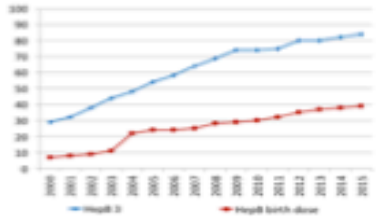
Country analysis

Is it is possible today?

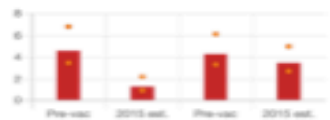
Ana Maria Henao- Restrepo
Initiative for Vaccine Research

World Health Organization

Global Immunization 3rd dose of Hepatitis B (HepB3) coverage in infants and Birth Dose of Hepatitis B in newborns, 2000-2015



Global estimated HBsAg prevalence
(%, 95% CI *)



under 5 years old — all ages

* credible intervals and - indicates upper and lower intervals

Global estimated number of chronic HBV infection
(95% CI *)

under 5 years old — all ages

* credible intervals and - indicates upper and lower intervals

Global estimated number of chronic HBV infection prevented
(95% CI *)

under 5 years old — all ages

* credible intervals and - indicates upper and lower intervals

This dashboard shows the HBsAg prevalence estimates at global, regional and country level and how they have changed since hepatitis B vaccination was introduced.

This dataset represents the best estimates for the hepatitis B surface antigen indicator and aims to facilitate comparability across countries and over time. The estimates are not always the same as the official national estimates, because of the use of different methodologies and data sources. Estimates are provided for 196 WHO Member States. The analysis was carried out for the age groups 0-5 years and for the general population. Due to scarcity of data from some countries, the estimates are more robust at global and regional level than at country level, therefore, we suggest countries focus on the 95% Credible Intervals and not only on the reported point estimates.

WHO's estimates uses a methodology reviewed by the Immunization and Vaccines Related Implementation Research Advisory Committee (IVIR-AC) and presented to the Strategic Advisory Group of Experts (SAGE). These estimates have been documented following the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER). More detailed information on quality of data sources and methods, as well as estimated uncertainty intervals, is provided in the Global Hepatitis Report 2017, the WHO Immunization surveillance, assessment and monitoring system, the estimations of worldwide prevalence of chronic hepatitis B virus infection: a systematic review of data published between 1965 and 2017, and in other referenced sources.

WHO provided Member States the opportunity to review and comment on data and estimates as part of the so called country consultation process.

The database last update was 23 March 2017. Estimates will be updated as more recent or revised data become available, or when there are changes to the methodology being used. Next scheduled update will be in Q1 2018. Member States, civil society, country and regional offices that wish to contribute to improve the seroprevalence database can send their potential eligible published and unpublished reports on surface antigen prevalence to the following email: VaccineResearch@who.int until October 15, 2017. They will be screened according to the inclusion criteria of the review. Potential contributions received after this date will be considered in the next update exercise.

Hepatitis b surface antigen estimates and number of carriers in 2015 in the general population.

Hepatitis b surface antigen estimates and number of carriers in 2015 in the under 5 years of age.

Hepatitis b surface antigen estimates in 2015 and in the pre- vaccination era and number of carriers prevented in all ages and in the under 5 years old population

Under 5 years old

- (•) pre-vaccination
- ( ) 2015 estimate

All ages

- ( ) pre-vaccination
- ( ) 2015 estimate

World Health Organization

Total Population (2015)	1,977,590
Total Population under 5 (2015)	351,973
Births (2010 – 2015)	377,816
Infant Mortality (2010 – 2015)	49.8 per 1,000
Urban Population (2015)	59.6%
Births attended by skilled health personnel *	57.2% (2013)

Source: United Nations, Population Division. The World Population Prospects - the 2017 revision". New York, 2017

Note: Births and Infant Mortality refers to five-year periods running from 1 July to 30 June of the initial and final years.

* Births attended by skilled health personnel is from WHO Health Statistics 2017. Data are scarce, comes from different years, and are not available for every country.

Hepatitis B Vaccine Schedule

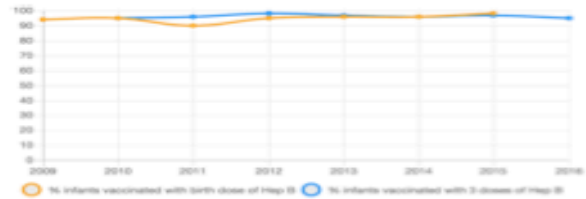
HepB vaccine introduced nationwide	1991
HepB birth dose introduced	2000
Current schedule	birth; 2, 3, 4 months;
HepB vaccine types	HepB monovalent; DTwPHibHepB

Source: http://www.who.int/immunization/monitoring_surveillance/data/en/

became available, the proportion of persons living with chronic HBV infection remains high. Prevalence was the highest in the African (6.1%) and Western Pacific regions (6.2%). Overall, about 257 million persons were living with HBV infection. Assuming that women of reproductive age constitute 25.3% of the world's population (United Nations data), adults chronically infected may include 65 million women of childbearing age who can potentially transmit HBV to their babies. The widespread use of hepatitis B vaccine in infants has considerably reduced the incidence of new chronic HBV infections. Between the pre-vaccine era (which, according to the year of introduction can range from the 1980s to the early 2000s) and 2015, the proportion of children under 5 years of age who became chronically infected fell from 4.7% to 1.3%.

