Covid-19 – PPE demand & supply perspectives

Webinar presentation
March 2021
Based on report written in December 2020
Contents

Project objectives and scope

I. Impact of Covid-19 on global PPE supply
II. Modelling of global PPE demand for 2020-25
III. Emerging perspectives on PPE market dynamics in the short to medium term
This report has 2 main objectives

**Key objectives**

- Estimate **global demand for PPE for 2021-2025 by geography, product and type of end-consumption**
- Clarify **recent and possible future global supply dynamics and their implications for manufacturers**
This report looks at 3 types of products: medical PPE, non-medical PPE and disinfectant/waste management products.

This report looks only at medical PPE used in (i) medical settings for «business as usual» activities and Covid-19-related activities and (ii) in other industry settings for usage related to Covid-19-induced sanitary measures.

PPE demand coming from «business as usual» of certain industries (e.g., construction, restauration) is not within the scope of this report.
Project objectives and scope

I. Impact of Covid-19 on global PPE supply

II. Modelling of global PPE demand for 2020-25

III. Emerging perspectives on PPE market dynamics in the short to medium term
I. Impact of Covid-19 on global PPE supply

In 2019 the medical PPE market amounted to ~$8bn. It was consolidated and led by the US and Asia.
Before the crisis, the global PPE market accounted for ~$8bn and was led by North America and Asia.

**Medical PPE market share by region, 2019, %**

- **North America**: 33%
- **Europe**: 22%
- **Asia and the Pacific**: 28%
- **Latin America and Africa**: 11%

Total revenues = ~$8bn

**Key messages**

In 2019 the medical PPE market was estimated to amount to ~$8bn, in turn accounting for 15% of total PPE market size.

In 2019, the countries with the highest production were China, US and Germany, each with different export dynamics: while China was the biggest exporter worldwide, the US exported mainly across North and Latin America and Germany served almost exclusively European countries.

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1. The PPE market has several sub-industries, including healthcare, construction, chemicals, and industry.

Source: Mordor Intelligence (updated in November 2020), Asian Development Bank
China and the US make the majority of every category except for gloves, which are mostly manufactured in Malaysia and Thailand

Medical PPE market share by type of PPE, 2019, % of total market

Top producing countries
- Malaysia (~65%)
- Thailand (~20%)
- China (~10%)
- Indonesia (~5%)

Top producing countries (eye protection)
- China (40-50%)
- US (20%)

Top producing countries (shoe covers)
- China (30-40%)
- US (20-25%)
- India, Germany, UK, Australia (5-10% each)

1. Figures by the Malaysian Rubber Glove Manufacturers Association (MARGMA)

2. In 2019, respirators accounted for ~60% of the medical masks market and surgical masks accounted for ~40%, according to interviews with industry experts

Source: Mordor Intelligence (updated in November 2020), Statista Research Department, Industry experts interviews (November 2020), Malaysian Rubber Glove Manufacturers Association (MARGMA)
Industry experts suggest that, as a consequence of the Covid-19 pandemic, global production of medical PPE increased by at least 300% at the peak, principally driven by demand for masks. This ramp-up started at the end of Q1/beginning of Q2 to compensate for a then global shortage and to satisfy forward-looking surge orders from governments and private entities.
Covid-19 triggered a surge in global PPE production: medical mask manufacturing spiked by as much as 1,200%

Estimated peak increases in global production during the Covid-19 crisis, %

<table>
<thead>
<tr>
<th>Medical PPE</th>
<th>Disinfectant/waste mgmt.</th>
<th>Non-medical PPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical masks</td>
<td></td>
<td>Newy1 created product during Covid-19 pandemic</td>
</tr>
<tr>
<td>Medical gloves</td>
<td>200-600%</td>
<td></td>
</tr>
<tr>
<td>Gowns</td>
<td>100-200%</td>
<td></td>
</tr>
<tr>
<td>Shoe covers</td>
<td>50-100%</td>
<td></td>
</tr>
<tr>
<td>Aprons</td>
<td>50-100%</td>
<td></td>
</tr>
<tr>
<td>Coveralls</td>
<td>50-100%</td>
<td></td>
</tr>
<tr>
<td>Face shield</td>
<td>50-100%</td>
<td></td>
</tr>
<tr>
<td>Goggles</td>
<td>25-50%</td>
<td></td>
</tr>
<tr>
<td>Alcohol-based hand rub</td>
<td>200-600%</td>
<td></td>
</tr>
<tr>
<td>Body bags</td>
<td>50-100%</td>
<td></td>
</tr>
<tr>
<td>Clinical waste bags</td>
<td>25-50%</td>
<td></td>
</tr>
<tr>
<td>Chlorine HTH 70%</td>
<td>25-50%</td>
<td></td>
</tr>
<tr>
<td>Non-medical masks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Production pre-Covid-19 was negligible compared to current production

Source: Industry experts interviews (November 2020), press search
Around half of this increased production was delivered by incumbents and the other half came from new market entrants.

