Measles Monovalent and Measles and Rubella Combination Vaccines: Supply and Demand Update

UNICEF Supply Division

August 2019
This update provides new information on measles monovalent and measles and rubella combination vaccines, including supply, demand, and anticipated market developments through 2023. It highlights UNICEF’s efforts to address continued demand forecast inaccuracies while ensuring supply availability amidst resurgent measles prevalence.

1. Summary

- To prevent measles outbreaks, the World Health Organization (WHO) recommends routine immunization programmes reach and sustain over 95 per cent coverage with two measles-containing vaccine (MCV) doses. Currently, over 168 countries have introduced a second MCV dose (MCV2) into their expanded programme on immunization (EPI) schedules with the average coverage rate in those countries reaching 67 per cent,1 and with the current global coverage rate for the first dose (MCV1) at 85 per cent.

- The demand for measles monovalent (MV) and measles and rubella (MR) vaccines is interconnected, with the volume of MR vaccines procured through UNICEF now exceeding that of MV. UNICEF procured 190 million doses of MR vaccine in 2018 on behalf of 37 countries and 117 million doses of MV on behalf of 31 countries. Supplementary immunization activities (SIAs) represent a large share of MV and MR vaccine demand through UNICEF. As countries introduce a rubella-containing vaccine and switch from MV to MR vaccines, the demand for MR vaccine will progressively replace that of MV vaccines. As such, any forecast inaccuracy related to the timing of MR vaccine introduction in countries will affect the demand for MV. Predicting the exact timing of country SIAs as well as their target population sizes has been a challenge and has caused significant forecasting inaccuracies requiring improvement.

- The industry’s current production capacity and supply is sufficient to meet all forecast demand and outbreak response requirements. However, between 80-90 per cent of MV and MR vaccines supply is dependent on one manufacturer that offers the only WHO prequalified MR vaccine. New market entrants are needed to improve market health, diversify supply, and reduce supply risk. Post 2023, once the majority of wide-age range catch up campaigns using the MR vaccine have been completed, and the demand for this vaccine stabilizes, UNICEF anticipates there will be a need for manufacturers to balance the level of MR production capacity in the market while maintaining affordable prices.

- UNICEF anticipates issuing its next tender in 2020 for supply in 2021 and beyond. Should the MV and MR vaccine markets be subject to significant changes, UNICEF will update this note.

2. Background

Measles is a highly contagious viral infection caused by the measles Morbillivirus and is one of the leading causes of under-five child mortality despite available safe and cost-effective vaccines. It spreads easily from person to person through airborne, droplet, and contact transmission.² The risk of infection severity and mortality increases in children under-five years of age that are malnourished, especially if suffering from vitamin A deficiency (VAD).³ Some people may suffer from severe complications such as pneumonia (infection of the lungs), which is the most common cause of death from measles in young children, and encephalitis (swelling of the brain). There is no specific curative treatment for measles. Treatment will mainly be based on supportive care and seek to prevent and manage complications and secondary infections.⁴ To prevent infection,

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WHO recommends the routine immunization against measles of #EveryChild, everywhere, with two doses of MCV as standard in all national immunization programmes reaching a national coverage rate greater than 95 per cent.5

Rubella (also known as German measles) is an acute, contagious viral infection caused by the Rubivirus. While generally a mild infection, occurring mostly in children and young adults, it is a leading cause of vaccine-preventable birth defects in pregnant women.6 Congenital rubella syndrome (CRS) is a cause of foetal death, and the defects from CRS affect an estimated 100,000 newborns a year.7 To prevent rubella infection, WHO recommends countries include rubella vaccination in national programmes if they already include measles immunization.8 A single dose gives more than 95 per cent long-lasting immunity.9

A country’s measles and rubella vaccination policy and delivery strategy can vary. Whereas countries with well-established and high-performing immunization programmes rely on routine immunization services to deliver both MCV1 and MCV2, countries with less than 95 per cent coverage of both doses use SIAs to improve coverage and rapidly reduce the pool of susceptible children. WHO recommends countries continue SIAs until they reach and sustain coverage with both MCV doses of over 95 per cent through routine immunization programmes.

Several vaccines containing rubella exist, including MR, measles, mumps and rubella (MMR), and measles, mumps, rubella and varicella (MMRV) vaccines. This market note will only cover MV and MR vaccines and will not include information or data on MMR, which UNICEF will address through a separate market note. As there is currently no demand through UNICEF for varicella vaccines, this note, and the future issue on MMR, will not include market information on MMRV.

