

# Covid-19 – PPE demand & supply perspectives

Webinar presentation

March 2021

*Based on report written in December 2020*



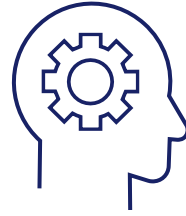
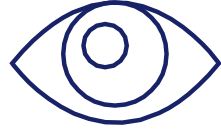
This programme is funded by UK aid from the UK Government; however, the views expressed do not necessarily reflect the UK government's official policies

# 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

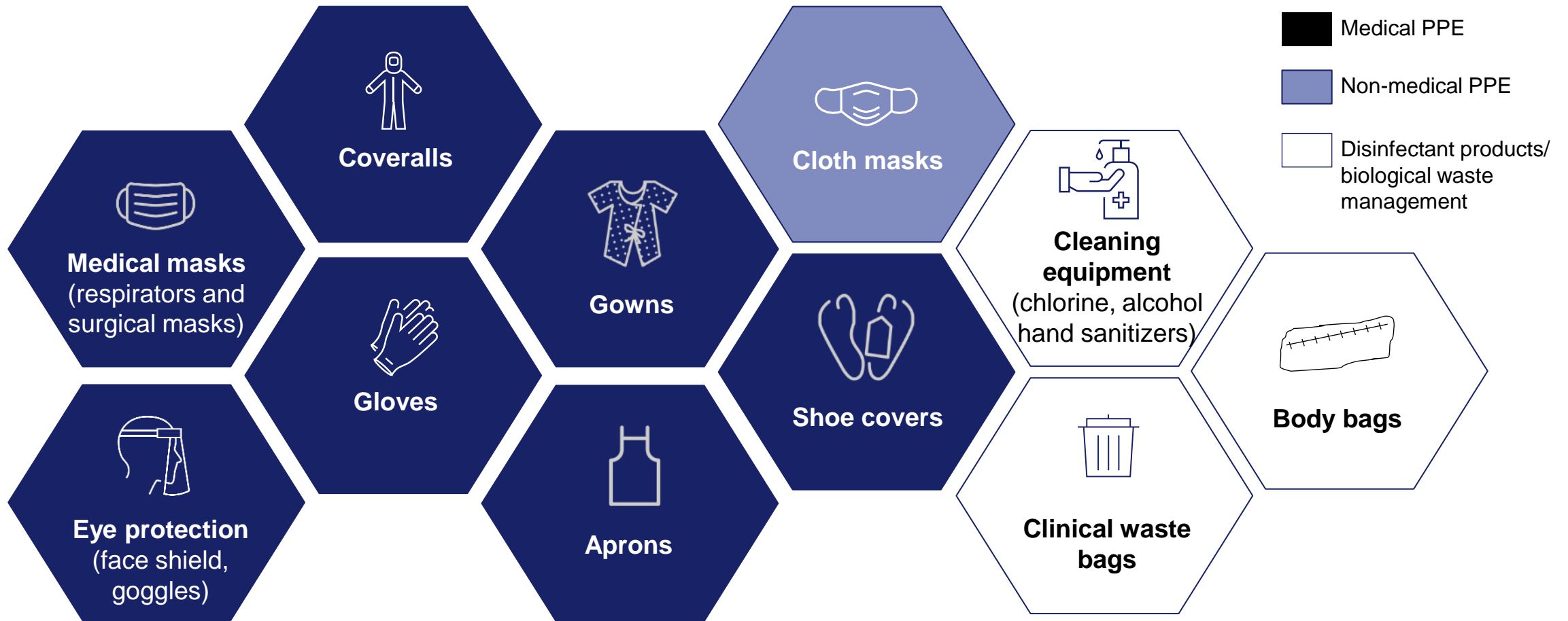


### Key objectives

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.

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# I. Impact of Covid-19 on global PPE supply