<table>
<thead>
<tr>
<th>Share of new production capacity added during Covid-19 pandemic, estimates</th>
<th>Examples (non-exhaustive)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incumbents</strong></td>
<td>50-60%</td>
</tr>
<tr>
<td><strong>New players</strong></td>
<td>40-50%</td>
</tr>
</tbody>
</table>

2 types of new players: companies in adjacent industries converting production capacities and new local players

- 3M increased its PPE production by 3x
- DuPont doubled its production of gowns
- Top Glove increased its production by ~20%

Examples (non-exhaustive)

- National Safety Apparel started producing 1.5m face masks a week
- Several textile companies in Italy and North Africa shifted part of their production to manufacture masks
- Haco and East African Breweries, in Kenya, partnered to produce hand sanitizers

Main insights from interviews

Most incumbents consider their capacity addition to be temporary as most have either increased utilization or deployed idle machine/production lines.

New players have invested in machinery and equipment but only been able to generate acceptable returns on investment because of surges in market price.

A significant part of this production surge has come from targeting new customer segments beyond health systems (e.g., consumers, workers in non-healthcare settings).

"Before Covid-19, 90% of medical PPE was targeted at health system customers. Currently sales are running at closer to 50% to medical customers and 50% to non-medical customers."

– former Life Safety Product Manager at leading PPE manufacturer

Source: Industry experts interviews (November 2020), press search
I. Impact of Covid-19 on global PPE supply

This increase in output put the entire PPE manufacturing value chain under significant pressure.
Increasing manufacturing capacity has put the PPE supply chain under pressure, especially with regard to raw materials.

Mapping of bottlenecks along the PPE value chain

<table>
<thead>
<tr>
<th>Value chain</th>
<th>Most pressure</th>
<th>Least pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials sourcing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respirators</td>
<td>Shortage of melt-blown non-woven</td>
<td></td>
</tr>
<tr>
<td>Medical gloves</td>
<td>Pressure on nitrile</td>
<td></td>
</tr>
<tr>
<td>Surgical masks</td>
<td>Shortage of melt-blown non-woven</td>
<td></td>
</tr>
<tr>
<td>Disposable gowns</td>
<td>Pressure on non-woven and composite fabric</td>
<td></td>
</tr>
<tr>
<td>Alcohol-based hand rub</td>
<td>Pressure on non-woven and composite fabric</td>
<td></td>
</tr>
<tr>
<td>Coveralls</td>
<td>Shortage of alcohol</td>
<td></td>
</tr>
<tr>
<td>Shoe covers</td>
<td>Pressure on non-woven and composite fabric</td>
<td></td>
</tr>
<tr>
<td>Body bags</td>
<td>Pressure on PU, PVC, HDPE</td>
<td></td>
</tr>
<tr>
<td>Aprons</td>
<td>n.a.</td>
<td></td>
</tr>
<tr>
<td>Chlorine HTH 70%</td>
<td>n.a.</td>
<td></td>
</tr>
<tr>
<td>Clinical waste bags</td>
<td>n.a.</td>
<td></td>
</tr>
<tr>
<td>Goggles</td>
<td>n.a.</td>
<td></td>
</tr>
<tr>
<td>Face shield</td>
<td>n.a.</td>
<td></td>
</tr>
<tr>
<td>Cloth masks</td>
<td>n.a.</td>
<td></td>
</tr>
</tbody>
</table>

- Trade restrictions forced a couple of countries to stop exporting PPE, putting pressure on importers who were compelled to build local capacity.
- Disruptions of transport and logistics have made delivery of PPE to final customers more complicated and resulted in delays even at domestic level.

1. High pressure on manufacturing usually comes from technology solutions with machines manufactured by very few players over long lead times.