The measles and rubella initiative (MRI), initially established in 2001,10 is a global partnership led by the American Red Cross, United Nations Foundation, United States (US)Centers for Disease Control and Prevention (CDC), UNICEF, and WHO. UNICEF chairs the supply coordination group (SCG),11 the strategic communications working group (CWG) and is co-chair of the programme implementation working group (PIWG). The MRI supports the global vaccine action plan’s (GVAP) target to eliminate measles and rubella in at least five geographic regions by the end of 2020 by supporting countries to increase their measles and rubella immunization coverage rates, and provide technical and financial support for quality SIAs and effective outbreak response.12 Although the GVAP’s targets will not likely be met, as current measles coverage is plateauing globally at 85 per cent, and measles remains endemic in all regions,13 progress is being made as more children are reached every year and 86 per cent of countries have introduced a MCV2 into their national immunization programmes with global coverage having reached 67 percent. The 73rd session of World Health Assembly scheduled in May 2020 will consider the feasibility of global measles and rubella eradication, with any potential eradication strategies likely to impact global demand beyond 2020.

Measles cases spiked in 2017 to reach 173,000, representing an increase of 31 per cent from 2016,14 with the greatest surge in cases being in the Americas, the Eastern Mediterranean, and Europe.15 In addition there were a significant number of outbreaks reported in 2018, bringing the total number of cases in 2018 to 326,000, representing a continuing surge in increase by 88 per cent from 2017. Recent data from WHO for 2019 reports that the total number of confirmed cases reached so far

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7Ibid.
9WHO, Rubella Key Facts.
10Initially established as the Measles Initiative in 2001, later rubella was added to its mission in 2012, becoming the MRI.
11Note: The Supply Coordination Group (SCG) under MRI is an advisory body on measles-containing vaccine (MCV) supply to manage effectively global procurement activities and information exchange on market developments. It meets regularly to discuss, validate, and prioritize any demand against available supply.
during first quarter is 112,163 cases, surpassing the number of cases reported during the same quarter period in 2018 by 300 per cent, which was 28,124 cases.\textsuperscript{16} Should this trend continue, the number of measles cases in 2019 will be significantly higher than in previous years. The Americas region lost their measles elimination status, and measles outbreaks have occurred in all regions with an estimated 110,000 deaths related to the disease in 2017. While significant progress has been made with over 21 million lives saved through measles immunizations since 2000, complacency over the disease, an aggressive anti-vaccine lobby, conflicts, population displacement, and insufficient immunization coverage rates are contributing to a global resurgence of measles that is undermining the years of progress made in reducing the prevalence of measles incidence and mortality. Existing country strategies need to change to increase routine immunization coverage, strengthen health systems, and be supported with appropriate resources.\textsuperscript{17}

In November 2018, Gavi, the Vaccine Alliance (Gavi) amended its health system immunization strengthening (HSIS) framework to further encourage countries to strengthen their routine measles immunization programmes.\textsuperscript{18} It seeks to reach children with no previous history of measles vaccination (zero dose) and those only having received MCV1. Countries can now apply for operational support costs for follow up SIAs to reach higher measles immunization coverage rates targeting missed children.\textsuperscript{19}

At present, WHO has prequalified vaccines by two manufacturers that come in ten different vial presentations, ranging from one-dose to 20-dose vial, of which there are six MV and four MR vaccines. Only one manufacturer, Serum Institute of India (SII) currently has WHO prequalified MR vaccines (Table 1).\textsuperscript{20} However, not all the vaccines listed by WHO may be available on the market, as there may not be any demand, and so may not be produced. UNICEF only procures MV and MR in 5- and 10-dose vials.

