

Price transparency is a step towards sustainable access in middle income countries

Tania Cernuschi and colleagues show how information from the Market Information for Access to Vaccines database is strengthening the ability of middle income countries to negotiate with vaccine producers

Two thirds of the world's poorest people live in middle income countries and account for two thirds of the world's deaths in children under 5. Sixteen per cent of children who do not receive a third dose of diphtheria-tetanus-pertussis vaccine, and 37% of the children who are undervaccinated with pneumococcal conjugate vaccine live in these countries.¹

For most low income countries, and for a few middle income countries, donors have offered financial support for the purchase of vaccines at low prices, mainly through Unicef and Gavi, the Vaccine Alliance.² Most middle income countries have two challenges. Firstly, most are lagging behind the introduction of new vaccines and, in some cases, coverage with traditional vaccines. This problem is set to increase as more countries move from low to middle income.³ This prospect is a challenge to traditional strategies for

official development assistance, which are largely based on a country's income.⁴⁻⁷

Secondly, the ability of middle income countries to negotiate affordable vaccines is undermined by a historic lack of information about vaccine prices, and limited resources to gather and analyse market intelligence.² A number of stakeholders believe that improving price transparency would encourage fair pricing and strengthen access to vaccines.⁸⁻¹⁵ The World Health Organization (WHO) has developed a strategy for access to medicines and vaccines, endorsed by the World Health Assembly in May 2019. In this, enhancement of price transparency is seen as a key step.¹⁶

In 2014 WHO launched the vaccine product, price, and procurement initiative, now referred to as Market Information for Access to Vaccines (MI4A).²⁰ This aimed to improve vaccine price transparency and therefore support country immunisation planning and budgeting, price negotiation, and, ultimately, improve access to vaccines. In 2018, the MI4A collated information from 151 countries into a single database. Of these countries, 65 entirely fund and procure their own vaccines, and 63 are middle income countries. The initiative aims also to provide information on procurement options, vaccine sources, and market dynamics.

In this article we describe how making better price, procurement, and product data available can improve availability of vaccines by giving countries a clearer picture of the vaccine market and pricing trends.

In addition, we provide an analysis of MI4A data use based on 58 instances documented by staff of WHO's expanded programme on immunisation, through email or by personal contact with users.

Better data

Before the MI4A initiative, the prices of vaccines for countries of all level of income, and details of all vaccine types, were not

available. By 2018, 151 countries from all WHO regions had reported vaccine prices for 2017 to the MI4A. This was a threefold increase over 2016 (51 countries) and an almost sixfold increase over the launch year 2014 (26 countries).

The MI4A database contains vaccine information for 85% of all countries, or 95% of the global birth cohort. The data cover 41 of 46 non-Gavi, non-Pan American Health Organization (PAHO) middle income countries (89%), which normally do not receive external financial support for access to vaccines. Efforts by WHO regional offices have successfully increased participation. The data collection process is integrated within the well-established WHO and Unicef joint reporting form on immunisation. This is sent to UN member states every year, resulting in a dramatic increase in data reporting since 2017. Some countries that procure vaccines through the Unicef supply division and PAHO revolving fund choose not to report to MI4A. For these cases vaccine pricing is integrated into the MI4A database using the Unicef and PAHO revolving fund published prices. Data reported to the MI4A through the joint revolving fund are screened by WHO staff for entry errors and, where possible, countries are asked to validate or correct outlier values before publication.

Thirty-five non-Gavi, non-PAHO countries (24 high income countries and 11 middle income countries) did not share price information for 2017. Of these, five countries were unable to share for reasons of confidentiality, and three because procurement was not done by the central government. Concern was raised about confidentiality of data when MI4A was being developed, but has been a barrier for only a small number of countries.