Source: Industry experts interviews (November 2020), Asian Development Bank
Contents

Project objectives and scope

I. Impact of Covid-19 on global PPE supply

II. Modelling of global PPE demand for 2020-25

III. Emerging perspectives on PPE market dynamics in the short to medium term
Global volume demand for PPE increased by 300-400% between 2019 and 2020\(^1\), driven by increased consumption by the general public and in non-healthcare work settings.

This peak demand is expected to continue throughout 2021 but is likely to decrease sharply in 2022 as consumption from both these groups is expected to shrink.

Demand will then return to its pre-crisis mix and keep rising at a CAGR of 6-9% between 2022 and 2025, underpinned by some lagging effect of Covid-19 as well as natural healthcare sector growth.
Consumers and non-healthcare workers will drive global PPE demand to peak in 2021 at 340-420bn units before it resumes its historic growth rate.

ESTIMATES – AS OF 16 DECEMBER 2020

**Total estimated volume PPE demand, 2018-25, units, bn**

<table>
<thead>
<tr>
<th>Year</th>
<th>A. Non-COVID-19</th>
<th>B. Hospital days</th>
<th>C. Vaccination</th>
<th>D. Non-healthcare workers</th>
<th>E. Consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>~70-120</td>
<td>~5-10</td>
<td>~10</td>
<td>~10-15</td>
<td>~105-160</td>
</tr>
<tr>
<td>2019</td>
<td>~120-145</td>
<td>~10-15</td>
<td>~10</td>
<td>~10-15</td>
<td>~110-20</td>
</tr>
<tr>
<td>2020</td>
<td>~20</td>
<td>~10-15</td>
<td>~10</td>
<td>~10-15</td>
<td>~120-130</td>
</tr>
<tr>
<td>2021</td>
<td>~120-145</td>
<td>~10-15</td>
<td>~10</td>
<td>~10-15</td>
<td>~135-160</td>
</tr>
<tr>
<td>2022</td>
<td>~10-20</td>
<td>~2-6</td>
<td>~10</td>
<td>~10-15</td>
<td>~125-140</td>
</tr>
<tr>
<td>2023</td>
<td>~23-25</td>
<td>2-6</td>
<td>~10</td>
<td>~10-15</td>
<td>~135-155</td>
</tr>
<tr>
<td>2024</td>
<td>23-27</td>
<td>2-6</td>
<td>~10</td>
<td>~10-15</td>
<td>~145-175</td>
</tr>
<tr>
<td>2025</td>
<td>23-28</td>
<td>2-6</td>
<td>~10</td>
<td>~10-15</td>
<td>~155-193</td>
</tr>
</tbody>
</table>

1. Range reflects 2 scenarios ("high" vs. "low"): (i) non-Covid-19 baseline demand based on 2 growth scenarios (historic growth -2% to account for critical size of the market vs. historic growth +1% to account for potential changes in usage habits), (ii) hospital days and vaccination demands depend on vaccination scenario ("pessimistic" vs. "optimistic"), and (iii) workers in non-healthcare settings and consumer demand depend on adoption rate assumptions ("high" vs. "low")

2. Unit is per item or per pair in case of gloves, hand sanitizer is per litre and chlorine is per kg

3. Surgical masks adoption rate is assumed to be 10% for consumers in Sub-Saharan Africa while 80% represents the adoption rate for workers in non-healthcare settings in China and North America

Source: Mordor Intelligence (updated in November 2020), EPI model, WHO assumptions
Consumers and non-healthcare workers will drive surgical mask demand to peak in 2021 at 125-160bn units before falling back ~40% p.a. in 2021-25

**ESTIMATES – AS OF 16 DECEMBER 2020**

**Total estimated PPE¹ demand by category**
2019-25, units, bn² (% of total demand by volume)

1. Range reflects 2 scenarios (“high” vs. “low”): (i) non-Covid-19 baseline demand based on 2 growth scenarios (historic growth -2% to account for critical size of the market vs. historic growth +1% to account for potential changes in usage habits), (ii) hospital days and vaccination demands depend on vaccination scenario (“pessimistic” vs. “optimistic”), and (iii) workers in non-healthcare settings and consumer demand depend on adoption rate assumptions (“high” vs. “low”)

2. Unit is per item or per pair in case of gloves, hand sanitizer is per litre and chlorine is per kg ; bn = billion

3. Eye protection (face shields and goggles), shoe cover, and disinfectant products/biological waste management (i.e., hand sanitizer, chlorine, body bags and clinical waste bags)

4. Excluding Sub-Saharan Africa adoption rate, depending on geography, worker archetype and population age

Source: Mordor Intelligence (updated in November 2020), EPI model, WHO assumptions
We expect demand from consumers and non-healthcare workers to shift the weight of global PPE demand away from North America and towards Asia.

