



Wearing Face Masks in the UK Workplace

Transport, Retail, Education, Hospitality & Office sectors

A pragmatic employer 'White Paper' guide to the COVID-19 regulatory environment, PPE procurement challenges and key buying considerations for appropriate and safe workplace face mask supply

Document Date: July 2020

Author: John J Graham

The Old Grain Store, 4 Denne Road, Horsham, West Sussex, RH12 1JE

Phone: +44 (0) 1403 220517 | **Fax:** +44 (0) 1403 272715 | **Web:** www.medimaskppe.co.uk

COVID-19 Impact – Wearing face masks

Executive Summary

This white paper analyses current legislation and best practices plus takes a look at changing public sentiment with regard to wearing face masks/coverings in public and in a range of workplace environments such as Retail, Transport, Hospitality, Education and Office sectors. It aims to provide a pragmatic fact based face mask/covering guide and an aide memoire for the 'new normal' UK employers face as the UK economy gets back to work post lockdown and as we enter the next phase of COVID-19's impact on society and work during 2020 and beyond.

Key issues addressed

- Views and advice from UK and International regulatory bodies, research organisations and science experts and global health authorities
- Current by country' usage trends during the global pandemic period
- Mask types and face covering alternatives with an analysis of protection performance standards
- Procurement advice for PPE buyers
- Potential COVID-19 'second wave' impact during traditional UK winter flu and cold 2020/21 season
- Key trend data

Key sector data extracts – Consumer & employer face mask sentiment and impact data in:

Transport and Retail

- **Only 37% of the public are wearing face masks** as of late July
- This is increasing based on **mandatory wearing of face masks on Public Transport and in shops**
- **Retail Sales and footfall increased in June**, but major city centre footfall is still very low due to working from home plus altered commuting routes, transport choices travel time habits
- In June, non-food stores, including department stores and clothes shops, partially recovered from strong falls during the lockdown **but were still 15% lower than in February**
- Non-essential shops in England **were not allowed to reopen until 15 June**, so they were only trading for half the month
- Online sales are buoyant as some shoppers stay at home

Hospitality

- Slow recovery due in part to above **working from home and commuter travel habit changes**
- Hospitality sector awaiting **August eating out** Government sponsored financial support plus the impact of cuts in VAT

Office

- Slow return to work with **less staff taking up additional square footage office space due to social distancing regimes** with resultant staggered time & day return to work shift patterns

Education

- **The GMB are calling on the Government to change its position** to mandate the wearing face masks for the safety of both students and staff in schools and colleges as pupils, parents and teachers plan for their September return date

Table of Contents

1. Key quotes

2. Background

2.1. March 23 UK Lockdown period starts – societal impact
2.2 Face mask wearing rules in early lockdown March 23 through to June 2020
2.3 International trend data on face mask wearing
2.4 Oxford - face mask 'behavioural' report
2.5 Behavioural change – key factors
2.6 Face mask types & their effectiveness
2.6.1 PPE Masks
2.6.2 Surgical/Medical masks
2.6.3 Non-medical grade masks & face coverings
2.7 How masks protect us
2.8 How masks are tested & rated

3. Face mask types and performance

3.1 What types of face mask & coverings are available & template
3.2 Key tips when buying masks

4. Employer PPE sentiment report

4. Employer sentiment - prioritisation of back to work policies for PPE, social distancing & hygiene – ONS survey

5. More help – risk assessment

5. Risk Assessment – Introduction
5.1 How many masks do I need for my workforce? – Volume Calculator

1. Who's saying what exactly?

Quoted remarks from leading Scientific, Government & Industry bodies



UK Prime Minister Boris Johnson said, "I do think that face coverings will be useful, both for epidemiological reasons, but also for giving people confidence that they can go back to work"

The Royal Society President, Venki Ramkrishnan said, "If all of us wear one, we protect each other and thereby ourselves, reducing transmission," he says. "We lower the chances of future surges and lockdowns which are economically and psychologically disruptive, and we increase the chance of eliminating the virus."

World Health Organisation Director General Dr Tedros Adhanom Ghebreyesus said, "In light of evolving evidence, the WHO advises that governments should encourage the general public to wear masks where there is widespread transmission risk and physical distancing is difficult, such as on public transport, in shops or in other confined or crowded environments".

Cambridge University, lead face mask impact study research author, Dr Richard Stutt said "Our analyses support the immediate and universal adoption of facemasks by the public. If widespread facemask use by the public is combined with physical distancing and some lockdown, it may offer an acceptable way of managing the pandemic and reopening economic activity long before there is a working vaccine."