**Table 1 WHO Prequalified Measles and Measles and Rubella Vaccines**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Vaccine Type</th>
<th>Course</th>
<th>WHO PQ</th>
<th>Presentation</th>
<th>Form.</th>
<th>Shelf life</th>
<th>VVM</th>
<th>Cold Chain Vol / Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio Farma (Indonesia)</td>
<td>MV</td>
<td>2-dose</td>
<td>1997</td>
<td>10-dose vial</td>
<td>Lyophilized</td>
<td>36 months</td>
<td>14</td>
<td>3.30 cm³</td>
</tr>
<tr>
<td></td>
<td>MV</td>
<td>2-dose</td>
<td>2006</td>
<td>20-dose vial</td>
<td>Lyophilized</td>
<td>36 months</td>
<td>14</td>
<td>1.74 cm³</td>
</tr>
<tr>
<td></td>
<td>MV</td>
<td>2-dose</td>
<td>1993</td>
<td>1-dose vial</td>
<td>Lyophilized</td>
<td>30 months</td>
<td>14</td>
<td>21.09 cm³</td>
</tr>
<tr>
<td></td>
<td>MV</td>
<td>2-dose</td>
<td>1993</td>
<td>2-dose vial</td>
<td>Lyophilized</td>
<td>30 months</td>
<td>14</td>
<td>10.54 cm³</td>
</tr>
<tr>
<td></td>
<td>MV</td>
<td>2-dose</td>
<td>1993</td>
<td>5-dose vial</td>
<td>Lyophilized</td>
<td>30 months</td>
<td>14</td>
<td>4.22 cm³</td>
</tr>
<tr>
<td>Serum Institute of India</td>
<td>MV</td>
<td>2-dose</td>
<td>1993</td>
<td>10-dose vial</td>
<td>Lyophilized</td>
<td>30 months</td>
<td>14</td>
<td>2.11 cm³</td>
</tr>
<tr>
<td></td>
<td>MR</td>
<td>2-dose</td>
<td>2000</td>
<td>1-dose vial</td>
<td>Lyophilized</td>
<td>30 months</td>
<td>14</td>
<td>21.09 cm³</td>
</tr>
<tr>
<td></td>
<td>MR</td>
<td>2-dose</td>
<td>2000</td>
<td>2-dose vial</td>
<td>Lyophilized</td>
<td>30 months</td>
<td>14</td>
<td>10.54 cm³</td>
</tr>
<tr>
<td></td>
<td>MR</td>
<td>2-dose</td>
<td>2000</td>
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<td>4.22 cm³</td>
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<tr>
<td></td>
<td>MR</td>
<td>2-dose</td>
<td>2000</td>
<td>10-dose vial</td>
<td>Lyophilized</td>
<td>30 months</td>
<td>14</td>
<td>2.11 cm³</td>
</tr>
</tbody>
</table>

Source: World Health Organization

All measles vaccines are immunogenically interchangeable with each other, even if based on different strains of the disease. Bio Farma’s vaccines are based on the CAM 70 strain whilst SII’s measles vaccines use the Edmonston-Zagreb strain.\textsuperscript{21}

Several other manufacturers produce non-WHO prequalified MV and or MR vaccines, including Biological E (India), China National Biotech Group (China), Microgen (Russia), POLYVAC (VietNam), Razi Institue (Iran), and Zydus Cadilla (India), amongst others, and which mainly produce for their domestic markets. Several other manufacturers are also currently developing new MV and MR vaccines, which UNICEF expects could contribute to greater diversification of potential sources of supply and reduce dependency on a single national regulatory authority (NRA). UNICEF expects one manufacturer’s new MR product will achieve WHO prequalification by 2020.


3. **Innovation**

A number of new emerging vaccine technologies could impact the demand for measles-containing vaccines such as microarray patches (MAPs) and new MR-containing combination vaccines. In 2017, the Bill and Melinda Gates Foundation (BMGF), Gavi, PATH, UNICEF, and WHO, launched the vaccine innovation prioritization strategy (VIPS). The purpose of VIPS is to help manufacturers and partners make investment decisions in new product development by prioritising innovations made in vaccine product attributes. UNICEF anticipates MAPs may have a significant impact on programme delivery in the future. MAPs, as well as other innovations, will be considered as part of VIPS’ stakeholder outcome considerations known at the end of 2019.

4. **Current Market Situation**

In 2018, the global revenues from the MV and MR market are estimated to have reached approximately USD 450 million a year, of which MR vaccines account for 90 per cent of market share (Figure 1). In aggregate, South-East Asia accounts for approximately 60 per cent of the market, followed by Africa with an estimated 18 per cent. In terms of World Bank country classifications, middle-income countries (MICs) account for 84 per cent of the MV and MR market.