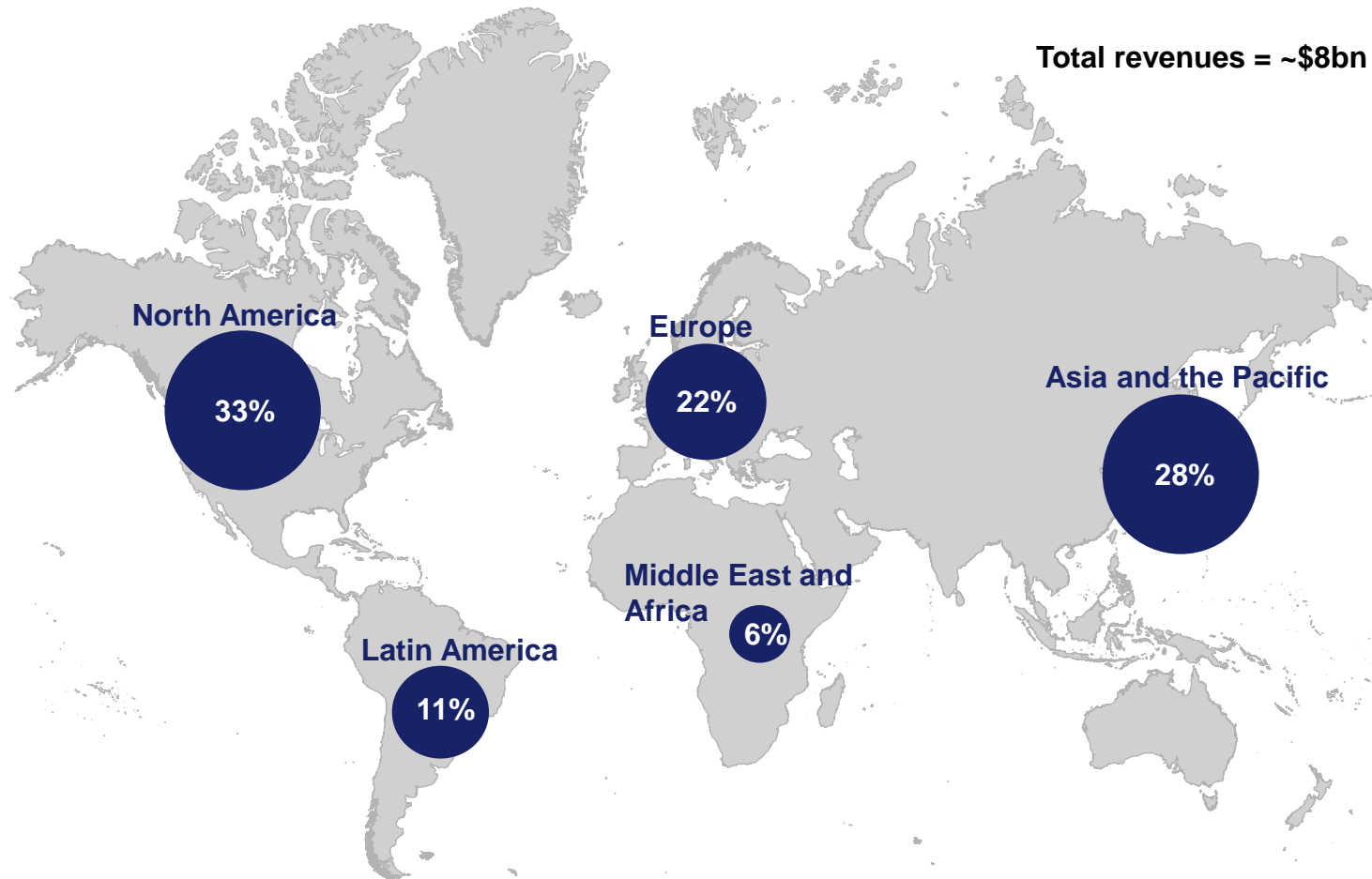


**In 2019 the medical PPE market amounted to ~\$8bn. It was consolidated and led by the US and Asia.**

# Before the crisis, the global PPE market accounted for ~\$8bn and was led by North America and Asia

MARKET ESTIMATES – ONLY MEDICAL PPE CONSIDERED

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



## Key messages

In **2019** the **medical PPE** market was estimated to amount to ~\$8bn, in turn accounting for **15% of total PPE<sup>1</sup> market size**

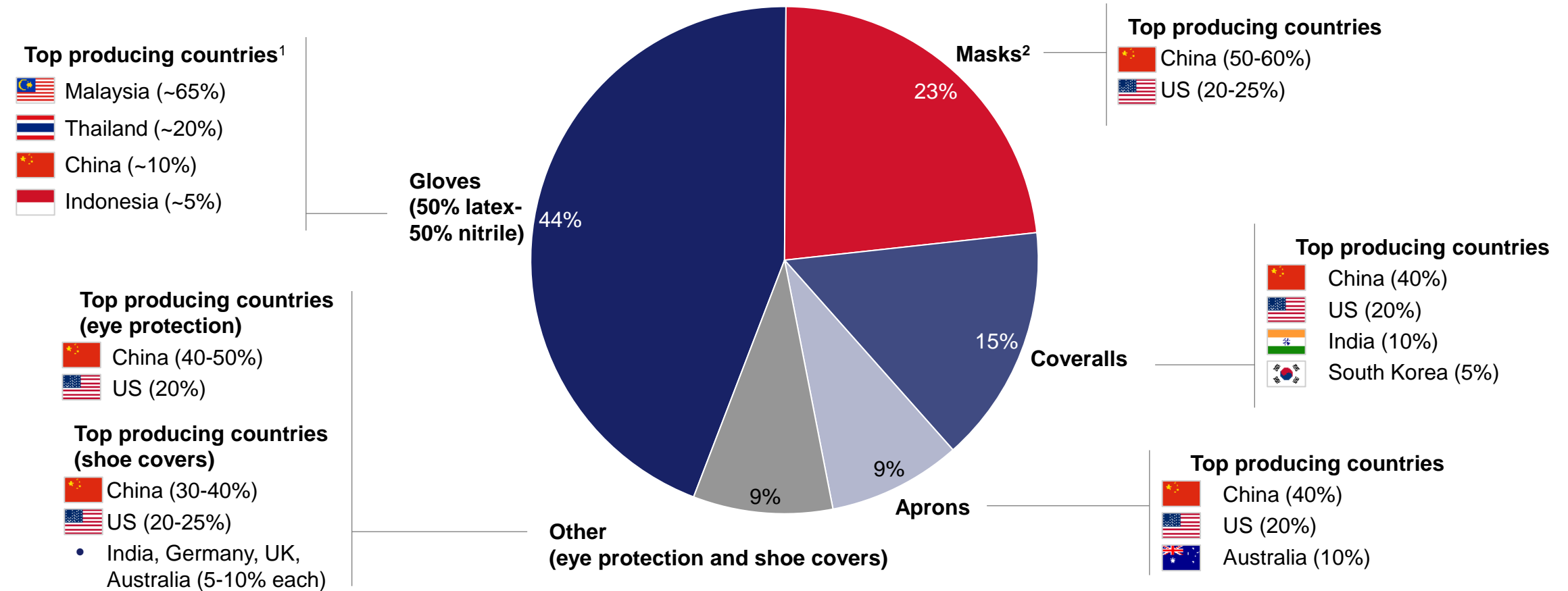
In 2019, the countries with the highest production were **China, US and Germany**, each with **different export dynamics**: while China was the biggest exporter worldwide, the US exported mainly across North and Latin America and Germany served almost exclusively European countries

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

# China and the US make the majority of every category except for gloves, which are mostly manufactured in Malaysia and Thailand

MARKET ESTIMATES – ONLY MEDICAL PPE CONSIDERED

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



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



# I. Impact of Covid-19 on global PPE supply



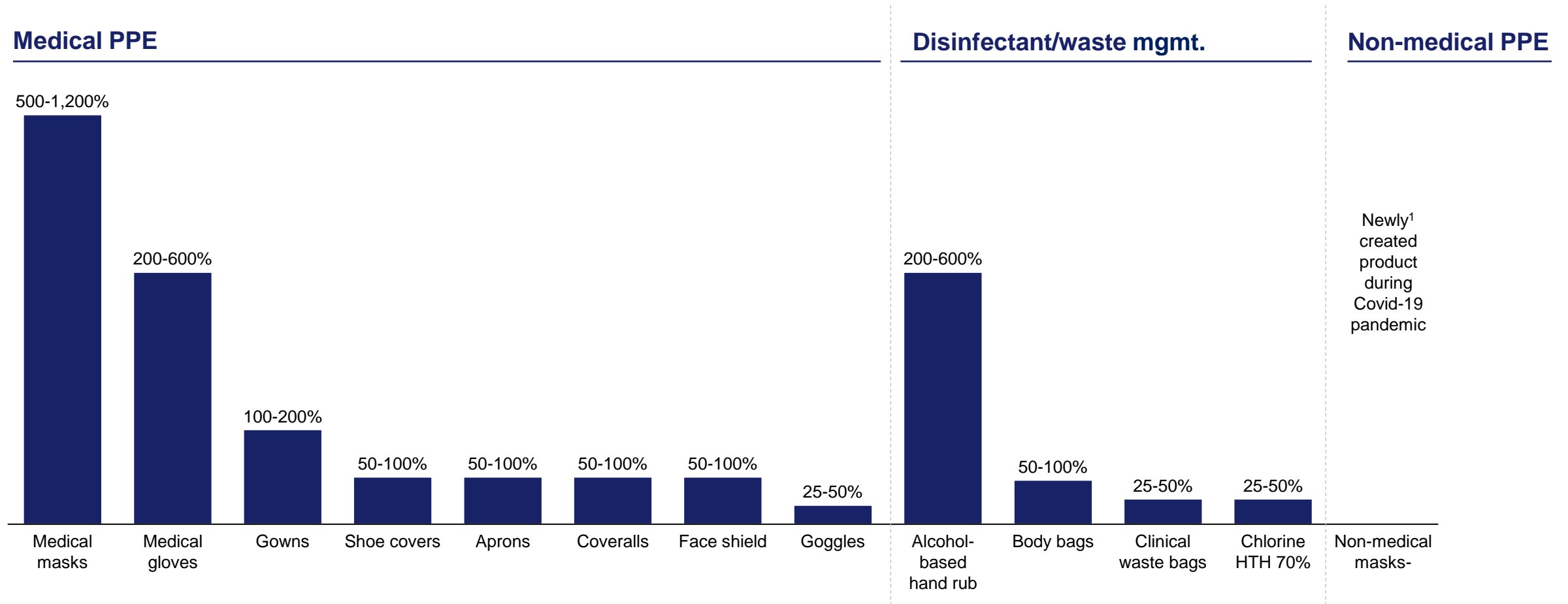
**Industry experts suggest that, as a consequence of the Covid-19 pandemic, global production of medical PPE increased by at least 300% at the peak, principally driven by demand for masks.**