UK Hospitality Chief Executive Kate Nichols, said in response to the BBC regarding unclear government messaging on July 24 regarding face mask/covering regulations in sandwich bars and food takeaways, "The messaging from the government had been contradictory and it was "very late in the day" for the guidance to be confirmed. "It's really unhelpful to have that confusion because the single biggest thing we need now is to rebuild consumer confidence and that needs clear, unambiguous messaging"

Professor Melinda Mills, Director, Oxford Leverhulme Centre said, 'The evidence is clear that people should wear masks to reduce virus transmission and protect themselves, with most countries recommending the public to wear them. Yet clear policy recommendations that the public should broadly wear them has been unclear and inconsistent in some countries such as England.' The evidence is clear that people should wear masks to reduce virus transmission and protect themselves, with most countries recommending the public to wear them."

Dr Nagpaul, BMA Council Chairman said in response to their 5,000 survey with over 56,000 Doctors said "Making it mandatory to wear nose and mouth coverings isn't a fix all, but it will significantly reduce the risk of catching the virus for millions of people and will also help our economy and our health service". "As more and more shops and social areas open, the more people will naturally want to visit them. By wearing a face covering, they reduce the risk to others and reduce the spread of a virus that has already claimed more than 40,000 lives."

2. Background

Summary of The European Centre for Disease Prevention and Control (ECDC) rapid risk assessment from 12 March 2020.

On 31 December 2019, a cluster of pneumonia cases of unknown aetiology was reported in Wuhan, Hubei Province, China. On 9 January 2020, China CDC reported a novel coronavirus as the causative agent of this outbreak, which is phylogenetically in the SARS-CoV clade. The disease associated with the virus is referred to as novel coronavirus disease 2019 (COVID-19). As of 11 March 2020, 118,598 cases of COVID-19 were reported worldwide by more than 100 countries. Since late February, the majority of cases reported are from outside China, with an increasing majority of these reported from EU/EEA countries and the UK.

The Director General of the World Health Organization declared COVID-19 a global pandemic on 11 March 2020. Key recommendations adopted by the UK were:

The ECDC recommended Social distancing measures in order to mitigate the impact of the epidemic and to delay the epidemic peak. This can interrupt human-to-human transmission chains, prevent further spread, reduce the intensity of the epidemic and slow down the increase in cases, while allowing healthcare systems to prepare and cope with an increased influx of patients.



2.1 Covid-19 Lockdown period starts March 23, 2020

Effective from March 23, the UK entered a 'Lockdown' period to mitigate the rapid spread of COVID-19 and to prevent the NHS from being overwhelmed. Modeling done by scientists assisting the Government and Public Health Authorities showed that the current capacities of available intensive care beds, qualified medical staff, appropriate PPE supplies and the required number of appropriate intubation medical devices were all insufficient to cope with a rapid spread of the coronavirus so stringent social distancing and hygiene measures would be the only way to combat the pandemic in the short term until such time as a vaccine was developed. A Lockdown was required to restrict mobility and P2P interactions so de-facto stop to all social interactions with anyone outside of the home unit and a halt to all non-essential commercial activity, commuting and travel.

2.2 Face masks & face covering advice & regulations during the pandemic

Without doubt the consensus expert opinion to-date is that the early official advice and guidance from the UK Government with regard to face mask and coverings was confusing and at times contradictory (between March and June). Only the very recent face mask/covering regulations for travelling on public transport on June 15 (Train, Bus, Rail, Coach and Air) and the more recent rules for the different retail environments (July 13 & 24) has acknowledged expert scientific research opinion on

how wearing face masks and coverings, together with social distancing and hand hygiene, plays a critical role in inhibiting and reducing the 'R' number transmission rate that is mission critical in stopping the virus from spreading.

2.3 International trend data on face mask wearing

How many people wear face coverings?

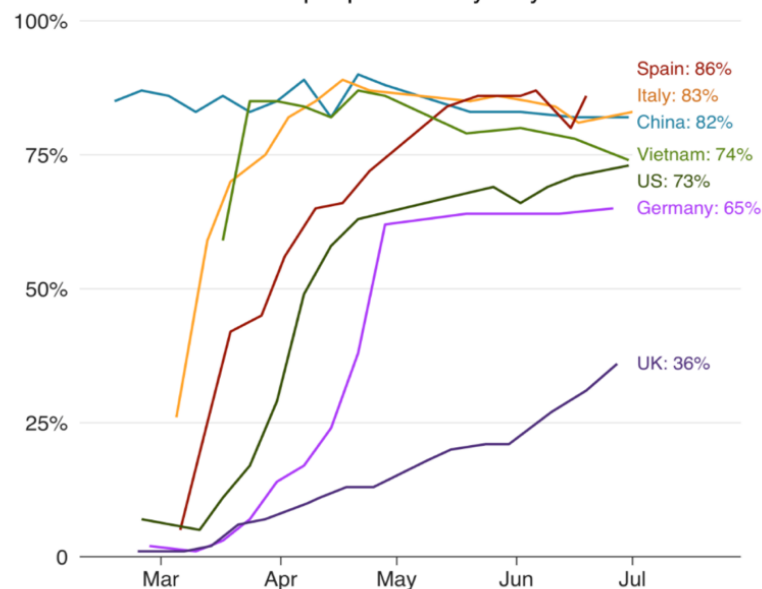
There is a lot of variation around the world when it comes to wearing face coverings in public, **according to polling company YouGov.**

People in Asian countries are most likely to say they wear them. In Singapore, **where it is an offence not to wear a mask outside your home**, 90% of people do so - the highest rate in the world.