Prices of 590 distinct products are now available to the public, in addition to important data on procurement method, volumes, sources, presentation form (type of vaccine container, such as vial, prefilled syringe, or other), presentation size (single

KEY MESSAGES

- Middle income countries have little financial support from donors for vaccine purchases and little vaccine price and market information, hampering their ability to negotiate equitable prices
- Since 2014, WHO's Market Information for Access to Vaccines (MI4A) database has provided middle income countries with much needed data on vaccine products, prices, and procurement
- Greater price transparency is informing budget analysis, purchase choices, tendering strategies, adoption of new or improved procurement mechanisms, and may encourage vaccine manufacturers to articulate clearer pricing policies
- MI4A also provides a global view of the vaccine markets that is being used for policy making, disease control strategies, and global market shaping

or multiple doses in a container), and several other parameters, for each product.

The primary limitation of the MI4A data stems from the voluntary nature of data reporting, which may lead to reporting biases and variable data quality. Some WHO regions continue to be under-represented in the MI4A database (only 16 of 28 (57%) countries from the Western Pacific Region and 34 of 53 (64%) countries from Europe reported data for 2017). High income countries are under-represented, with only 60% of countries reporting. However, 2018 shows a marked improvement, with more than 52% of high income countries reporting compared with 30% in 2016.

Between January 2015 and July 2017, the MI4A website was visited over 6000 times by users in 162 countries. Between January 2016 and July 2017 the purpose of these visits was logged in 58 instances, based on questions asked to WHO staff through the MI4A email address (MI4A-@who.int) or on questions posed directly to staff. Most requests were by international partners (other UN agencies and non-governmental organisations working in immunisation), and countries (national immunisation programme staff from Ministries of Health), but some came from staff at regional offices of WHO or other UN agencies and non-governmental organisations. Data were mainly used to compare vaccine prices against those in countries with similar procurement and socioeconomic conditions or to assess budget requirements for new vaccine introductions and programmes. In a few instances though, countries used the information to learn about the vaccine market and the factors that influence prices for the purpose of informing procurement decisions.

Based on the WHO expanded programme on immunisation team observation, at a regional and international level, data were primarily used to inform global policy and strategies for disease control, for market analyses and research. Users also leveraged data to encourage further price transparency, to update immunisation partners' tools and market shaping strategies.

Understanding price trends

The MI4A data have allowed an analysis of price changes over time (fig 1). For any country considering introduction of a new vaccine, data on its cost are important for decision making and planning.

No clear global trend in vaccine price is evident. For some vaccines, an increase in price was seen (diphtheria-tetanus,

measles-rubella, tetanus toxoid). For others, prices have been broadly stable with <15% change (diphtheria-tetanus-whole cell pertussis, *Haemophilus influenzae* type b, yellow fever) and some decreased in price (diphtheria-tetanus-whole cell pertussis-hepatitis b-*Haemophilus influenzae* type b, human papillomavirus, inactivated polio vaccine, pneumococcal conjugate vaccine).

Figure 2 shows the evolution of the weighted average price for three newer vaccines (pneumococcal conjugate vaccine, human papillomavirus, and rotavirus) in single dose presentations in non-Gavi, non-PAHO middle income countries, for 2014-2017. These three vaccines, which are recommended by WHO in most of these countries, present the greatest challenge for middle income countries because their prices are substantially higher than for traditional vaccines. Prices for all these vaccines were stable over the past four years.

Much discussion has centred on the affordability of new vaccines, particularly for non-Gavi, non-PAHO middle income countries. It is encouraging to see prices decline in some self-procuring countries, even when vaccines are delivered by only two suppliers. However, because of the limited data, this analysis was conducted without distinction between manufacturers. Thus, country switches from one manufacturer's product to another, in any given year, which results in a price change, might have distorted any observed price trend. Also, these analyses use a global inflation rate, which may differ from those in specific income groups or WHO regions.

Countries also need to consider carefully the effect of introduction of new vaccines on their spending to assess their sustainability. For the newer vaccines, spending by non-Gavi, non-PAHO middle income countries increases drastically when they introduce a new vaccine. This is particularly the case for pneumococcal conjugate vaccine, human papillomavirus, and rotavirus which, on average, comprise 34%, 22%, and 14%, respectively, of non-Gavi, middle income countries' vaccine budgets. In individual countries the percentage might be as much as 66%, 70%, and 41% of vaccine spending, placing a particular burden on non-Gavi low and middle income countries.

