your children wear a facemask, the effectiveness depends on two factors:

How effective the facemask or material is at **filtering particles** (stopping the particles in air pollution from passing through the material).

The **fit of the facemask** or material to the face (lowering the number of particles that enter around the edges).

If the facemask is of poor quality or doesn't fit your child's face, it will not be very protective, but it will likely be better than nothing. If your child is young, or has a small face, find a facemask designed for children.

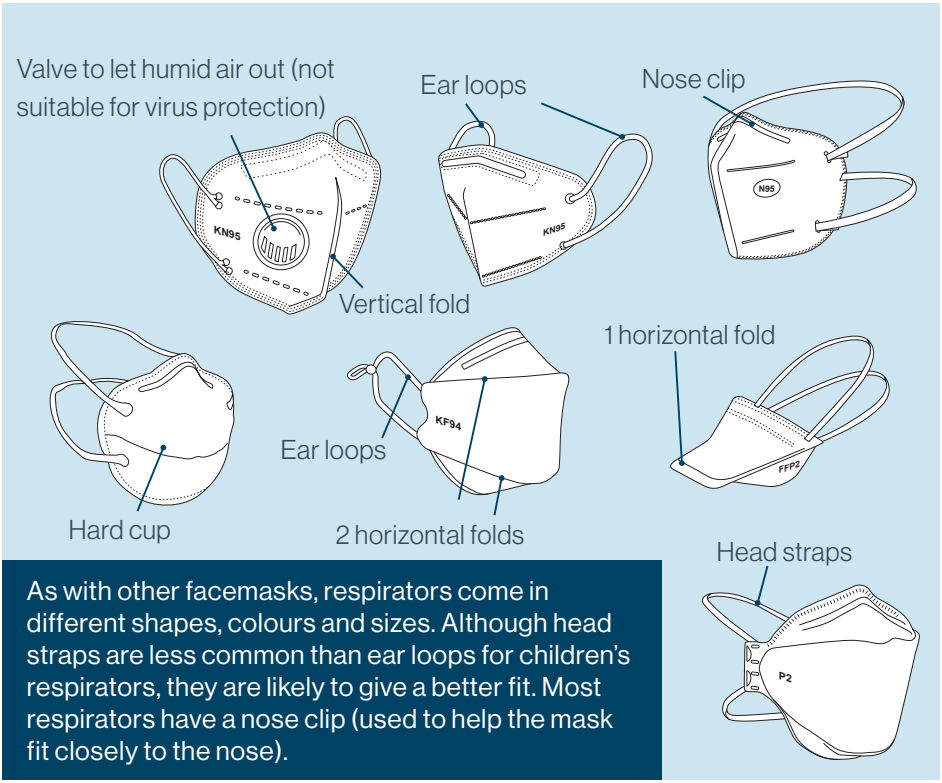


Certified respirators

The most effective facemask is a well-fitting, certified respirator. These respirators have different names in different parts of the world (for example, for respirators that filter around 95% of particles: KN95 in China, N95 in the USA, KF94 in Korea, FFP2 in the EU/UK, P2 in Australia and New Zealand).

Certified respirators have passed tests to prove that they stop (filter) most particles passing through them.

They are also designed to form a seal to the face. Research shows that, if most children wore approved masks in polluted locations (like on the way to school), it would reduce the number of children who become ill with lung problems. It would also increase the life expectancy of the population. Other types of facemasks may be less effective, such as cloth masks and surgical masks.



As with other facemasks, respirators come in different shapes, colours and sizes. Although head straps are less common than ear loops for children's respirators, they are likely to give a better fit. Most respirators have a nose clip (used to help the mask fit closely to the nose).

Many types of respirators now come in children's sizes, but adult ones may fit older children. If you can get a respirator to fit your child's face well, it will reduce their exposure to particles. **Even with the best respirator, your children will still be breathing some particles, and they do not filter gases.**

How do I know if a certified respirator is fake?

Some facemasks are sold as approved masks without having passed the required tests. A genuine respirator should have the name of the standard (e.g., KN95) printed on the packaging and on the respirator, as well as the name or logo of the manufacturer. Authentic respirators are likely to be sold in reputable pharmacies, online stores and supermarkets. If in doubt, please check the manufacturer's website before purchasing, to make sure that their information matches the product.

Other facemasks

There are several other facemasks that can be used to reduce exposure to air pollution, although they may be less effective:

$PM_{2.5}$ or virus facemasks

On the packaging of some facemasks, it is written that they are designed to filter '$PM_{2.5}$' (small particles less than 2.5 micrometres in diameter, which is the most harmful size of particle) or viruses/bacteria. If they do not have a regulatory standard printed on them, they are not approved respirators, so it is hard to know how effective they are.

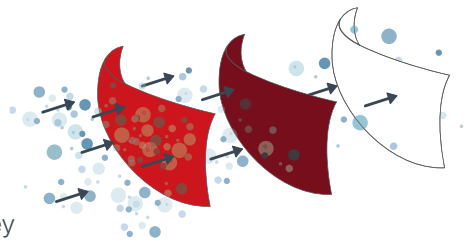
Surgical facemasks

Most surgical facemasks filter fewer particles than respirators and they may not filter the smallest particles. They are also not designed to fit snugly to the face. However, wearing a surgical facemask will filter some particles, so may be better than no protection.