In Europe, the proportion of people wearing masks is highest in Spain (86%), followed by Italy (83%) and France (78%).

Who is wearing face coverings in public?

Selected countries: % of people who say they wear face masks



Data is based on a poll of at least 1,000 adults in each country

Source: YouGov



In the UK, just 36% of people say they wear a mask in public - although this has been steadily increasing.

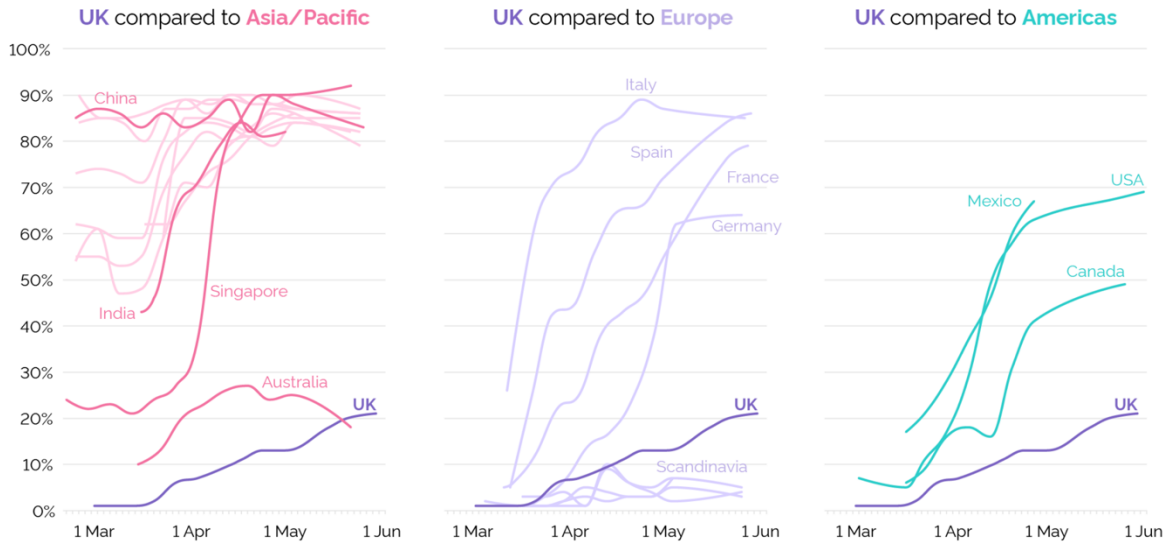
In the US, the rate is 73%, which is slightly higher than its neighbour Canada (60%).

The data comes from surveys run in nearly 30 countries.

- **The UK lags behind others such as Spain, Germany, Italy and the USA in wearing masks/coverings in public**
- **Over 120 countries now require their citizens to wear masks in public**

Britons continue to be far more reluctant than people in other countries to wear face masks to protect against COVID-19

% of people in each country who say they are wearing face masks in public places



YouGov

Latest data: 29 May- 1 June 2020

2.4 Oxford face mask report

In a comprehensive study by Oxford's Leverhulme Centre for Demographic Science, their report investigates the effectiveness of different face mask types and coverings, including an international comparison of policies and behavioural factors underlying usage.

Professor Melinda Mills, Director of the Oxford Leverhulme Centre and author of the study, says,

'The evidence is clear that people should wear masks to reduce virus transmission and protect themselves, with most countries recommending the public to wear them. Yet clear policy recommendations that the public should broadly wear them has been unclear and inconsistent in some countries such as England.' The evidence is clear that people should wear masks to reduce virus transmission and protect themselves, with most countries recommending the public to wear them. Yet clear policy recommendations that the public should broadly wear them has been unclear and inconsistent in some countries such as England''

Professor Mills' team found that, after the WHO announced the pandemic in mid-March:

- **Some 70 countries immediately recommended mask wearing**
- **But more than 120 now require mask wearing – most, everywhere in public (as of July 2020)**
- **Asian countries that had previous experiences of the SARS outbreak experienced early and virtually universal mask usage**
- **UK needs more joined up education around the importance and inter-dependence of Face masks, Hand hygiene and social, distancing**

UNIVERSITY OF WASHINGTON predicts mask wearing by Americans would save 34,000 lives by October 2020

But, says Professor Mills, many other countries have seen a reversal of behaviour. She maintains,

*'There is a general assumption that countries such as the UK, which have no culture or history of mask wearing, will not rapidly adopt them. But this just doesn't hold when we look at the data. As of late April, mask-wearing was up to *84% in Italy, 66% in the US and 64% in Spain, which increased almost immediately after clear policy recommendations and advice was given to the public.'*

**These results are updated on the above schematic, section 1.4, page 6*

2.5 Behavioural change – key factors

The above study was prompted by the need for a comprehensive systematic literature review of mask wearing – beyond medical research. Professor Mills maintains,

'There has been a blind spot in thinking about the behavioural factors of how the general public responds to wearing masks. Also, by looking at lessons learned about face mask wearing from previous epidemics and other countries, we get a broader and clearer picture.'