**Figure 1 MV and MR Global Estimated USD Revenues and Market Share 2018**

Source: Global Vaccine Market Model 2019

The data above provides an indicative overview of the global market for MV and MR. Some regions (notably Western Europe and Central Asia) are absent from Figure 1 given that countries in these regions have a preference for Mumps-containing combination vaccines and as aforementioned, MMR vaccines will be covered in a separate market note.

UNICEF estimates the global market share between MV and MR is approximately 30:70 per cent based on UNICEF procurement data, taking into consideration quantities used in India and Indonesia. Furthermore, the estimated annual global revenues of around USD 450 million by the Global Vaccine Market Model (GVMM) are considered to be a high estimate considering UNICEF procurement peaked at USD 173 million in 2018, and noting that in 2018 there was significant procurement of MR vaccines supporting catch up campaigns, including in India, which may not be representative of typical annual global demand.

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The MV and MR vaccine market is dominated by SII, which UNICEF estimates supplies over 80 per cent of global demand. SII’s dominance is even higher in the MR vaccine market segment, in which it supplies over 90 per cent of global demand.\textsuperscript{23}

**Figure 2 MV and MR Global Procurement in Doses**

Globally, 136 million children require two MCV doses a year,\textsuperscript{24} which in 2017 UNICEF estimated equated into a global demand for approximately 450 million MCV doses for all country routine immunization programmes,\textsuperscript{25} taking into account coverage and wastage rates.\textsuperscript{26} UNICEF supplied approximately 65 per cent of this volume (270 million doses) (Figure 2) at a value of USD 125.7 million.\textsuperscript{27}

Source: UNICEF Supply Division

In 2017, the global coverage rate for MCV1 and MCV2 reached 85 and 67 per cent respectively.\textsuperscript{28} Approximately 205 million persons received supplementary MCV immunization during 2017,\textsuperscript{29} of which 77 per cent (158 million persons) were reached with vaccines procured through UNICEF.\textsuperscript{30}

### 4.1 Demand

**Figure 3 MV and MR Vaccine Country Demand and Forecast through UNICEF 2000-2021**

UNICEF procures MV and MR vaccines for country routine immunization, SIAs, and in response to outbreaks and humanitarian emergencies. Demand through UNICEF traditionally averaged 188 million doses a year until 2012, mostly for MV (Figure 3).


\textsuperscript{25}Note *, Based on the assumption using a 10-dose vial presentation.

\textsuperscript{26}WHO, *Vaccine Purchase Data*.

\textsuperscript{27}UNICEF, *Pricing Data*, UNICEF, Copenhagen, April 2018.


\textsuperscript{29}Centers for Disease Control and Prevention, *Progress Toward Regional Measles Elimination Worldwide: 2000–2017*, CDC, Atlanta, November 2018, Table 2.

\textsuperscript{30}UNICEF Supply Division data.
As countries introduced MR into their routine immunization programmes, total procurement of MV and MR increased to average approximately 280 million doses. In 2013, there was a peak in supply procured through UNICEF, reaching 400 million doses on account of several large countries, namely DR Congo, Ethiopia, Nigeria, and Pakistan, carrying out measles campaigns.

In 2019, UNICEF anticipates a demand forecast of 145 million MV doses primarily for SIAs, and 147 million doses of MR vaccine for routine and SIAs. Between 50-60 per cent of the total demand is typically concentrated around the third quarter of the year due to country specific context including the seasonality of the disease and local holidays that may heighten the risk of transmission.

If the factors that are currently undermining global immunization coverage rates contributing to a global resurgence of measles and epidemic outbreaks continue, it will lead to an increasing need for planned preventions and SIA campaigns, increasing the demand. Country demand for MV and MR vaccines through UNICEF is heavily driven by SIAs, which represents approximately two thirds of the demand through UNICEF and is primarily funded by Gavi. Country MV and MR vaccine demand for SIAs fluctuates substantially, with uncertainty around the timing of SIAs related to country preparedness, funding availability to conduct follow up campaigns, country plans, and programmatic readiness to introduce MR vaccine, as the countries seek to take advantage of their measles immunization programme to introduce MR as their choice of rubella containing-vaccine (Figure 4).