**ESTIMATES – AS OF 16 DECEMBER 2020**

**Total estimated**

1 PPE demand by region, 2019-25, units, bn2 (% of total demand by volume)

1. Range reflects 2 scenarios (“high” vs. “low”): (i) non-Covid-19 baseline demand depends on 2 growth scenarios (historic growth of -2% to account for critical size of the market vs. historic growth of +1% to account for potential changes in usage habits), (ii) hospital days and vaccination demands depend on vaccination scenario (“pessimistic” vs. “optimistic”), and (iii) workers in non-healthcare settings and consumer demands depend on adoption rate assumptions (“high” vs. “low”).

2. Unit is per item or per pair in case of gloves, hand sanitizer is per litter, and chlorine is per kg.

3. Including Russia and Central Asia.

4. Including China and India.

Source: Mordor Intelligence (updated in November 2020), EPI model, WHO assumptions.
There is still some significant uncertainty as to the magnitude of the peak in 2021 as we witness a fast-evolving health situation (e.g., new variants) and developing scientific advice, leading to changes in public health and government policies as well as individual behaviors (i.e., mask wearing requirements and habits)
2 new scenarios for mask adoption, driven by both regulations and sentiments

Mask adoption rate among general public, 2020-2025, US example (illustrative)

Note: in this example, the moment at which the adoption rate starts to decline is specific to the US context; in other geographies, it may occur later, depending on the progress of national vaccination campaigns.

Scenario 1
- Official guidelines continue to require wearing masks in public places, in part due to uncertainty about incidence and transmission of variants
- As remaining at-risk populations are vaccinated, governments slowly lift regulations regarding masks wearing in public space
- Mask adoption declines as the vaccination continues, gradually reaching a "new normal" near the pre-COVID adoption rate

Scenario 2
- Official guidelines continue to require wearing masks in public places until herd immunity is achieved
- Long-term adoption rate remains higher than pre-COVID crisis levels due to e.g. personal preferences

It is important to note that there is still a high level of uncertainty regarding the crisis future evolutions; therefore these might be more possible scenarios than these 2 ones.
With revised adoption rates, global PPE demand could peak in 2021 at 510-595bn units before falling back to 195-235bn units in 2022-23

ESTIMATES – NEW ADOPTION RATES AS OF MARCH 2021

Total estimated¹ volume PPE demand, 2018-25, units, bn²

<table>
<thead>
<tr>
<th>Year</th>
<th>Scenario 0 (December 2020)</th>
<th>Surplus from increased adoption rate – Scenario 1 (March 2021)</th>
<th>Surplus from increased adoption rate – Scenario 2 (March 2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>~95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>~105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>~405</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>~420</td>
<td>510-595</td>
<td>~85</td>
</tr>
<tr>
<td>2022</td>
<td>~190</td>
<td>195-235</td>
<td>~90</td>
</tr>
<tr>
<td>2023</td>
<td>~195</td>
<td>195-235</td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td>~215</td>
<td>215-255</td>
<td>~40</td>
</tr>
<tr>
<td>2025</td>
<td>~230</td>
<td>235-275</td>
<td>~40</td>
</tr>
</tbody>
</table>

¹For readability reasons, only the “high” scenario is presented
²Unit is per item or per pair in case of gloves, hand sanitizer is per litre and chlorine is per kg
3.Surgical masks adoption rate is assumed to be 10% for consumers in Sub-Saharan Africa while 80% represents the adoption rate for workers in non-healthcare settings in China and North America

Source: Mordor Intelligence (updated in November 2020), EPI model, WHO assumptions
Project objectives and scope

I. Impact of Covid-19 on global PPE supply

II. Modelling of global PPE demand for 2020-25

III. Emerging perspectives on PPE market dynamics in the short to medium term
III. Emerging perspectives on short/medium term market dynamics

Market entry is less attractive than it was in 2020, with prices decreasing and global supply meeting demand for most PPE.
Despite supply bottlenecks at the start of the crisis, several countries have now built stockpiles and are showing early signs of oversupply