**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%

NON-EXHAUSTIVE – DIRECTIONAL ESTIMATES BASED ON INTERVIEWS WITH INDUSTRY PLAYERS, AS OF MID-DECEMBER 2020

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



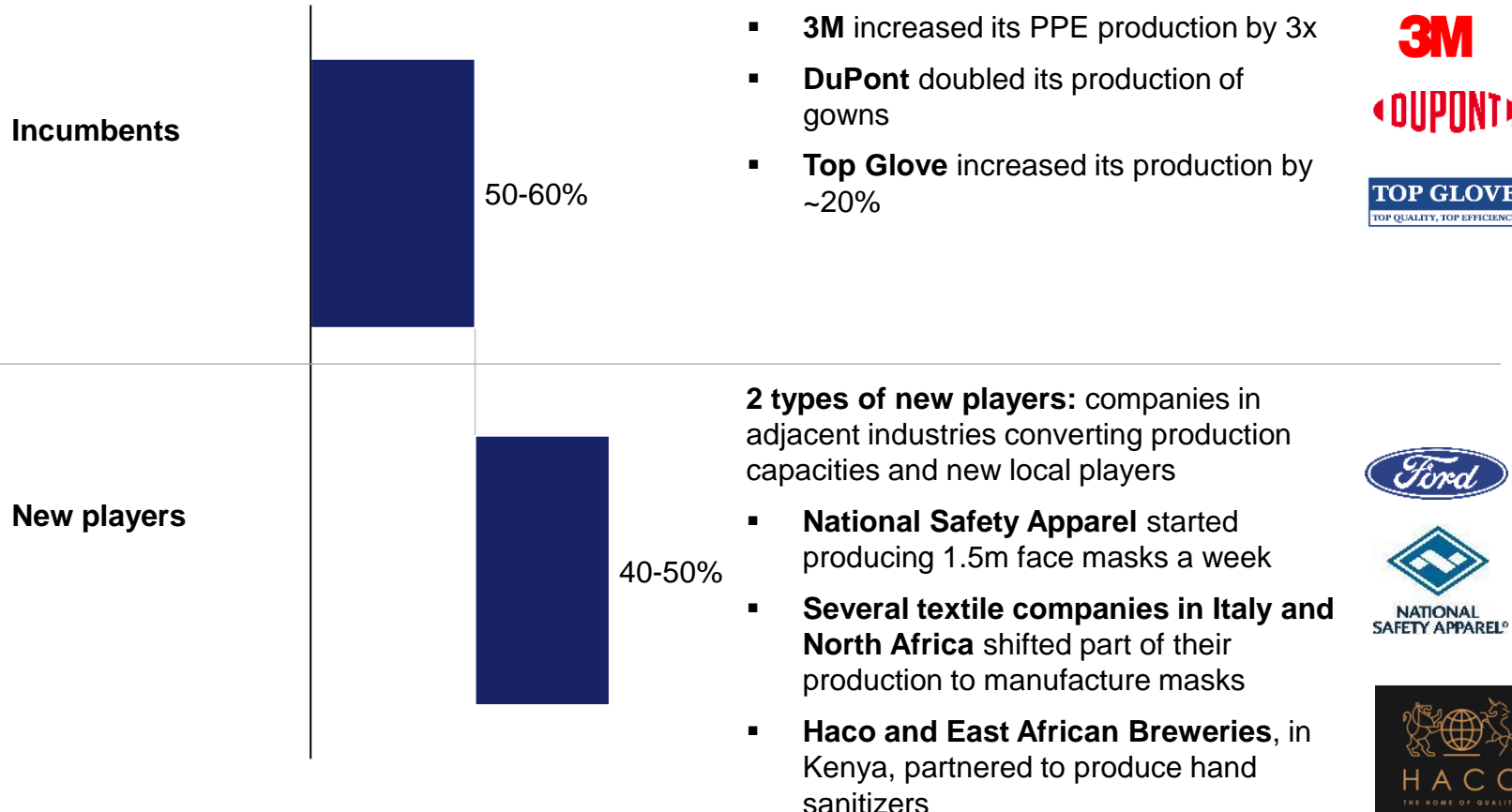
1. Production pre-Covid-19 was negligible compared to current production

# Around half of this increased production was delivered by incumbents and the other half came from new market entrants

NON-EXHAUSTIVE AND ILLUSTRATIVE – ESTIMATES BASED ON INTERVIEWS WITH INDUSTRY PLAYERS, AS OF MID-DECEMBER 2020

## Share of new production capacity added during Covid-19 pandemic, estimates

### Examples (non-exhaustive)



## 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

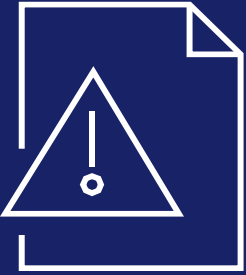
A significant part of this production surge has come from targeting new customer segments beyond health systems (e.g., consumers, workers in non-healthcare settings)