Figure 4 MV/MR SIA and Routine Immunization Country Demand and Forecast through UNICEF 2012-2021

As countries seek to introduce the MR vaccine, the timing of its introduction through wide-age range catch up campaigns is closely interconnected to their demand for MV. The demand for preventative measles follow up campaigns using MV, which would typically target children aged nine months to under five years of age, is replaced by the demand for MR vaccine for wide-age range catch up campaigns, typically targeting children aged nine months to 14 years. As the demand for routine immunization requirements following catch-up campaigns subsequently replace MV by MR vaccine, any reduction in the demand for MR vaccine, say in case of delays in MR vaccine introduction, is therefore not equal or commensurate to an increase in the demand for MV due to the different age groups targeted for a catch-up and follow-up campaigns (Figure 5, next page).

Country decisions to postpone MR introductions and to continue using MV have contributed to significant forecast inaccuracies for both MV and MR vaccines (Figure 5). These decisions have had an inverse relationship on each other’s forecasts during UNICEF’s 2013-2017 tender period. As countries postponed their MR introduction, consequently the quantities of MR were over forecasted and MV demand was under forecasted in all years with the exception of 2017. Delays
in country preventive follow up campaigns, as a result of donors increasing their focus on ensuring that countries demonstrated sufficient preparedness to conduct high quality campaigns to reach a minimum of 95 per cent of the targeted children, further contributed to inaccuracies in MV and MR vaccine demand forecasts, as seen in 2017 where the demand for both MV and MR was lower than what had initially been forecasted.

Figure 5. MV and MR Forecast Accuracy as a Per Cent of Deviation from Tender Forecast Quantities 2013-2018

Source: UNICEF Supply Division

While country MV and MR demand forecasting accuracy remains a challenge, UNICEF noted improvements in 2017 and 2018 as a result of triangulating data and information about country plans and priorities from several different sources. The forecasts were also validated and discussed within the MRI’s SCG, where feasibility was reviewed in terms of country ability to meet Gavi’s criteria for support. The SCG continuously reviews country demand forecasts for re-adjustment to ensure aspirational plans are turned into realistic numbers. In addition, Gavi’s engagement helped make SIA funding more predictable, and Gavi’s requirement for countries to submit a five-year planning horizon of all their measles and rubella activities as part of their applications also improved visibility on country plans.

Overall, MV and MR vaccine country demand for routine immunization procurement through UNICEF has steadily increased by approximately 6.6 per cent a year, from 99 million doses in 2012 to reach 145 million in 2018. UNICEF anticipates growth at 2.17 per cent per year through to 2022 (Figure 4). The increase is due to countries having introduced an MCV2 into their national immunization schedules and increasing their MCV1 and MCV2 coverage rates. However, demand through UNICEF for SIAs fluctuates substantially, reflecting the scale and size of country SIAs. UNICEF anticipates this trend in SIA fluctuations to continue for the foreseeable future.

Several countries are likely to introduce MR vaccine into their schedules over the next four years (2019-2022). They include DPR Korea, DR Congo, Ethiopia, Guinea Bissau, Madagascar, Mali, Pakistan, Sierra Leone, Sudan, and Uganda. UNICEF anticipates MR catch-up campaigns to reach over 220 million children during this period. The timing of these country MR vaccine introduction campaigns will require significant production planning. The MRI’s SCG is in continuous dialogue with these countries, UNICEF regional offices, programme partners, as well as Gavi, to re-assess and adjust the timelines of each country’s MR vaccine introduction to ensure manufacturers have as accurate planning information as possible.

4.2 Gavi Measles and Rubella Programme

Gavi supports measles vaccine introductions and campaigns under their new measles and rubella strategy seeking to increase routine immunization coverage, complemented by high-quality, well-planned, more targeted, and independently monitored SIAs. Gavi’s new measles and rubella strategy provides comprehensive support for:

- MR vaccine catch-up campaigns following or combined with MR introduction,

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31 Gavi, the Vaccine Alliance, Measles and Measles-Rubella Vaccine Support Gavi, Geneva.
• MCV2 and MR vaccine introduction into routine immunization through country co-financing,
• Measles and MR follow-up campaigns,
• Outbreak response funding managed by MRI.

As a result of Gavi’s increased engagement in the measles and rubella programme, UNICEF expects Gavi will continue to be a major funding source for measles and rubella activities in countries eligible for Gavi support. The changes Gavi made to its country application requirements include the need for countries to use domestic resources to fully finance their MV component of MCV1 from 2018 onwards, which increases a country’s share in the financing of their measles and rubella programme (Figure 6).