**Both France and the UK have accumulated large stocks of PPE**

Before the crisis, France was producing 3 million masks a week [...] In June, 25 million masks were produced each week in France [...] 40 million masks did not find takers, [...] it is estimated that 10% of the companies involved in this production have stocks on their hands

– Press article (France Culture), June 2020

“Stocks of masks manufactured in France are largely sufficient to meet local demand [...] In the Auvergne-Rhône-Alpes region alone, we have a stock of 3 million masks and enough fabric to manufacture an additional 19 million”

– Regional general delegate (Pierric Chalvin), July 2020

Mask oversupply has succeeded the lack of supply in the French textile industry. [...] Some companies have actually had to lay off employees because of oversupply

– Press article (France Info), July 2020

“The government is now in a position where it has sufficient contracted supplies to meet demand, and the total volume of offers it has is far greater than any foreseeable future requirement

It is therefore no longer accepting offers for PPE. It has also closed down all existing offers submitted that are surplus to requirements”

– Contractsfinder.service.gov.uk

Volume and value of PPE ordered in the UK has started to ramp down from June, given stock supply

– National Audit Office analysis of Department of Health & Social Care information

**Interviews with industry experts suggest a potential oversupply risk**

“…”

The UK is already facing an oversupply situation on surgical masks

– Procurement Director at a government agency, November 2020

“…”

We will find ourselves in an oversupply market once the pandemic is over. Australia alone can now supply all of Europe’s pre-Covid-19 needs

– PPE industry expert, November 2020

“…”

Since the second wave in Europe, there has been a slight increase in orders, but without comparison with last March and April. Countries have built up stocks and are now relying on them

– PPE industry expert, November 2020

**Source:** press search, interviews with industry experts (November-December 2020)
Increased PPE market prices allowed new entrants to generate significant returns on investment – but prices are decreasing

Selected UK PPE unit prices

<table>
<thead>
<tr>
<th>Type of PPE</th>
<th>2019 (Feb-Jul)</th>
<th>2020 (Feb-Jul)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face masks</td>
<td>£0.11</td>
<td>£0.40</td>
<td>3.6x</td>
</tr>
<tr>
<td>Respirators</td>
<td>£0.94</td>
<td>£2.51</td>
<td>2.7x</td>
</tr>
<tr>
<td>Gowns and overalls</td>
<td>£0.33</td>
<td>£4.50</td>
<td>13.8x</td>
</tr>
<tr>
<td>Gloves</td>
<td>£0.02</td>
<td>£0.12</td>
<td>6.2x</td>
</tr>
<tr>
<td>Eye protection</td>
<td>£0.60</td>
<td>£1.82</td>
<td>3.0x</td>
</tr>
<tr>
<td>Hand hygiene</td>
<td>£1.12</td>
<td>£6.14</td>
<td>5.5x</td>
</tr>
</tbody>
</table>

Price for face mask on Amazon.com (illustrative example, index January 2020)

During the pandemic, PPE unit prices dramatically increased before dropping to a level which remains above pre-crisis (as of end-November 2020)

“[…] prices for PPE may remain high, up to 4x the costs for masks and gloves in January

– CFO of a US healthcare network, November 2020

Due to high prices, new players who’ve invested in equipment and machinery are earning a high ROI and will probably take the money and get out of the market once the pandemic is gone

– PPE expert, November 2020
III. Emerging perspectives on short/medium term market dynamics

The outlook for the market nevertheless remains positive over the longer term
Although the 2020 demand peak triggered by Covid-19 might reduce after 2021, the outlook for the market remains positive over the longer term.

**Key messages**

In the short-term, although demand peak is to persist through 2021, market entry appears less attractive than it was in 2020, with prices decreasing and global supply meeting demand for most PPE.

In the medium/long-term, despite the reduction of the Covid-19-induced peak after 2021, the outlook for the market remains positive over the longer term, with a 6-9% annual growth in 2023-2025:

- Incumbents might continue to capture the lion's share of this growth as they are already cost-competitive, have been able to ramp up their production capacity during the crisis and already meet quality requirements.
- New entrants may be able to capture a degree of this growth, provided that they can be cost-competitive, manage to meet quality standards, and receive government support (especially in guaranteeing offtake).