*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

# I. Impact of Covid-19 on global PPE supply



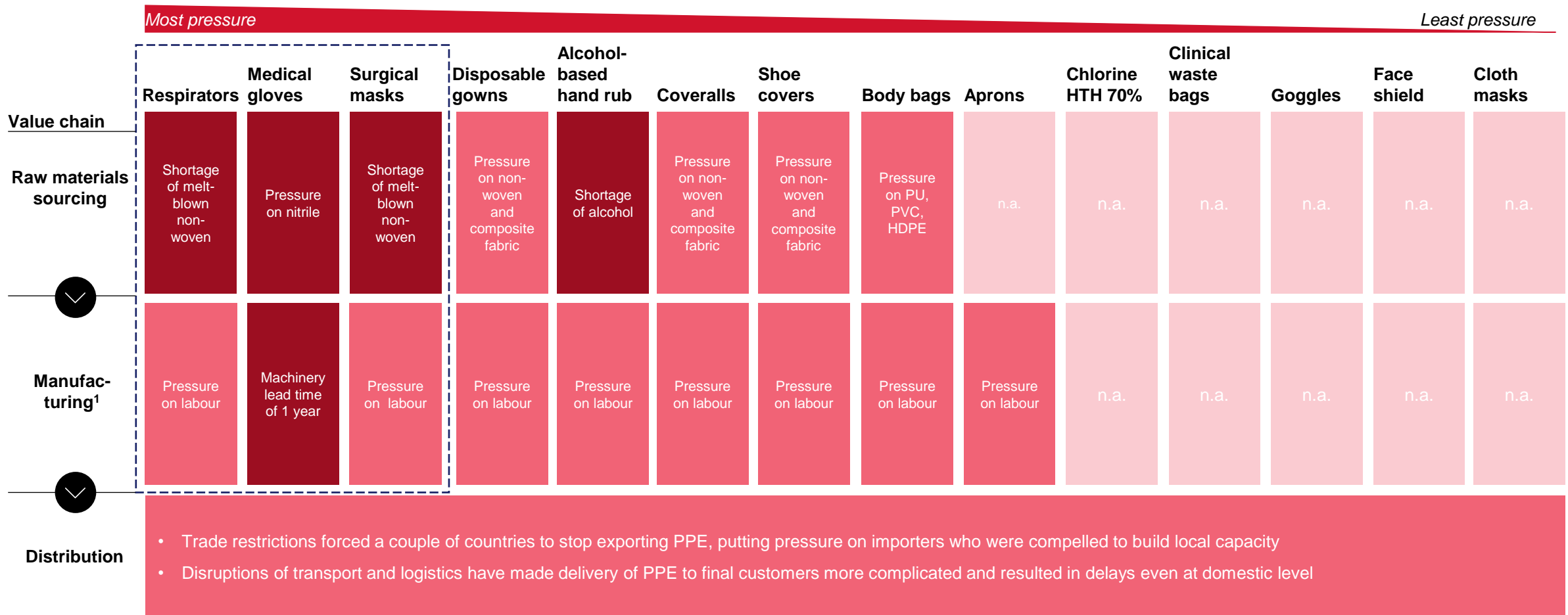
**This increase in output put the entire PPE manufacturing value chain under significant pressure.**

# Increasing manufacturing capacity has put the PPE supply chain under pressure, especially with regard to raw materials

NON-EXHAUSTIVE – BASED ON INTERVIEWS WITH INDUSTRY PLAYERS, AS OF MID-DECEMBER 2020

  Focus of next pages
  High supply pressure
  Medium supply pressure
  Low supply pressure

## Mapping of bottlenecks along the PPE value chain



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

# Contents

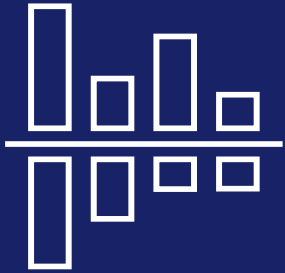
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## II. 2020-25 global PPE demand forecast



**Global volume demand for PPE increased by 300-400% between 2019 and 2020<sup>1</sup>, driven by increased consumption by the general public and in non-healthcare work settings.**

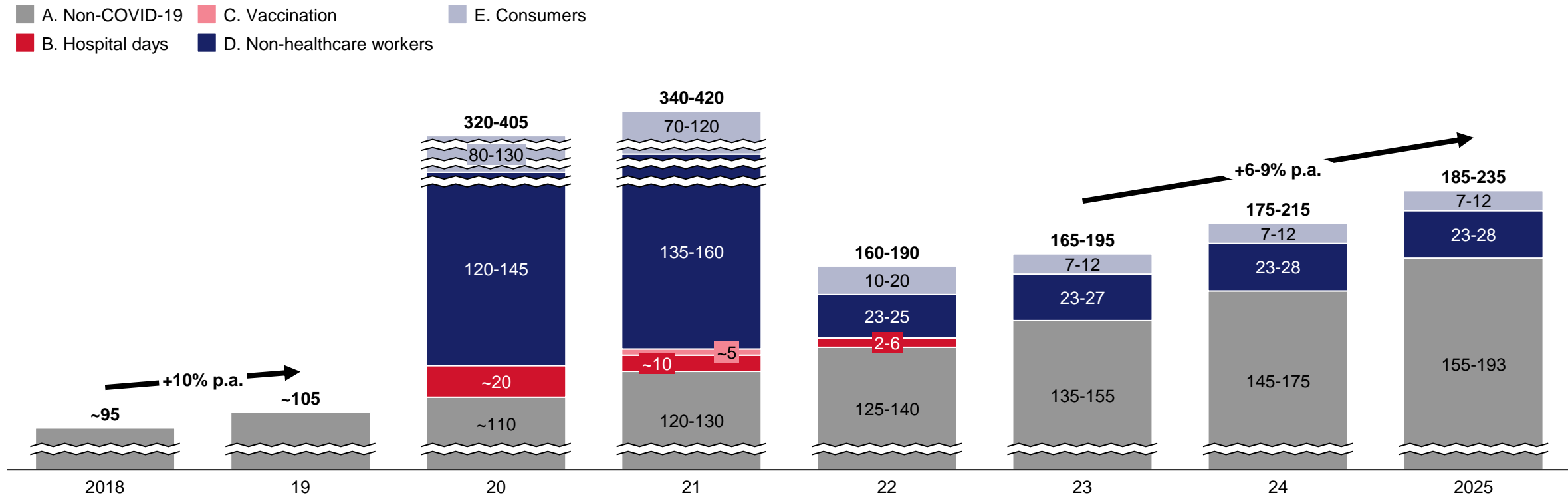
**This peak demand is expected to continue throughout 2021 but is likely to decrease sharply in 2022 as consumption from both these groups is expected to shrink.**