Analysis of the MI4A data relating vaccine specific expenditures for newer vaccines in each country to total vaccine expenditure in each corresponding country, shows that higher prices of pneumococcal conjugate vaccine, human papillomavirus,

and rotavirus were not associated with higher relative vaccine expenditure. The proportion of new vaccine expenditure is instead related to the mix of vaccines (mature versus new) and number of other vaccines purchased.

Understanding the market

Understanding the market and prices for vaccines provides countries with better leverage in procurement negotiations and can inform policies of international development agencies.

Data in MI4A from reporting countries for 2017 show that 3.99bn doses of 65 vaccine types were purchased, for a total of US\$9.78bn (£7.95bn, €8.86bn). These data also show that the most expensive vaccines are not those most widely used. The 10 most expensive vaccines are pneumococcal conjugate vaccine 13-valent, human papillomavirus 9-valent, rotavirus, seasonal influenza, pneumococcal conjugate vaccine 10-valent, seasonal influenza (adult), varicella, diphtheria-tetanus-acellular pertussis-hepatitis B-*Haemophilus influenzae* type b-inactivated polio vaccine, diphtheria-tetanus-whole cell pertussis-hepatitis B-*Haemophilus influenzae* type b, measles-mumps-rubella-varicella. These account for 69% of the total market value of purchases, but only 22% of the total purchased volume.

Furthermore, the vaccine market is stratified by income segment. High income countries accounted for 56% of the total market value in 2017 reported to the MI4A by 151 reporting countries, followed by the non-Gavi, non-PAHO middle income country market (26%), the Gavi market (14%), and the PAHO market (4%). The non-Gavi, non-PAHO, middle income country market is the second highest in value, higher than the Gavi segment, but only one third of the market sales by volume.

Enhanced access to vaccines in non-Gavi and non-PAHO middle income countries will save lives and reduce morbidity in line with global health targets. It is an important opportunity for market growth for vaccine manufacturers, since this segment has yet to achieve its full potential. The current pneumococcal conjugate vaccine, human papillomavirus, and rotavirus vaccine markets in these countries comprise 10-17% of the global markets for each vaccine. Projections for the full value of this market in non-Gavi, non-PAHO countries (46 countries fully vaccinating a total birth cohort of 36 million) show that it could be

>40%.¹⁷ The potential for growth may lead to much needed capacity investments by

manufacturers and serve as a negotiating point for buyers.