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**ESTIMATES – ONLY MEDICAL PPE CONSIDERED – AS OF MID-DECEMBER 2020**

Global estimated\(^1\) PPE demand by volume, 2018-25, units, bn\(^2\)

1. Range reflects 2 scenarios ("high" vs. "low"): (i) non-Covid-19 baseline demand depends on 2 growth scenarios (historic growth of -2% to account for critical size of the market vs. historic growth of +1% to account for potential changes in usage habits), (ii) hospital days and vaccination demands depend on vaccination scenario ("pessimistic" vs. "optimistic"), and (iii) non-healthcare worker and consumer demands depend on adoption rate assumptions ("high" vs. "low")

2. Unit is per item or per pair in case of gloves, hand sanitizer is per litre, and chlorine is per kg

Source: Mordor Intelligence (updated in November 2020)
The progressive lifting of export restrictions imposed in March has eased supply pressure and rebalanced global supply and demand.

PPE export restrictions worldwide as of November 2020

<table>
<thead>
<tr>
<th>Countries with active export restrictions</th>
<th>Countries with export restrictions which have been terminated</th>
</tr>
</thead>
</table>

**The United States**

In April 2020, the US banned exports for 5 categories of PPE (including respirators, gloves and masks).

In August, the export ban was renewed until December 2020.

**The United Kingdom**

In April 2020, the UK decided to introduce a specific license to allow exports of PPE beyond the EU and EFTA member states.

**China**

In April 2020, China banned medical supplies exports from firms not licensed to sell them nationally. At the end of April, a new set of regulations was introduced which made manufacturers subject to export authorisations.

Source: International Trade Center website (access in November 2020)
III. Emerging perspectives on short/medium term market dynamics

In light of these dynamics, incumbents and new PPE manufacturers alike may wish to consider four strategic moves for the future – investment for the long term, distribution, diversification and innovation.
PPE manufacturers can try to lock in short- and medium-term demand in those geographies where they are cost-competitive by systematic exploration of multiple channels – Europe example

<table>
<thead>
<tr>
<th>Demand</th>
<th>Typical channels</th>
<th>Examples of organizations involved</th>
<th>Level of opportunity¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public healthcare provision and rest of government</td>
<td>International organizations’ procurement arms</td>
<td>n/a</td>
<td>Low to European countries overall</td>
</tr>
<tr>
<td></td>
<td>Regional online tendering platform</td>
<td>Ted</td>
<td>Launch of pan-European med product procurement platform, few tenders open from local authorities and various public entities (e.g., schools)</td>
</tr>
<tr>
<td></td>
<td>Distributors and/or GPOs supplying to public sector</td>
<td>Distributors, GPOs, AGKAMED</td>
<td>Distributors and GPOs reported to be looking to enlarge their supplier list with cost-competitive options closer than Far East</td>
</tr>
<tr>
<td></td>
<td>Direct tendering from public sector</td>
<td>consip, PARIS, Regione Lombardia</td>
<td>Few tenders open from local authorities and various public entities (e.g., schools) on national platforms, sometimes directly accessible to manufacturers (vs. distributors/GPOs)</td>
</tr>
<tr>
<td>Private healthcare provision</td>
<td>Distributors and/or GPOs supplying to private sector</td>
<td>Distributors, GPOs, AGKAMED</td>
<td>Distributors and GPOs reported to be looking to enlarge their supplier list with cost-competitive options closer than Far East</td>
</tr>
<tr>
<td></td>
<td>Direct tendering from private sector</td>
<td>ASKLEPIOS</td>
<td>Some opportunities flagged by private hospitals in UK on specific niche products (gloves, gowns) when NHS undersupplying; probably low volume</td>
</tr>
</tbody>
</table>

¹ Non-exhaustive and illustrative

Source: Interviews with industry experts (November-December 2020)
### PPE manufacturers can try to lock in short- and medium-term demand in those geographies where they are cost-competitive by systematic exploration of multiple channels – Africa example