Figure 6 Share and Sources of MV and MR Vaccine Financing Procured through UNICEF 2013-2018

Source: UNICEF Supply Division

4.3 Supply

UNICEF seeks to secure the continued and uninterrupted supply of MV and MR vaccines for country routine immunization programmes, SIAs, response to outbreaks, and humanitarian emergencies. UNICEF secures access to MV and MR vaccine through its long-term arrangements (LTAs) with manufacturers with current arrangements in place until end of 2020 (Table 2).

Table 2 UNICEF Long-term Arrangement 2018-2020

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total MV</td>
<td>382,637,000</td>
</tr>
<tr>
<td>Total MR</td>
<td>423,000,000</td>
</tr>
<tr>
<td>Total Awards</td>
<td>805,637,000</td>
</tr>
</tbody>
</table>

Source: UNICEF Supply Division

Note*: 30 million doses of forecasted MR demand for 2020 left unawarded.

UNICEF and partners seek to expand their supply base to stimulate a heather and more diverse MR vaccine supply market to reduce any risk to supply security. In 2018, UNICEF concluded its 2018-2020 MV and MR vaccine tender and awarded LTAs to two manufacturers of MV and one manufacturer of MR for 806 million doses, of which 383 million is for MV and 423 million is for MR vaccine.

UNICEF retained 30 million unawarded doses of MR vaccine forecast supply in 2020 as an incentive and in anticipation of any new manufacturer acquiring MR WHO prequalification (Table 2).

Currently, manufacturer MV and MR vaccine production capacity is sufficient to meet all country forecast demand requirements and requests for outbreaks response even with any anticipated increase in unforeseen demand due to a resurgent trend in measles prevalence. Two large countries, India and Indonesia, are concluding their MR catch-up campaigns during 2019, resulting in an additional 475 million children being immunized against measles and rubella as part of their introduction campaigns. Through close ongoing communication between countries, MRI partners, and manufacturers, this surge in demand will not affect supply through UNICEF to any other country, nor the supply for any outbreaks and humanitarian emergencies.
In addition to a ten-dose vial presentation, UNICEF also now offers countries access to MV and MR vaccine in five-dose vials. The transition to using a five-dose vial, depending on the country's context, may have a potential for countries to reach more children and to reduce open vial wastage rates. The current initial supply of five-dose vial presentations to countries for the first time is carefully managed through close communication with countries and manufacturers with the support of programmatic partners to ensure programmatic alignment with the new presentation. In addition, studies conducted by the dose per vial container partnership (DPCP), led by John Snow, Inc., provides a starting point for developing new recommendations for vaccine dose per vial container. The DPCP’s Zambia study was concluded in 2018 and its forthcoming report will have a potential to support better-informed analysis to weigh the trade-offs related to the dose per container.32

UNICEF anticipates issuing its next tender in 2020 for supply in 2021 and beyond. It will include award strategies that consider the anticipated timing of MR vaccine introduction in DR Congo, Ethiopia, Nigeria, and Pakistan, among other considerations.

5. Pricing

The price for MR vaccines is over double that of MV vaccines. Over the past 2013-2017 tender period, the weighted average price (WAP) per dose through UNICEF increased by an average of three per cent per year for MV and four per cent a year for MR vaccine. For the current 2018-2020 tender period, UNICEF anticipates the MR WAP per dose to stabilise and show an average annual increase of 2.2 per cent. The WAP for MV increased in 2018 by five per cent when compared to 2017. However, during 2019 and 2020, the WAP for MV is expected to decrease by an annual average of three per cent. The evolution in prices is a characteristic of the prevailing supply market situation with duopolistic supply of MV vaccine and monopolistic supply of MR. UNICEF expects the MCV market health, especially the MR market, will improve as new pipeline products become available, which may also have a positive impact on pricing over the coming years (Figure 7, Table 3).