These analyses are being used by international partners to shape

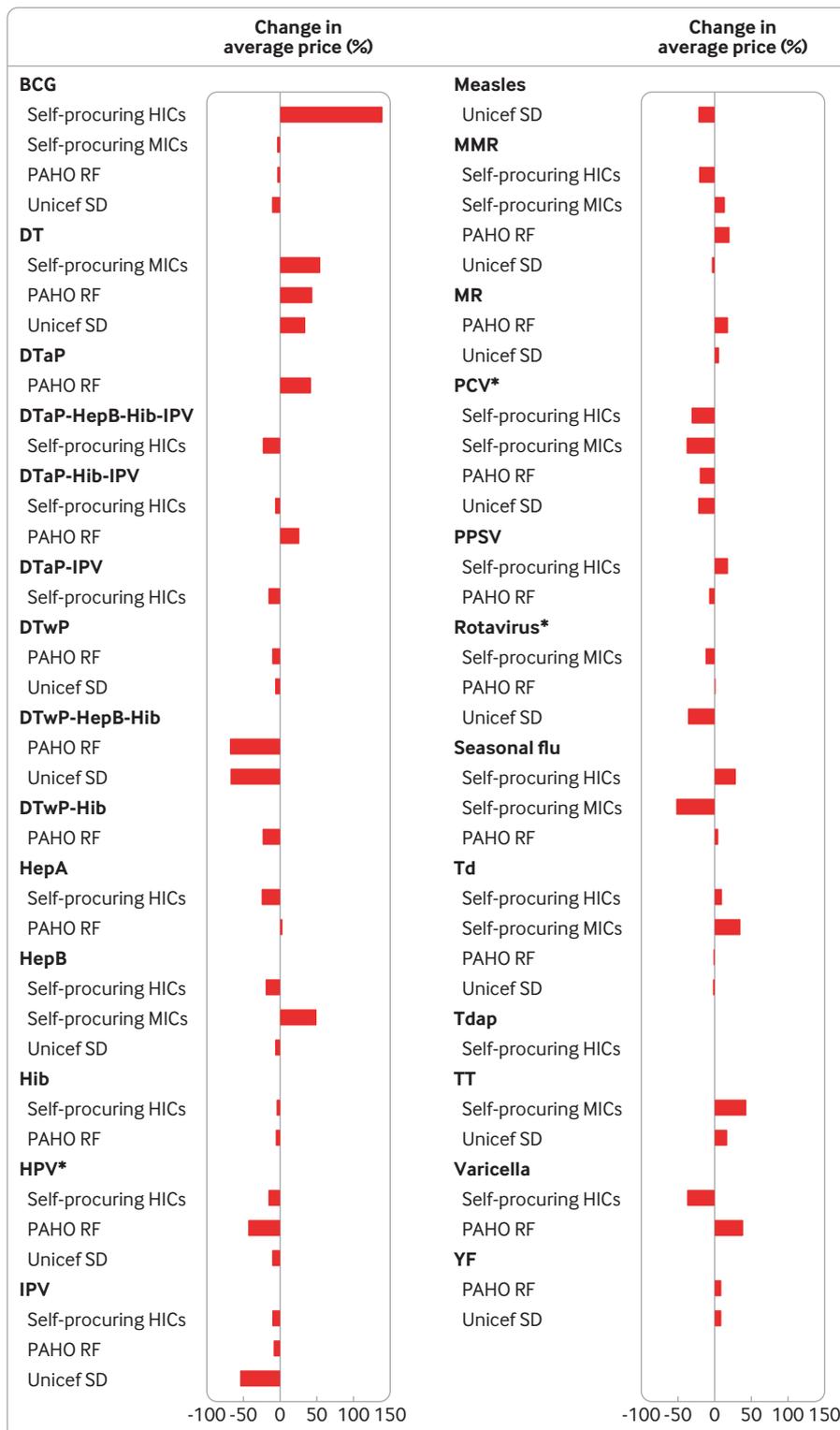


Fig 1 | Percentage change in average price over time, 2013–17 by procurement mechanism and vaccine type. BCG=Bacillus-Calmette-Guerin; DT=diphtheria-tetanus; DTaP=diphtheria-tetanus-acellular pertussis; DTwP=diphtheria-tetanus-whole cell pertussis; HepB=hepatitis B; Hib=Haemophilus influenzae type b; HICs=high income countries; HPV=human papillomavirus; IPV=inactivated polio vaccine; MICs=middle income countries; MMR=measles-mumps-rubella; MR=measles-rubella; PAHO= Pan American Health Organization; PCV=pneumococcal conjugate vaccine; PPSV=pneumococcal polysaccharide vaccine; RF=revolving fund; SD=supply division; Td=tetanus diphtheria; Tdap=tetanus, diphtheria, and pertussis; TT=tetanus toxoid; YF=yellow fever