**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<sup>1</sup> volume PPE demand, 2018-25, units, bn<sup>2</sup>



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

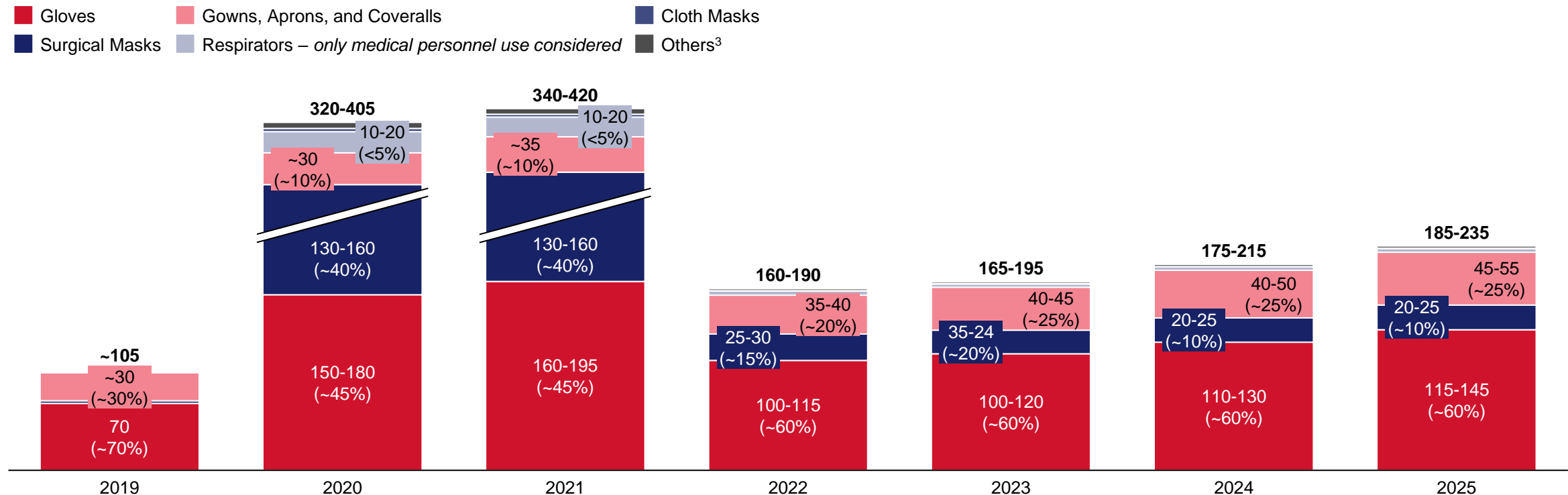


# Consumers and non-healthcare workers will drive surgical mask demand to peak in 2021 at 125-160bn units before falling back ~40% p.a. in 2021-25

ESTIMATES – AS OF 16 DECEMBER 2020

## Total estimated PPE<sup>1</sup> demand by category

2019-25, units, bn<sup>2</sup> (% 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

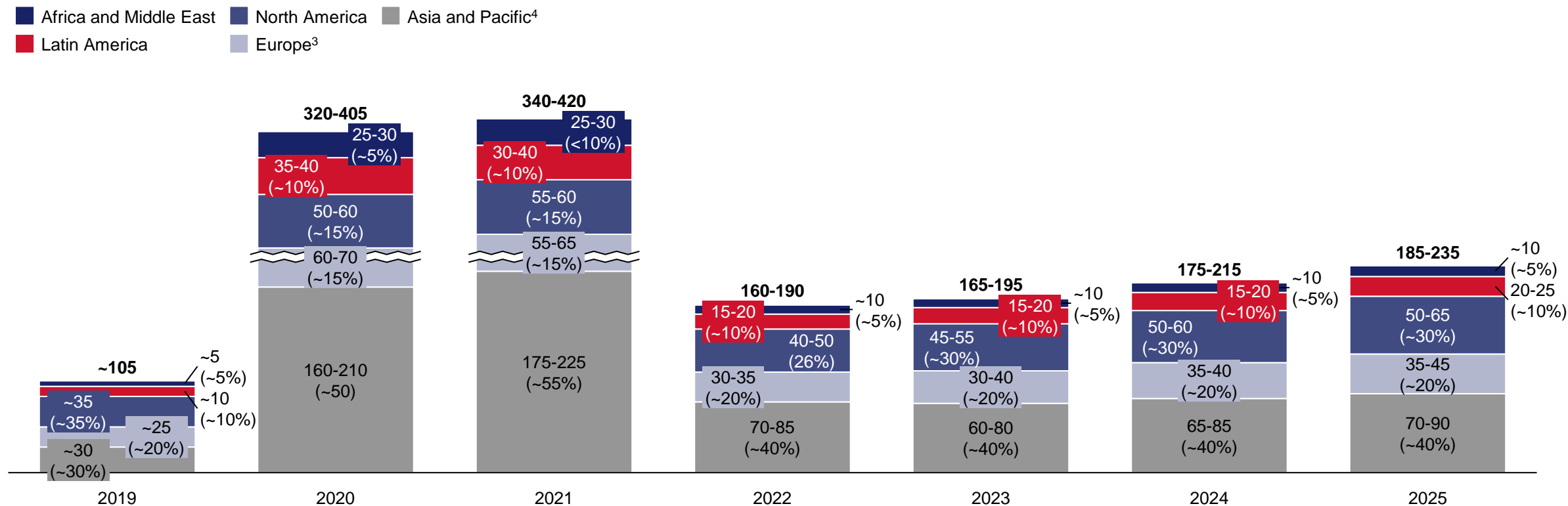
3.Eye protection (face shields and goggles), shoe cover, and disinfectant products/biological waste management (i.e., hand sanitizer, chlorine, body bags and clinical waste bags)

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

# 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<sup>1</sup> PPE demand by region, 2019-25, units, bn<sup>2</sup> (% 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")

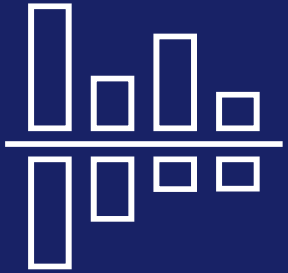
2. Unit is per item or per pair in case of gloves, hand sanitizer is per liter, and chlorine is per kg

3. Including Russia and Central Asia

4. Including China and India

Source: Mordor Intelligence (updated in November 2020), EPI model, WHO assumptions