The key study findings:

- **Behavioural factors such as how people understand the virus and their perceptions of risk + trust in experts and government, can adversely affect mask wearing**
- **Face masks need to be seen as part of 'policy packages' with other measures such as social distancing and hand hygiene**
- **Clear and consistent policies and public messaging are key to the adoption of wearing face masks and coverings by the general public**

The report concludes that the UK public is confused about wearing face masks and coverings because they have heard the scientific evidence is inconclusive and advice...has changed. People also feared they might be competing for scarce PPE resources and they need clear advice on what to wear, when to wear them and how to wear them.

Around the world, the study finds, 'Next to hand washing and social distancing, face masks and coverings are one of the most of widely adopted non-pharmaceutical interventions for reducing the transmission of respiratory infections.'

2.6 Face mask types and their effectiveness

There are effectively three types of face mask categories that public and private health authorities, care homes, employers and the general public should consider when it comes to deciding on protection from transmission spread of the coronavirus:

2.6.1 PPE masks (N95 & FFP range)

These masks are directly made for medical care personnel in high risk environments. The key factors here are that all the mask type variants in this category must have a specific individual 'fit' (being tight around the individuals nose and mouth and some with filters); have a high BFE

Face masks				
Name	Intended users	Who does it protect?	Applicable regulations	Regulator or enforcement authority
Surgical/medical face masks	Health care staff to limit passing on coronavirus and other germs to patients in medical settings	Patients	Class 1 - Medical Devices regulations	Medicines and Healthcare products Regulatory Agency (MHRA)
Surgical/medical/PPE face masks	Healthcare professionals	The wearer and patients	Medical Devices regulations and PPE regulations	MHRA, Health and Safety Executive (HSE) (for business use) and Trading Standards (for consumer use)
PPE face masks	Health care staff to limit catching coronavirus and other germs from patients in medical settings	The wearer	PPE regulations	HSE (for business use) Trading Standards (for consumer use)

rating (bacteria filtration efficiency) between 93% and 98% and are fluid and aerosol/droplet resistant. All masks with the **N95 & FFP** product name are in this category. The vast majority of global health and safety, medical and governmental bodies recommend that these masks are to be exclusively supplied to health care professionals especially in high risk situations. All are for a limited timespan (per shift or per patient encounter) and are therefore considered disposable in these circumstances.

2.6.2 Surgical/medical masks

These masks are generally a looser non-tight fit with ear loops and expandable pleats and can also incorporate a microbial barrier that is designed to be effective in reducing the emission of infective agents from the nose and mouth of a carrier or a patient with clinical symptoms. These masks are intended to be a barrier to infection of others though they do offer limited protection to the wearer and are classified into two main types; **Type I** – these masks should only be used by patients and other persons to reduce the risk of spread of infections particularly in epidemic or pandemic situations. Type I masks are not intended for use by healthcare professionals in an operating room or in other medical settings with similar requirements.

Type II and **Type IIR** – these masks can be used by healthcare professionals in an operating room or other medical settings with similar requirements and **this mask type is the most prevalent one used by the public worldwide to protect against COVID-19 transmission spread**. Type II is further divided according to whether or not the mask is splash resistant. The **R** signifies splash resistance.

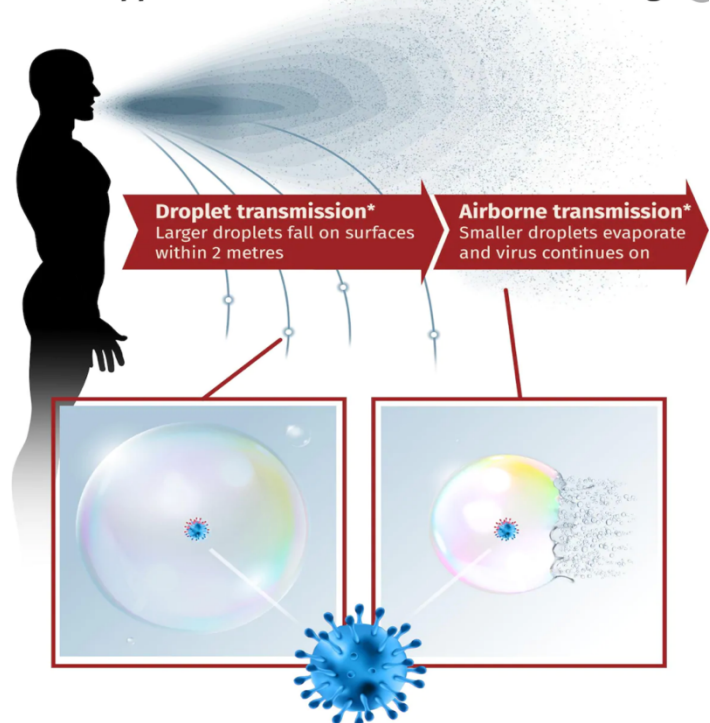
2.6.3 Non-medical grade

Reusable, washable or disposable face masks or face coverings - All these other mask and face covering variants that do not adhere to any recognised UK or International safety or bacterial protection standards such as **EN:19863:2019** or **EN:149:2001** **at best give minimal to low levels of protection from any virus transmission.**