Hard-cup facemasks

Also called nuisance-dust facemasks, these are less effective at filtering particles than respirators and surgical facemasks. They also may not fit well to children's faces. Some hard-cup facemasks may look very similar to approved facemasks, so check the packaging to see if it is certified.

Cloth



Cloth materials (for example, bandanas, t-shirts, hijab, handkerchiefs) and cloth facemasks are much less effective at filtering particles than most facemasks. This means they offer less protection. They also tend to fit poorly. Increasing the number of layers of cloth improves the filtration of particles but will still be less effective than surgical facemasks or respirators.

Teaching children to put on and take off a facemask

You can teach your child the following steps to make sure a facemask fits as well as possible.

With clean hands, take the facemask out of the packaging. Avoid getting the inside dirty.

Open up any flaps (horizontal fold facemasks will often have two).

If using a vertical-fold facemask, flatten the nose clip before fitting the facemask.

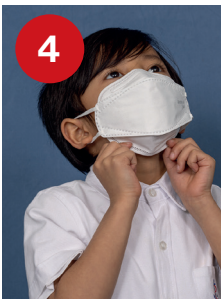
Put the facemask on the face so that it covers the nose and mouth.

If the facemask has ear loops, place them around the ears.

If the facemask has head straps, put them over your child's head with the top strap above their ears. Put the lower strap below their ears, at the back of the neck.

With both hands, gently press and smooth down the nose clip so that it fits well across the nose and onto the face below the eyes. There should be no gap at the bridge of the nose.

Do not pinch the clip as this may make a gap.



Make sure the facemask sits close under the chin (near the neck).

Make sure all edges are flat on the face.

If your child wears a head scarf or hijab, make sure that the facemask is either against the skin or is tightly against the hijab.

They may also use an ear-loop clip to attach the ear loops over the hijab.

If your child wears glasses, make sure the frames do not get in between the facemask and the face. It is best to take glasses off when putting the facemask on. Then sit the glasses on top of the facemask, on the nose. This may help with fit.

To take the facemask off, with clean hands, slide the facemask off the ears or remove head straps from the head. Place it back in its packaging or a paper bag for clean storage until its next use.

Make sure the facemask fits your child's face

Horizontal-fold masks tend to fit children's faces better than vertical-fold ones. Elastic head straps also usually fit better than ear loops. In some locations, only ear loop masks are available.

You can improve the fit, effectiveness and comfort of a mask or respirator in several ways:

- Use an ear loop clip/strap to pull the ear loops towards the back of the head, to tighten them (this may also avoid discomfort to the ears).
- If you do not have a clip/strap, you may be able to tie a knot in the ear loops if they are too big or use something like a hair band instead of a clip.

Ear-loop clip

Knot in ear loop

Hair clip

Tied hair bands

Some facemasks are simply the wrong size for children's faces. If you can't get it to fit, try to find one which fits your child's face better.

For how long can children keep using the same facemask?

- Disposable facemasks were originally designed for single use by workers (so the packaging often states they should be thrown away after 8 hours, or every day). **However, the general public can wear facemasks until they become clogged, dirty, breathing becomes harder** (check this regularly with your child), **or until the facemask starts to break**. You may have to replace them sooner for hygiene reasons, especially if the facemask is dirty inside.

- Some respirators have a 'use-by' or 'service life' date printed on them. After this date, the manufacturer cannot guarantee the effectiveness of the materials.
- If supplies are limited, facemasks can be stored for re-use in a clean paper bag (which is better than plastic to stop mould growth) to make sure dirt does not contaminate them. They should not be hung in a dirty environment or placed on dirty surfaces.
- If you can afford several facemasks, you can wear them alternately, on different days, to give time for them to dry if they become damp.
- Some manufacturers make non-disposable facemasks for community use. These can be washed, for hygiene reasons, but washing will not remove particles from the filtering layer (and may damage it). So, they must be thrown away when they become clogged, breathing becomes harder, or if you notice the facemask starting to break.

Re-using facemasks helps the environment because fewer facemasks are thrown away. Make sure you dispose of facemasks in a safe way for the environment.

How to encourage children to wear facemasks

Children might not want to wear facemasks because they can be hot and uncomfortable. If you want your children to wear a facemask you can:

- Tell them that you want them to wear a facemask.
- Explain to them why it is important to protect their health.
- Include them in finding a well-fitting facemask that they like and will wear.
- Identify important times, together, when they will agree to wear a facemask (like on the way to school or riding on a motorcycle).
- Wear a facemask yourself (children are more likely to wear facemasks if adults around them wear them too).
- Provide a reward (this may help motivate younger children to wear a facemask and keep it on).

Children may forget to wear a facemask. You can help facemask wearing become a habit by:

- Making sure they put their facemask on before leaving the house or keep it in a place where they won't forget it (like just inside the entrance to your home).
- Making sure they keep a spare facemask (in its packaging to keep it clean) in their school bag. This is a good idea anyway in case the facemask they are using breaks.

The booklet has been reviewed by an expert panel: Ministry of Health, Indonesia; Sheela Shrestha, and Dr Bhakta KC, NHEICC; Desiree Narvaez, UNICEF; Arun Rai, Save the Children Nepal; Raja Ram Pote Shrestha, WHO Nepal; Nicole Vars McCullough, 3M; Pallavi Pant, Health Effects Institute; Professor Prashant Kumar, Global Centre for Clean Air Research (GCARE), University of Surrey, UK; UKHSA. ; and Dr Stephanie Holm (Western States Pediatric Environmental Health Specialty Unit).

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