## II. 2020-25 global PPE demand forecast – **Update from March 2021**

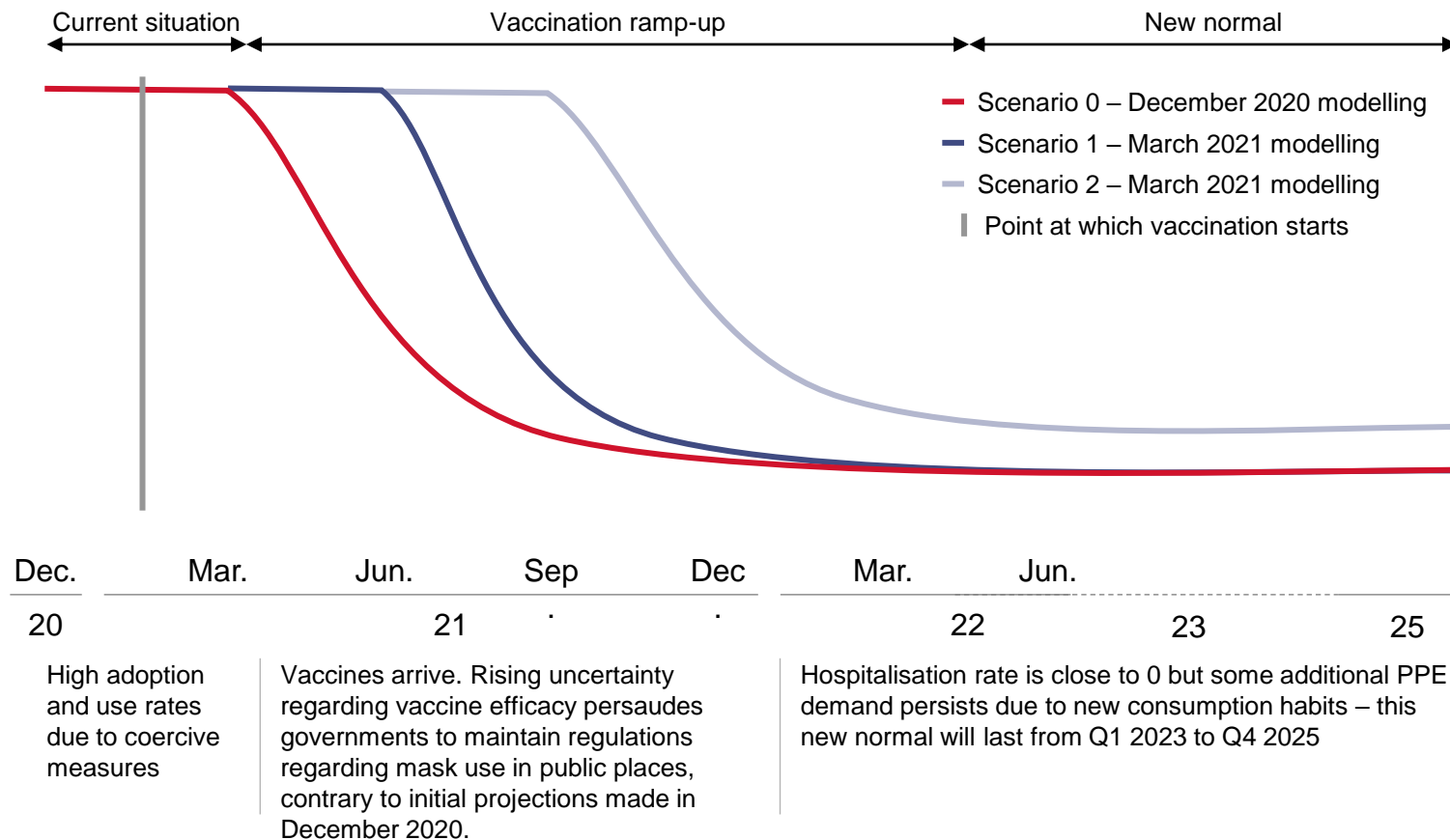


**There is still some significant uncertainty as to the magnitude of the peak in 2021 as we witness a fast-evolving health situation (e.g., new variants) and developing scientific advice, leading to changes in public health and government policies as well as individual behaviors (i.e., mask wearing requirements 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

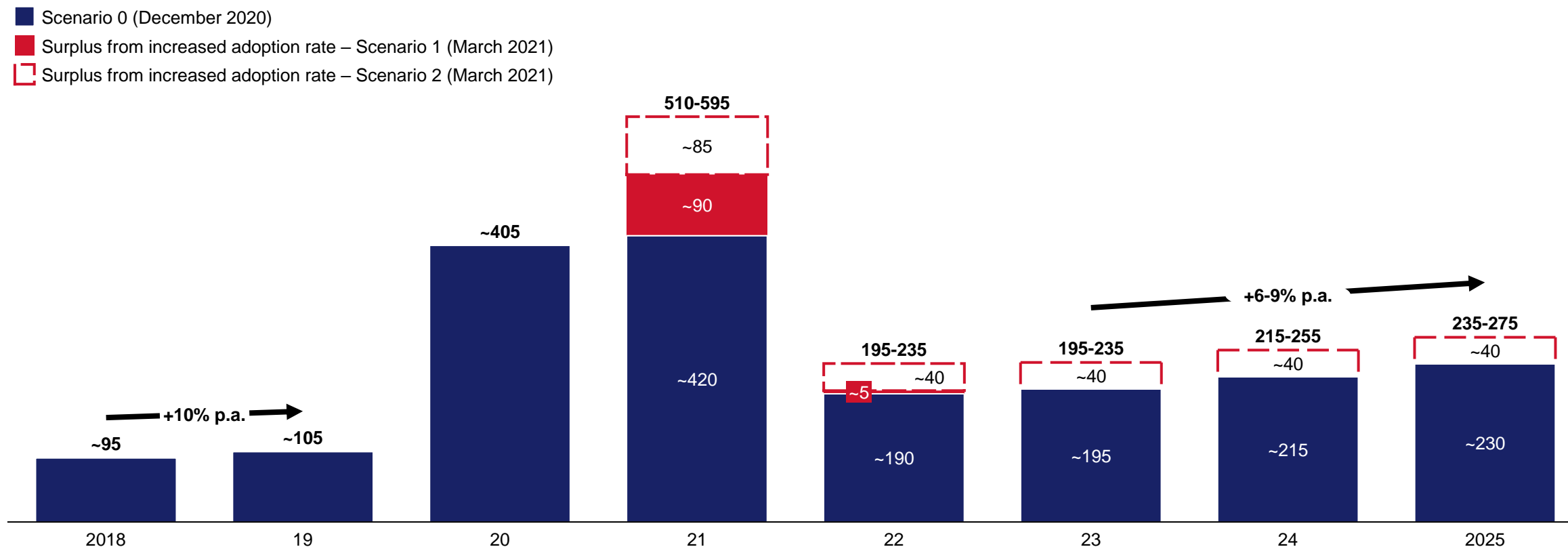
- Official guidelines continue to require wearing masks in public places until herd immunity is achieved
- Long-term adoption rate remains higher than pre-COVID crisis levels due to e.g. personal preferences

*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 estimated<sup>1</sup> volume PPE demand, 2018-25, units, bn<sup>2</sup>



1. For readability reasons, only the "high" scenario is presented

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

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### 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

NON-EXHAUSTIVE AND ILLUSTRATIVE – AS OF NOVEMBER 2020

## 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**



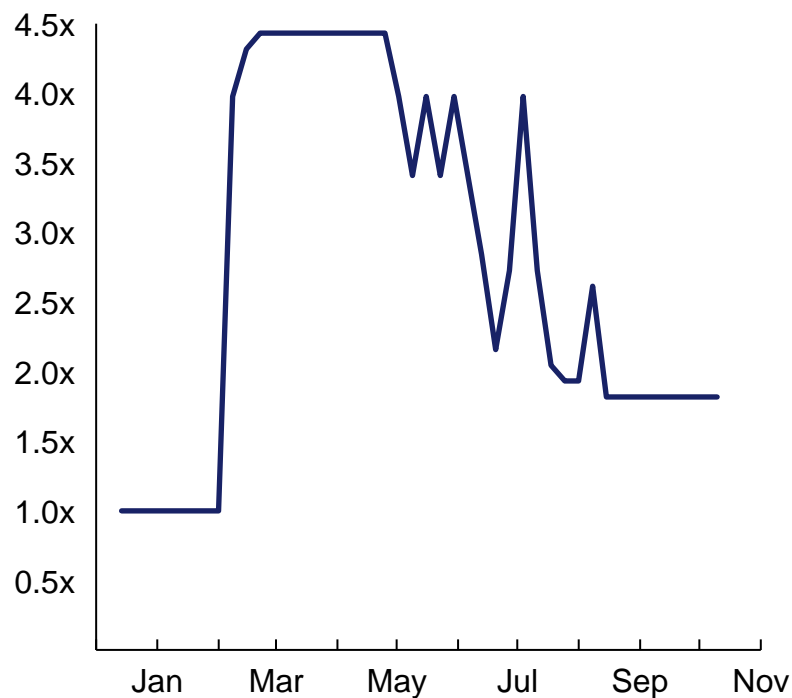
# Increased PPE market prices allowed new entrants to generate significant returns on investment – but prices are decreasing