Widespread facemask use could shrink the 'R' number and prevent a second COVID-19 wave

Latest Cambridge University Study
June 10, 2020

What happens at two metres when someone coughs?



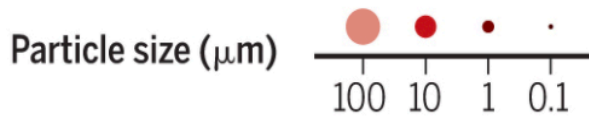
CBC NEWS

*Not to scale. Coronaviruses are 120-160 nm (less than 0.0002 mm) in diameter.

2.7 How masks protect us

Masks reduce airborne transmission

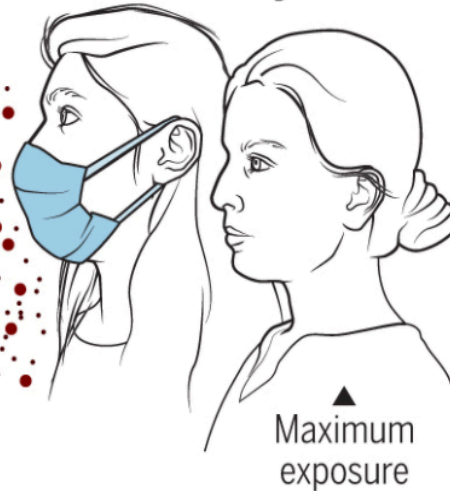
Infectious aerosol particles can be released during breathing and speaking by asymptomatic infected individuals. No masking maximizes exposure, whereas universal masking results in the least exposure.



Infected, asymptomatic



Healthy



2.8 How are masks tested & rated

Testing masks to the EN:14683:2019 standards accreditation so that they can legally claim critical performance protections such as a BFE rating and fluid resistance is a thorough process by accredited test facilities authorized by the Medicines and Healthcare products Regulatory Agency (MHRA). Here is a sample test analysis extract:

4ward Sample No: 4WT4750
 Customer reference: ZM/PS 160720
 Date received: 17/07/2020

Test Summary

	M1	M2	M3	M4	M5	Threshold	Result
Bacterial filtration efficiency (BFE), [%] 5.2.2	99.86	99.59	99.86	99.86	99.79	≥ 98	Pass
Breathability 5.2.3 (differential pressure) average of 5 areas/mask [Pa/cm ²]	48.4	46.9	46.4	48.5	44.9	< 60	Pass
Splash resistance pressure 5.2.4 [kPa]	30 of 32 masks passed at					≥ 16,0	Pass
Microbial cleanliness 5.2.5 (Bioburden) [cfu/g]	4.07	3.74	13.15	7.46	3.45	≤ 30	Pass

Threshold for type IIR mask

Myth Buster!

Are hand dryers effective against COVID-19?

No. Hand dryers are not effective. To protect yourself against the new coronavirus, you should frequently clean your hands with an alcohol-based hand rub or wash them with soap and water.

3. What types of mask and face coverings are available?

According to many recent studies, a significant proportion of people who have COVID-19 don't show symptoms, enabling the virus to spread before they realize they are sick. The fact that the coronavirus can spread through close proximity to others, often by speaking, coughing or sneezing has led to the initial recommendation and subsequent regulation for the general public to wear face masks or coverings in public, especially in situations where physical distancing may be difficult, such as in shops and malls or on public transportation, and in other areas where there is a significant amount of potential community transmission such as theatres, tourist attractions and other entertainment and sports/leisure venues and locations.

Key mask performance is Droplet Protection

Similar to influenza and other respiratory viruses, the virus that causes COVID-19 appears to be transmitted primarily through large respiratory droplets. Surgical or procedural masks provide protection against respiratory droplet spread.

- **N95 professional respirators**

Called N95 respirators, these medical devices are made to prevent exposure to tiny droplets that can remain suspended in the air. Health care workers who wear them undergo a fitment test to find the right make, model and size to ensure a tight seal. Only recommended for health care workers.



- **Surgical Masks - UK IIR - 2, 3 & 4-ply fluid resistant to EN:14683:2019**

These are loose-fitting masks designed to cover the mouth and nose. Although they are not close fitting, these disposable masks are fluid resistant and provide some protection against larger respiratory droplets from coughs and sneezes. Primarily, they prevent the wearer from spreading infectious droplets to others. Like N95 respirators, these masks are primarily used by health care workers whose safety depends on an adequate supply.