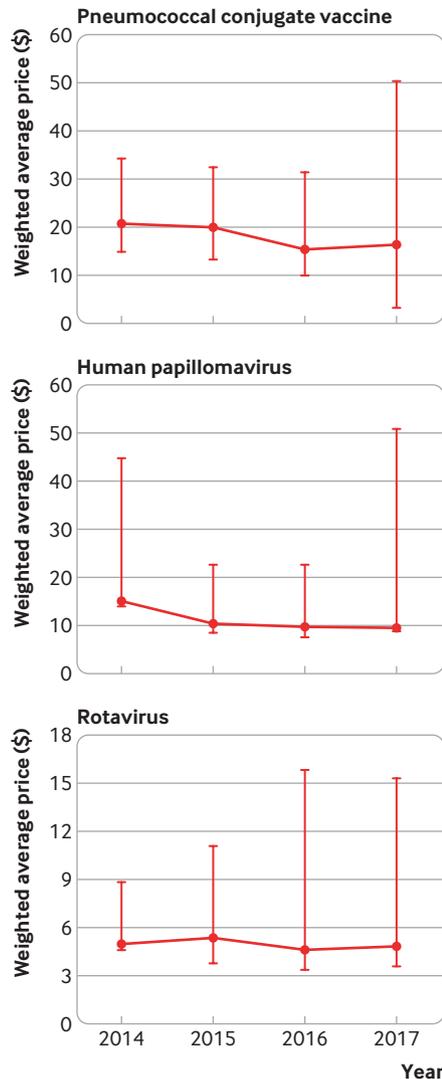


Fig 2 | Changes in weighted average price for pneumococcal conjugate vaccine, human papillomavirus, rotavirus in single dose presentations in non-Gavi, non-PAHO middle income countries for 2014-2017

strategies for specific vaccines. MI4A has conducted studies on specific vaccines with affordability and shortage risks.²⁰ These global market studies provide countries with key recommendations and conclusions on global demand and supply availability. For the Bacillus-Calmette-Guerin vaccine, for instance, MI4A showed that global supply exceeds demand. Shortages may still occur, however, owing to product registration constraints (many countries have only one, or no, product registered) and instability of the manufacturing process. For diphtheria and tetanus containing vaccines it is estimated that the vaccine supply is sufficient for all countries to introduce the recommended life course of six doses and to replace tetanus toxoid with tetanus-diphtheria as recommended by both WHO and Unicef.

Understanding price

Several factors related to country and procurement characteristics are known to affect vaccine price, but little information was available until the launch of MI4A. Price comparisons have been the most common reason for country users accessing MI4A data. At least four countries have reported using the data for price negotiations with suppliers.

We are aware of three instances where MI4A data have been used for purchase of national vaccines. This has led to changes in practices that have reduced costs, such as earlier ordering and pooled procurement—that is, across neighbouring countries.

The MI4A database has also enabled an analysis of the spread in prices, for identical or equivalent vaccines, between

countries with different gross national incomes.

In most cases, procurement of vaccines by a group of countries rather than a single country provides access to the most favourable prices within the same income group (fig 3). In the Americas, most countries purchase some or all of their vaccines through the PAHO revolving fund by pool procurement. Outside the Americas, low income countries and some middle income countries have the option to obtain vaccines by pool procurement through Unicef. Some high income countries (the Gulf States, Baltic States) have also established pool procurement systems. In comparison with self-procured middle income country prices, Unicef supply division (excluding Gavi-supported countries) or PAHO revolving fund procurement leads to lower prices for 90% (27/30) of vaccines.

Analysis of the procurement method clearly shows that prices through UN procurement (Unicef or PAHO) are generally more favourable than those obtained by self-procurement. Price is only one of the factors that countries should consider when making procurement choices. This newly available evidence provides important guidance to countries on choice of procurement method and shapes procurement regulations to enable access.

Price transparency, a step towards improving access to vaccines

Greater price transparency is informing choices and enhancing access to vaccines. For example, the pooled procurement of rotavirus in the Baltic States using MI4A data is notable.¹⁸ In 2012, health authorities of Latvia, Estonia, and Lithuania signed a partnership agreement on joint procurement and lending of medicinal products and medical devices to improve both product availability and affordability. These countries have worked in a well-coordinated, yet flexible, way to align demand requirements and deal with supply challenges. A joint tender for rotavirus resulted in a 17–25% lower price for each immunisation course than the individual countries had previously paid.