NON-EXHAUSTIVE AND ILLUSTRATIVE – AS OF NOVEMBER 2020

## Selected UK PPE unit prices

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

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



## Main insights



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

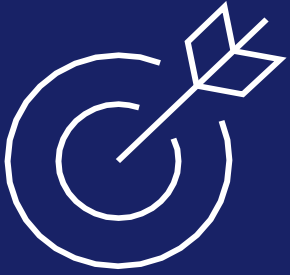
– CFO of a US healthcare network, November 2020

“ ”

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

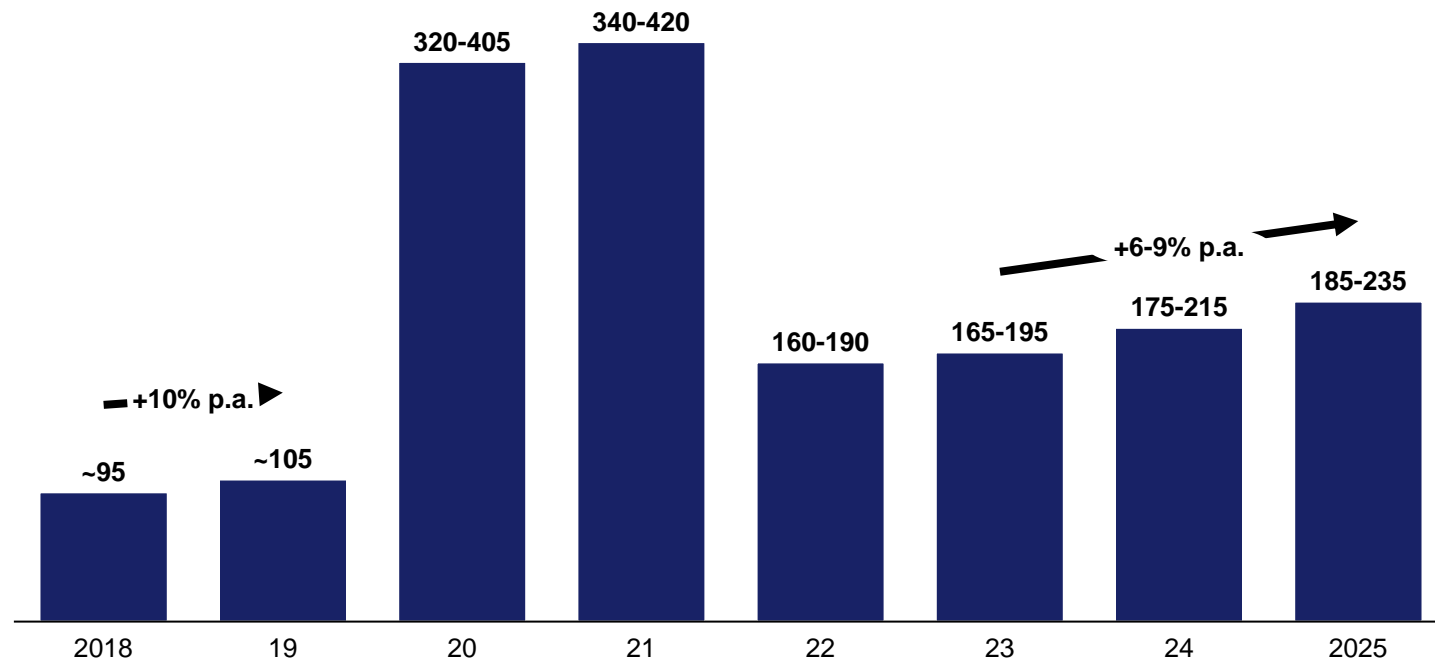


**The outlook for the market nevertheless remains positive over the longer term**

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

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

Global estimated<sup>1</sup> PPE demand by volume, 2018-25, units, bn<sup>2</sup>



## 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)

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")

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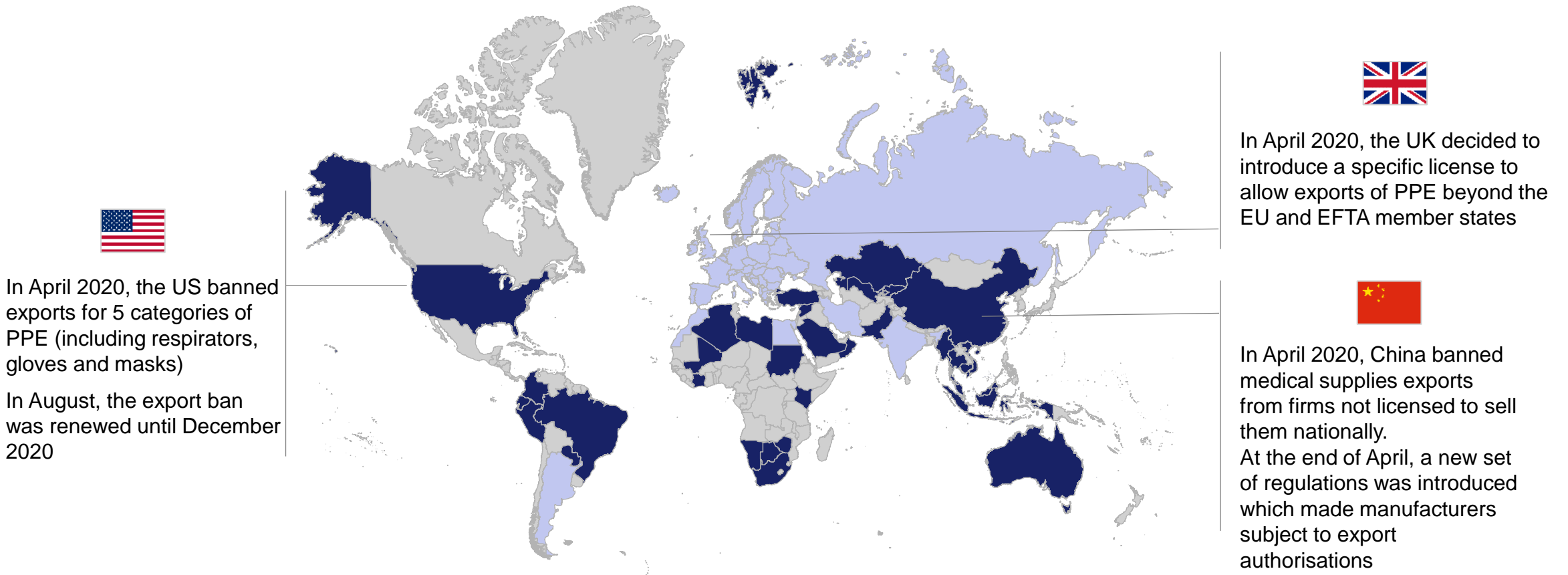
# The progressive lifting of export restrictions imposed in March has eased supply pressure and rebalanced global supply and demand