- **Disposable masks (some manufactured to the above EN standards)**

As above, these loose-fitting disposable masks are designed to cover the mouth and nose: some are fluid resistant and provide protection against larger respiratory droplets from coughs and sneezes. Are now being supplied to the public given adequate NHS supply. Check which manufacturing standards, if any, that they adhere to, to inform your buying decision.



- **Cloth or paper masks**

According to many authorities, these masks may help slow the spread of COVID-19 and help keep people who may unknowingly have the virus from transmitting it to others.



- **Fashion masks**

As above and some branded with fashion brand names such as Adidas, NIKE, etc.



- **Home-made face coverings**

Some people are making masks out of cotton, linen or other materials (such as t-shirts, socks or scarves).



- **Face shields**

A face shield is a piece of rigid, clear plastic attached to a headband. The plastic piece covers the face, extending to below your chin.



3.1 Key tips when buying masks?

Masks should have at least 2 layers of fabric to provide minimum 'droplet' protection. It should cover your nose and mouth without large gaps. The mask should have ear loops or ties so you can adjust for comfort. If you wear glasses, then go for a mask with a bendable border so you can adapt the mask to fit on your nose and help prevent 'fogging glasses'.

The mask buyer checklist

To ensure your masks are fit for purpose and made to the correct standards and reflects your CRS policies, we suggest you check that your potential mask supply is:

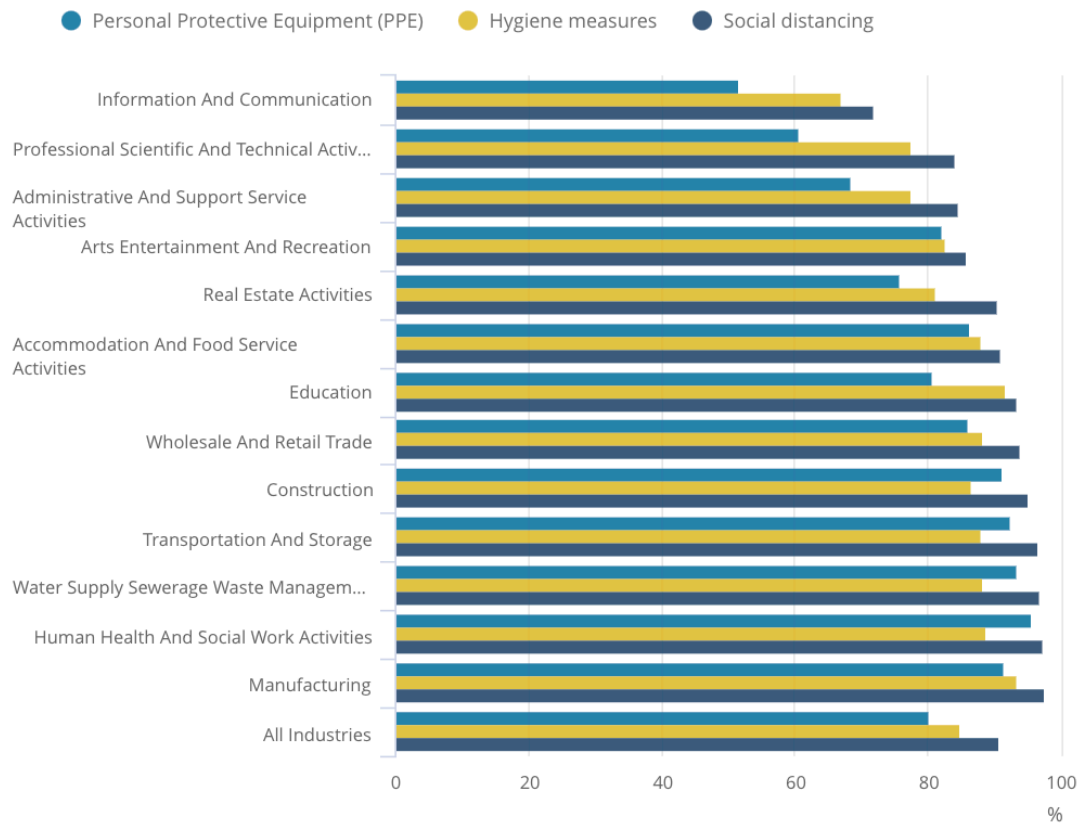
- **Made in the UK (we all need to support our economy at this time)**
- **Conforms to EN: 14683:2019 PPE Standards**
- **Fluid resistant**
- **BFE rated (Bacterial Filtration Efficiency) to $\geq 98\%$**

Another key consideration is to ensure that supply will not divert or interrupt existing supply to the NHS.