Figure 7 Historical and Forecast Weighted Average Price per Dose for MV and MR through UNICEF 2010 and 2020

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Vaccine</th>
<th>USD Price per Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-Farma (India)</td>
<td>MV 10-dose</td>
<td>0.237</td>
</tr>
<tr>
<td>Serum Institute of India</td>
<td>MV 5-dose</td>
<td>0.395</td>
</tr>
<tr>
<td>Serum Institute of India</td>
<td>MR 5-dose</td>
<td>0.820</td>
</tr>
<tr>
<td>Serum Institute of India</td>
<td>MR 10-dose</td>
<td>0.656</td>
</tr>
</tbody>
</table>

Source: UNICEF Supply Division

Table 3 UNICEF Long-term Arrangement Awards Price per Dose in USD 2018-2020

32https://www.jsi.com/JSIInternet/Inc/Common/_display_related_objects_of_base_object.cfm?thisSection=IntlHealth&thisSectionTitle=International %20Health&thisPage=Project&tid=40&id=22641&rtid=10
Over the last three years (2016-2018), UNICEF procured over 173 million doses of MR vaccine for the Government of India, funded by Gavi as part of its catalytic support for the country’s MR introduction. India self-procured an additional 260 million doses for introduction campaigns to be completed by the end of 2019. Due to different delivery terms for SII, situated in India, the MR vaccine procured through UNICEF for India was priced differently than MR vaccines procured by UNICEF for other countries.

Globally in 2017, self-procuring countries reportedly paid between USD 0.18 and USD 0.69 per dose for their MV vaccines. Countries procuring MR vaccine through the Pan American Health Organization (PAHO) Revolving Fund, irrespective of their income classification level, accessed the vaccine at USD 0.61 per dose. Countries accessing MR vaccine through their own procurement mechanisms have paid between USD 0.56 and USD 3.44 per dose in 2017 (Table 4).

### Table 4: MV and MR Indicative Price Range per Income Group, 2017

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>PAHO</th>
<th>UMIC</th>
<th>LMIC</th>
<th>LIC</th>
<th>UNICEF</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV</td>
<td>PAHO</td>
<td>UMIC</td>
<td>LMIC</td>
<td>LIC</td>
<td>UNICEF</td>
</tr>
<tr>
<td>MR</td>
<td>USD 0.61</td>
<td>USD 0.61-0.64</td>
<td>USD 0.61-0.64</td>
<td>USD 0.61-0.64</td>
<td>USD 0.61-0.64</td>
</tr>
</tbody>
</table>

Source: WHO / UNICEF Supply Division

6. **Issues and Challenges**

- MV and MR vaccine supply, both globally and through UNICEF, is dominated by one manufacturer, which perpetuates a fragile supply base and monopoly where pricing has increased.
- Demand for MV and MR vaccines is interconnected, with any inaccuracy in the demand forecast for one vaccine, say caused by postponed MR introductions, affecting the demand for MV. Enhanced efforts have been put in place to correct the forecast methodology and improve the forecast accuracy to provide a better basis for existing and pipeline manufacturers to plan operationally and make longer-term investment decisions.
- The increase and resurgence of measles outbreaks requires there to be a significant volume of MV and MR vaccine availability for potential country emergency response requirements.
- The uncertainty around decisions to introduce MR vaccine, and the timing of catch up campaigns in countries with large populations, such as DR Congo, Ethiopia, Nigeria, and Pakistan, continue to challenge the accuracy of long-term forecasting.
- Insufficient programmatic guidance to inform countries that are considering the use of five-dose vials leads to uncertain demand projections and long lead times for countries that have made the decision to switch.

7. **Steps Forward**

- UNICEF and partners will continue to encourage new market entrants to expand the supplier base, improve the health of the market, and ensure continued vaccine security. At the same time, as new manufacturers with WHO prequalified products enter the market, the industry’s combined production capacity will need to be balanced after 2023, once most of the wide-age range MR catch up campaigns are completed.
- UNICEF will continue to closely monitor all pipeline manufacturers with new products in development and their progress towards acquiring WHO prequalification.
- UNICEF will continue to seek closer collaboration with countries, UNICEF and WHO regional offices, Gavi, and all MRI partners to continually improve and re-adjust country forecasts to inform manufacturers and facilitate their production planning and the timely notification of any significant changes.
- UNICEF will continue to monitor monthly production availability and maintain close collaboration with countries to ensure as much flexibility as possible to meet the priority needs of any outbreaks.
- Studies conducted by the DPCP will contribute and develop better informed analysis for countries weighing the trade-offs related to dose per container decisions.

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UNICEF anticipates issuing its next tender in 2020 for 2021 and beyond. As the MV and MR market may be subject to changes, UNICEF will update this note should there be significant changes in the market.

For further questions or additional information, please contact:

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Other UNICEF information notes are found at http://www.unicef.org/supply/index_54214.html.