NON-EXHAUSTIVE AND ILLUSTRATIVE – AS OF NOVEMBER 30, 2020

## PPE export restrictions worldwide as of November 2020

 Countries with active export restrictions

 Countries with export restrictions which have been terminated
























### 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



NON EXHAUSTIVE AND ILLUSTRATIVE

| Demand                                             | Typical channels                                     | Examples of organizations involved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Level of opportunity <sup>1</sup>                                                                                                                                                  |
|----------------------------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Public healthcare provision and rest of government | International organizations' procurement arms        | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | n/a to European countries overall                                                                                                                                                  |
|                                                    | Regional online tendering platform                   |  Ted                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Launch of pan-European med product procurement platform, few tenders open from local authorities and various public entities (e.g., schools)                                       |
|                                                    | Distributors and/or GPOs supplying to public sector  | Distributors:  <br>GPOs:  <br>              | Distributors and GPOs reported to be looking to enlarge their supplier list with cost-competitive options closer than Far East                                                     |
|                                                    | Direct tendering from public sector                  |    Regione Lombardia                                                                                                                                                                                                                                                                                 | Few tenders open from local authorities and various public entities (e.g., schools) on national platforms,, sometimes directly accessible to manufacturers (vs. distributors/GPOs) |
| Private healthcare provision                       | Distributors and/or GPOs supplying to private sector | Distributors:  <br>GPOs:  <br>  | Distributors and GPOs reported to be looking to enlarge their supplier list with cost-competitive options closer than Far East                                                     |
|                                                    | Direct tendering from private sector                 |                                                                                                                      | Some opportunities flagged by private hospitals in UK on specific niche products (gloves, gowns) when NHS undersupplying; probably low volume                                      |

1. Qualitative assessment based on expert interviews - current as Nov-Dec 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

NON EXHAUSTIVE AND ILLUSTRATIVE

 Limited →  High

| Demand                                             | Typical channels                                     | Examples of organizations involved                                                                                                                                                                                                                                                                                                                      | Level of opportunity <sup>1</sup>                                                                                                                                                                                                                   |
|----------------------------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Public healthcare provision and rest of government | International organizations' procurement arms        |                                                                                                                                                                                   |  UNICEF stating open to enriching its supplier catalogue in 2021 directly with manufacturers                                                                     |
|                                                    | Regional online tendering platform                   |             |  African Medical Supply Platform (AMSP) launched in 2021 to pool volume from public sector across continent                                                      |
|                                                    | Distributors and/or GPOs supplying to public sector  | Central pharmacies and public procurement authorities (public GPOs) from several African countries                                                                                                                                                                                                                                                      |  Several central state reported to be overall over-stocked with PPE at end of 2021 (e.g., French-speaking Africa); some exception also reported (e.g., Ethiopia) |
|                                                    | Direct tendering from public sector                  | Ministries of Health of several African countries                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                     |
| Private healthcare provision                       | Distributors and/or GPOs supplying to private sector |     |  Inconsistencies in distributors reporting willingness to enlarge PPE supplier list                                                                            |
|                                                    | Direct tendering from private sector                 |                                                                                                                                                                               |  Expected lower volume                                                                                                                                         |

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

**X** Focus next page

NON-EXHAUSTIVE – FROM EXPERT INTERVIEWS, AS OF MID-DECEMBER 2020  
THOROUGH BUSINESS PLANNING REQUIRED TO ASSESS FURTHER THE 3 OPPORTUNITIES

## Level of opportunity



Limited



Significant



Historic CAGR  
2017-19



Forecast CAGR  
2020-25

| Opportunities                                               | Market size 2019,<br>Estimates, \$m | Market opportunity: high-level and<br>directional assessment                                                                                                          | Barriers to entry (non-exhaustive; see further details next<br>pages)                                                                                                                                                         |
|-------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>i</b> Melt-blown<br>manufacturing                        |                                     | <p>Potential to play a “volume” strategy and supply smaller mask manufacturers</p>                                                                                    | <ul style="list-style-type: none"> <li>• Regulation</li> <li>• Raw material and machinery shortage</li> <li>• Consolidated market</li> <li>• Importance of scale</li> </ul>                                                   |
| <b>ii</b> Gloves machinery<br>manufacturing                 |                                     | <p>Manufacturing semi-automated machines requiring less technical knowledge and expertise</p>                                                                         | <ul style="list-style-type: none"> <li>• Technical knowledge and expertise</li> <li>• Brand recognition needed</li> <li>• Highly fragmented market concentrated in China for semi-automated machines manufacturers</li> </ul> |
| <b>iii</b> Alcohol<br>manufacturing (for<br>hand sanitizer) |                                     | <p>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</p> | <ul style="list-style-type: none"> <li>• Importance of scale</li> <li>• High capex required</li> <li>• Brand recognition needed</li> <li>• Proximity to feedstocks required</li> <li>• Regulation</li> </ul>                  |

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

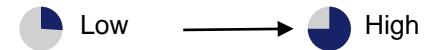


# Focus on melt-blown market: potential opportunities for cost-advantaged new entrants and large end-product producers looking to integrate vertically

PROPOSITION - NON-EXHAUSTIVE

THOROUGH BUSINESS PLANNING REQUIRED TO FURTHER ASSESS THE STRATEGIC POSITIONING

Feasibility



| Type of player                           | Strategic positioning               | Description                                                                                                                             | Key success factors                                                                                                                                                                                                                                                                                                                                                                                         | Feasibility |
|------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| For a brand new player                   | Cost leader                         | Enter the melt-blown industry with a <b>high volume and low cost strategy</b> by using low cost raw materials and low quality machinery | <ul style="list-style-type: none"> <li>Achieve economies of scale (would require producing spunbond as well as melt-blown and targeting multiple industries as customers)</li> <li>Locate near to raw material supply</li> <li>Locate in a low labour and utilities cost country</li> <li>Target small/medium and local players as customers</li> </ul>                                                     |             |
|                                          | Premium manufacturer                | Enter the melt-blown industry with a <b>high margin strategy</b> by using high quality raw materials and machinery                      | <ul style="list-style-type: none"> <li>Secure high quality raw materials and machinery (in short supply during the Covid-19 crisis)</li> <li>Target large players as customers (would involve inspections and quality control)</li> <li>Build solid brand and reputation (would require several years)</li> </ul>                                                                                           |             |
| For an existing end-product manufacturer | Value chain integrator <sup>1</sup> | <b>Build in-house melt-blown production capabilities</b> for own use (only makes sense for large end-product manufacturers)             | <ul style="list-style-type: none"> <li>Sufficient internal demand to break-even; it would be hard for a small company to integrate upward due to capital intensity and technical barriers</li> <li>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.</li> </ul> |             |

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