4. Employer sentiment – PPE, Social distancing & Hygiene – ONS Survey June 28, 2020

Figure 7: Of all responding businesses, social distancing, hygiene measures and personal protective equipment (PPE) were the top three most common safety measures

Safety measures, businesses who have not permanently stopped trading, broken down by industry, UK, 15 June to 28 June 2020



Source: Office for National Statistics – Business Impact of Coronavirus (COVID-19) Survey


- **Key Findings** - Implementing the wearing of Facemasks, Hygiene measures and Social Distancing regimes are the top 3 considerations by those companies whose workforce is returning from home working or furlough status

5. Workplaces - Risk assessment

Introduction - How to reopen your business safely during coronavirus (COVID-19)

This guidance can help you carry out your risk assessment to make sure you keep employees and other people on site safe when opening during coronavirus (COVID-19).

You should also consider the security implications of any decisions and control measures you intend to put in place, as any revisions could present new or altered security risks that may require mitigation. Always Record your risk assessment. You need to write down the findings of your risk assessment. The Health and Safety Executive (HSE) has a [risk assessment template](#) and [information on how to do a risk assessment](#) here.


Health and Safety Executive

Risk assessment template

Company name: Assessment carried out by:
 Date of next review: Date assessment was carried out:

What are the hazards?	Who might be harmed and how?	What are you already doing to control the risks?	What further action do you need to take to control the risks?	Who needs to carry out the action?	When is the action needed by?	Done

More information on managing risk: www.hse.gov.uk/simple-health-safety/risk/
 Published by the Health and Safety Executive 10/19

Your employees can help with the risk assessment. *You should share the results of your risk assessment with your workforce by displaying it prominently in your workplace, as well as on your website.*

5.1 How many masks do I need for my workforce? – Volume Calculator

It is recommended that your initial face mask supply order should be for a minimum of 13 weeks (3 months) – so let's say **x 78 working days**

Choose which category you believe your business profile to be in terms of social interaction by staff with others in the company and with your customers, visitors, passengers and students

- High (x 5 per day per employee usage factor)
- Medium x 3 per day per employee usage factor
- Low x 1.5 per day per employee usage factor)

Now decide the % of your total employee count that would require access to mask protection based on the probability of dealing with staff colleagues, visitors, customers, students or passengers. This gives a simple equation so as an example here is the calculation used by an estate agency brand with 120 offices nationally and on average of 5 customer facing agents per outlet and appx 10 customers/viewers per day per branch.

So, their profile was **high** as in **5 masks wearing probabilities per day**, so they calculated their initial order as: **15 mask wearing daily instances** (10 staff & 5 customers) across 120 branches by **x 600 agents x 78 days**

- = **702,000 masks at an average of 5,850 masks per branch to last 3 months.**

6. Research Sources:

1. <https://www.ucsf.edu/news/2020/06/417906/still-confused-about-masks-heres-science-behind-how-face-masks-prevent>
2. <https://www.bbc.co.uk/news/uk-politics-53371441>
3. <https://www.bbc.co.uk/news/world-53329946>
4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7218384/>
5. <https://www.ouh.nhs.uk/working-for-us/staff/covid-staff-faqs-ppe.aspx>
6. <https://www.dailymail.co.uk/sciencetech/article-8357645/Infected-Tube-passenger-showers-coronavirus-droplets-talking.html>
7. <https://www.london.gov.uk/coronavirus/coronavirus-covid-19-faqs/what-being-done-protect-passengers-and-drivers-taxis-and-private-hire-vehicles>
8. <https://www.gov.uk/guidance/coronavirus-covid-19-safer-travel-guidance-for-passengers>
9. <http://answers.google.com/answers/threadview/id/542605.html>
10. <https://www.cnbc.com/2020/07/15/most-brits-just-wont-wear-face-masks-heres-why.html>
11. <https://www.retailresearch.org/retail-forecast.html>
12. <https://www.bbc.co.uk/news/uk-53513026>
13. <https://www.bbc.co.uk/news/health-51205344>
14. <https://www.bbc.co.uk/news/world-53446827>

15. <https://www.gov.uk/government/collections/slides-and-datasets-to-ccompany-coronavirus-press-conferences>
16. <https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/bulletins/coronavirusandtheeconomicimpactsontheuk/18june2020>
17. <https://www.retailconomics.co.uk/white-papers/impact-of-coronavirus-on-uk-retail-industry>
18. <https://assets.publishing.service.gov.uk/media/5eb96e8e86650c278b077616/Keeping-workers-and-customers-safe-during-covid-19-restaurants-pubs-bars-takeaways-230620.pdf>
19. <https://www.gov.uk/coronavirus>
20. <https://www.gov.uk/guidance/working-safely-during-coronavirus-covid-19/close-contact-services>
21. <https://www.cam.ac.uk/research/news/widespread-facemask-use-could-shrink-the-r-number-and-prevent-a-second-covid-19-wave-study>
22. <https://www.nytimes.com/reuters/2020/06/24/us/24reuters-health-coronavirus-usa-forecast.html>
23. <https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/coronavirus-face-masks-what-you-need-to-know>