<table>
<thead>
<tr>
<th>Demand</th>
<th>Typical channels</th>
<th>Examples of organizations involved</th>
<th>Level of opportunity¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public healthcare provision and rest of government</td>
<td>International organizations’ procurement arms</td>
<td>UNICEF stating open to enriching its supplier catalogue in 2021 directly with manufacturers</td>
<td>有限 (Limited)</td>
</tr>
<tr>
<td></td>
<td>Regional online tendering platform</td>
<td>African Medical Supply Platform (AMSP) launched in 2021 to pool volume from public sector across continent</td>
<td>高 (High)</td>
</tr>
<tr>
<td></td>
<td>Distributors and/or GPOs supplying to public sector</td>
<td>Central pharmacies and public procurement authorities (public GPOs) from several African countries</td>
<td>有限 (Limited)</td>
</tr>
<tr>
<td></td>
<td>Direct tendering from public sector</td>
<td>Ministries of Health of several African countries</td>
<td>有限 (Limited)</td>
</tr>
<tr>
<td>Private healthcare provision</td>
<td>Distributors and/or GPOs supplying to private sector</td>
<td>Inconsistencies in distributors reporting willingness to enlarge PPE supplier list</td>
<td>有限 (Limited)</td>
</tr>
<tr>
<td></td>
<td>Direct tendering from private sector</td>
<td>Expected lower volume</td>
<td>有限 (Limited)</td>
</tr>
</tbody>
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1. Qualitative assessment based on expert interviews - current as Nov-Dec 2020

Source: Interviews with industry experts (November-December 2020)
New businesses could target 3 potential diversification opportunities along the PPE value chain

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Market size 2019, Estimates, $m</th>
<th>Market opportunity: high-level and directional assessment</th>
<th>Barriers to entry (non-exhaustive; see further details next pages)</th>
</tr>
</thead>
</table>
| Melt-blown manufacturing               | ~1,000                          | ≥9% | ≥8% | Potential to play a “volume” strategy and supply smaller mask manufacturers                                                       | • Regulation  
• Raw material and machinery shortage  
• Consolidated market  
• Importance of scale |
| Gloves machinery manufacturing         | ~800                            | ≥2% | ≤10%| Manufacturing semi-automated machines requiring less technical knowledge and expertise                                              | • Technical knowledge and expertise  
• Brand recognition needed  
• Highly fragmented market concentrated in China for semi-automated machines manufacturers |
| Alcohol manufacturing (for hand sanitizer) | ~500                             | ≥4% | ≤10%| Purchasing a low-quality alcohol factory (e.g., for gasoline end use) and upgrading it to a high-quality alcohol plant to supply hand sanitizer manufacturers | • Importance of scale  
• High capex required  
• Brand recognition needed  
• Proximity to feedstocks required  
• Regulation |

1. Global market size in volume is estimated at 200m gallons in 2019 and average price is estimated at $2.50/gallon

Source: industry expert interviews (December 2020)
Focus on melt-blown market: potential opportunities for cost-advantaged new entrants and large end-product producers looking to integrate vertically

**PROPOSITION - NON-EXHAUSTIVE**

**THOROUGH BUSINESS PLANNING REQUIRED TO FURTHER ASSESS THE STRATEGIC POSITIONING**

<table>
<thead>
<tr>
<th>Type of player</th>
<th>Strategic positioning</th>
<th>Description</th>
<th>Key success factors</th>
<th>Feasibility</th>
</tr>
</thead>
</table>
| For a brand new player          | Cost leader                           | Enter the melt-blown industry with a high volume and low cost strategy by using low cost raw materials and low quality machinery | • Achieve economies of scale (would require producing spunbond as well as melt-blown and targeting multiple industries as customers)  
  • Locate near to raw material supply  
  • Locate in a low labour and utilities cost country  
  • Target small/medium and local players as customers | High         |
|                                 | Premium manufacturer                  | Enter the melt-blown industry with a high margin strategy by using high quality raw materials and machinery | • Secure high quality raw materials and machinery (in short supply during the Covid-19 crisis)  
  • Target large players as customers (would involve inspections and quality control)  
  • Build solid brand and reputation (would require several years) | Low          |
| For an existing end-product manufacturer | Value chain integrator | Build in-house melt-blown production capabilities for own use (only makes sense for large end-product manufacturers) | • Sufficient internal demand to break-even; it would be hard for a small company to integrate upward due to capital intensity and technical barriers  
  • Secure high quality machinery and raw materials for premium products manufacturers/locate in low labour costs country with proximity to raw materials for lower quality products manufacture. | Low          |

1. Some examples of hygiene end-product manufacturers with integrated melt-blown manufacturing: Cardinal Health, Kimberly-Clark, Halyard Health

Source: interviews with industry experts (November-December 2020)