Other global stakeholders, such as the PAHO revolving fund, Unicef, Bill and Melinda Gates Foundation, Gavi, and vaccine manufacturers have been making a conscious effort to view the vaccine market in a global context, to assist in analysis and prioritisation of actions. This newly available global view of vaccine

Vaccine subtype	Median price per dose (\$)			
	Unicef SD*	PAHO RF	Self-procuring MIC	Self-procuring HIC
BCG	0.11	0.14	0.29	1.08
bOPV	0.14	0.15	0.20	0.24
Cholera	1.50	1.85		43.86
DT	0.16	0.17	0.34	2.69
DTaP		15.00	16.50	14.30
DTaP-HepB-Hib-IPV		19.80	35.66	41.57
DTaP-Hib-IPV		13.60	22.81	24.78
DTaP-IPV		11.00	16.91	19.70
DTwP	0.21	0.20	0.30	3.51
DTwP-HepB-Hib	0.92	1.06	2.53	3.63
DTwP-Hib		2.65	2.84	
HepA		8.06	9.68	13.95
HepA (adult)		13.20	19.43	26.47
HepB	0.25	0.22	1.23	5.03
HepB (adult)	0.30	0.25	1.14	8.55
Hib		2.05	4.31	8.73
HPV2	4.60	8.50	14.79	25.93
HPV4	4.50	9.80	15.55	38.25
IPV	1.87	3.60	4.00	7.61
JE live attenuated	0.42			18.77
Measles	0.26		0.69	7.15
Men AC			0.89	17.59
MenACYW-135		20.30	10.20	29.63
MMR	1.97	3.57	6.04	7.81
MR	0.61	1.43	0.93	
PCV10	3.05	12.85	32.16	32.41
PCV13	3.17	14.50	21.36	48.98
PPSV23		6.81	11.48	15.77
Rabies		2.25	13.66	16.58
Rota	2.77	6.50	7.87	14.90
Seasonal flu		1.52	4.29	7.67
Seasonal flu (adult)		3.91	3.38	8.08
TBE (adult)			6.60	36.80
Td	0.12	0.11	0.36	9.73
Tdap		11.39	26.39	17.77
TT	0.09		0.28	2.66
Typhoid Ps		9.00	9.60	10.36
Varicella		14.85	21.76	28.56
YF	1.05	1.17	18.05	33.97

Fig 3 | Median price per dose (US\$) for all vaccines by procurement income group. BCG=Bacillus-Calmette-Guerin; bOPV=bivalent oral polio vaccine; DT=diphtheria-tetanus; DTaP=diphtheria-tetanus-acellular pertussis; DTwP=diphtheria-tetanus-whole cell pertussis; HepB=hepatitis B; Hib=Haemophilus influenzae type b; HICs=high income countries; HPV=human papillomavirus; IPV=inactivated polio vaccine; JE=japanese encephalitis; Men AC= meningococcal A, C; MenACYW-135=meningococcal A, C, Y, and W-135; MICs=middle income countries; MMR=measles-mumps-rubella; MR=measles-rubella; PAHO= Pan American Health Organization; PCV=pneumococcal conjugate vaccine; PPSV=pneumococcal polysaccharide vaccine; RF=revolving fund; Rota=rotavirus; SD=supply division; TBE, tick borne encephalitis; Td=tetanus diphtheria; Tdap=tetanus, diphtheria, and pertussis; TT=tetanus toxoid; YF=yellow fever

markets is being used to advantage for policy making, disease control strategies, market shaping, negotiation, and tendering strategies. Greater price transparency may encourage vaccine manufacturers to use clearer pricing policies under different circumstances.

WHO's focus has been on collecting information. Now WHO is putting further emphasis on better use of available data globally, regionally, and nationally, with a focus on non-Gavi countries. These efforts must go hand in hand with evidence based decision making and improvement of political and financial commitments by middle income country governments to vaccination.

There are no obvious signs from the MI4A data that either vaccine availability or prices are negatively affected by greater transparency. Nevertheless, the increased availability of price data should be monitored to continue to assess both the positive and negative effects of increased transparency on vaccine availability and prices, including the potential for convergence of pricing from different manufacturers.¹⁹

Additional years of data and analyses are needed to develop a better understanding of market dynamics. This information would promote discussion on fair pricing, strengthen country procurement practices and regulations, and contribute to sustainable access. Nevertheless, early results are encouraging and this effort shows that systematic collection of purchase data is possible and may serve as a model for other health interventions.

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