24. COVID-19 Press Conference Slides - 16_04_2020
Vivacity Labs - The traffic insight company has been tracking data from its network of artificial intelligence (AI) based video road sensors to monitor the impact of COVID-19 on the UK's highways. www.vivacitylabs.com
25. <https://data.london.gov.uk/dataset/tfl-live-traffic-cameras>
26. Anon, (n.d.). Traffic Flows, Borough – London Datastore. [online] Available at:
27. <https://data.london.gov.uk/dataset/traffic-flows-borough>
28. Anon, (n.d.). Train Station Usage – London Datastore. [online] Available at:
29. <https://data.london.gov.uk/dataset/train-station-usage>
30. Anon, (n.d.). Travel Patterns and Trends, London – London Datastore. [online] Available at:
31. <https://data.london.gov.uk/dataset/travel-patterns-and-trends-london>
32. Anon, (n.d.). Walking and Cycling by Borough – London Datastore. [online] Available at:
33. <https://data.london.gov.uk/dataset/walking-and-cycling-borough>
34. CityAM. (2020). Retail footfall jumps as UK coronavirus cases rise. [online] Available at:
35. <https://www.cityam.com/retail-footfall-jumps-as-uk-coronavirus-cases-rise/>
36. citymapper.com. (n.d.). Citymapper Mobility Index. [online] Available at:
37. <https://citymapper.com/cmi/london>
38. Cohen|March 20, D. and 2020 (n.d.). How Coronavirus Has Impacted Foot Traffic Across Industries. [online] www.adweek.com. Available at: <http://www.adweek.com/digital/how-coronavirus-has-impacted-foot-traffic-across-industries/>
39. [https://enterprise.foursquare.com/\(n.d.\). Monitoring the Effects Of COVID-19 With Location Data. \[online\] Available at: https://enterprise.foursquare.com/intersections/article/monitoring-the-effects-of-covid-19/](https://enterprise.foursquare.com/(n.d.). Monitoring the Effects Of COVID-19 With Location Data. [online] Available at: https://enterprise.foursquare.com/intersections/article/monitoring-the-effects-of-covid-19/)
40. Hanbury, M. (n.d.). Charts reveal how the coronavirus pandemic has boosted foot traffic at grocery stores but pummeled movie theaters. [online] Business Insider. Available at: <https://www.businessinsider.com/coronavirus-outbreak-hurts-movie-theaters-boosts-grocery-stores-20-20-3?r=US&IR=T>
41. London Borough Data Partnership #8. (2018). [online] Available at:
42. https://londondatastore-upload.s3.amazonaws.com/LBDP_280318_slidedeck.pdf
43. London.gov.uk. (2011). London Datastore – Greater London Authority. [online] Available at: <https://data.london.gov.uk/>.
44. Matters, T. for L. | E.J. (n.d.). Our open data. [online] Transport for London. Available at:
45. <https://tfl.gov.uk/info-for/open-data-users/our-open-data#on-this-page-2>
46. Packed Tube trains make distancing "impossible." (2020). BBC News. [online] 23 Mar. Available at:
47. <https://www.bbc.co.uk/news/uk-england-london-52003076>
48. Placer.ai. (n.d.). The Coronavirus Effect | COVID-19 Retail Impact Tracker. [online] Available at:
49. <https://www.placer.ai/covid-19>
50. prezi.com. (n.d.). Commuting in London. [online] Available at:
51. <https://prezi.com/oenwplc4y95u/commuting-in-london/>
52. Statista. (n.d.). Hospital footfall in the United Kingdom (UK). [online] Available at:
53. <https://www.statista.com/study/33404/hospital-footfall-and-services-in-the-united-kingdom-uk>
54. <https://www.statista.com/statistics/317080/footfall-traffic-in-retail-centres-month-on-month-united-kingdom-uk/>
55. The Economist. (n.d.). Foot traffic has fallen sharply in cities with big coronavirus outbreaks. [online] Available at: <https://www.economist.com/graphic-detail/2020/03/14/foot-traffic-has-fallen-sharply-in-cities-with-big-coronavirus-outbreaks>
56. The Economist. (n.d.). Many Britons are not taking social distancing for Covid-19 seriously. [online] Available at: <https://www.economist.com/graphic-detail/2020/03/22/many-britons-are-not-taking-social-distancing-for-covid-19-seriously>
57. Tube passenger numbers fall due to coronavirus. (2020). BBC News. [online] 16 Mar. Available at:
58. <https://www.bbc.co.uk/news/uk-england-london-51910740>
59. [www.nomisweb.co.uk.](http://www.nomisweb.co.uk/) (n.d.). KS101EW (Usual resident population) - Nomis - Official Labour Market Statistics. [online] Available at: <http://www.nomisweb.co.uk/census/2011/ks101ew>.
60. [www.ons.gov.uk.](http://www.ons.gov.uk/) (n.d.). UK Population by Postcode - Office for National Statistics. [online] Available at:
61. <https://www.ons.gov.uk/aboutus/transparencyandgovernance/freedomofinformationfoi/ukpopulationbypostcode>