Gambia

Immunization coverage in infants with three doses of hepatitis b and hepatitis b birth dose vaccine (1990-2015)



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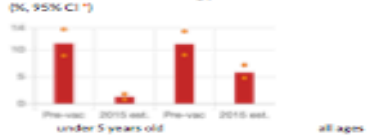
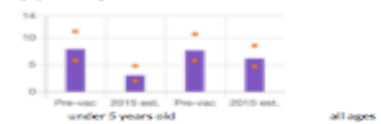
Estimated Hepatitis B surface antigen prevalence

Gambia estimated HBsAg prevalence (%, 95% CI *)

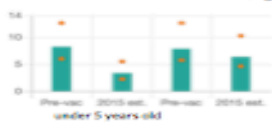


AFRO region estimated HBsAg prevalence (%, 95% CI *)



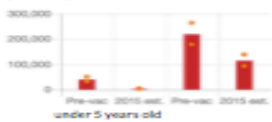
* credible intervals and - indicates upper and lower intervals

Low income countries estimated HBsAg prevalence (%, 95% CI *)



Estimated number of hepatitis B surface antigen carriers

Gambia estimated number of chronic HBV infection (95% CI *)



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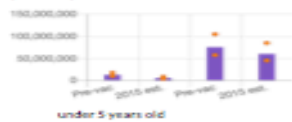
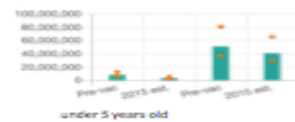


Low income estimated number of chronic HBV infection (95% CI *)



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Estimated number of hepatitis B surface antigen carriers prevented

Gambia estimated number of chronic HBV infection prevented (95% CI *)

AFRO region estimated number of chronic HBV infection prevented (95% CI *)

Low income estimated number of chronic HBV infection prevented (95% CI *)

VACCINE SCHEDULES

A World Health Organization Initiative to inform the choice of national vaccination schedules

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

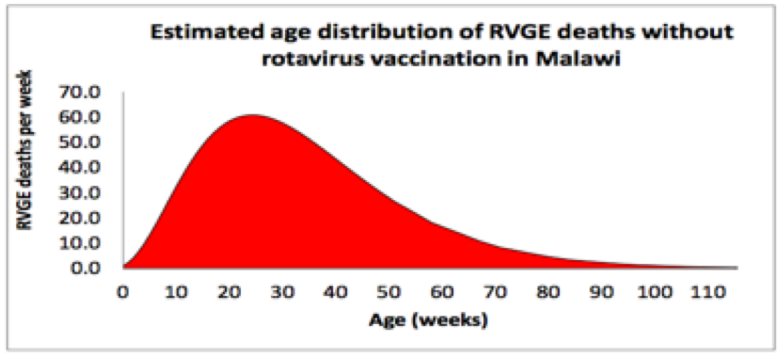
Country Reports

Country

All Countries

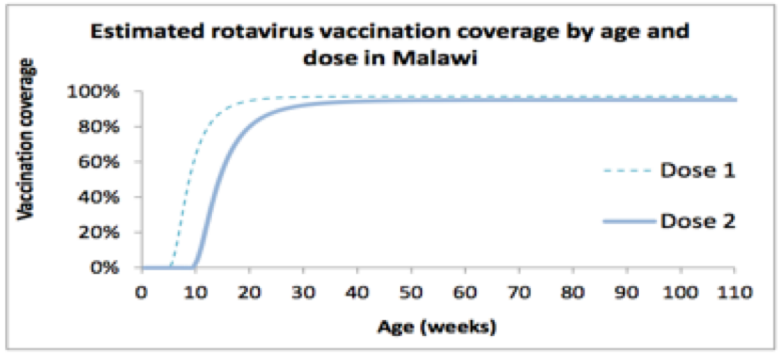
Showing 1 to 10 of 158 results **Show** 10 **results**

Country	Vaccine	Type of analysis	Download Leaflet	Global Review
Afghanistan	Rotavirus	RV1, Risk-benefit analysis	Download PDF	See Details
Albania	Rotavirus	RV1, Risk-benefit analysis	Download PDF	See Details
Algeria	Rotavirus	RV1, Risk-benefit analysis	Download PDF	See Details
Angola	Rotavirus	RV1, Risk-benefit analysis	Download PDF	See Details



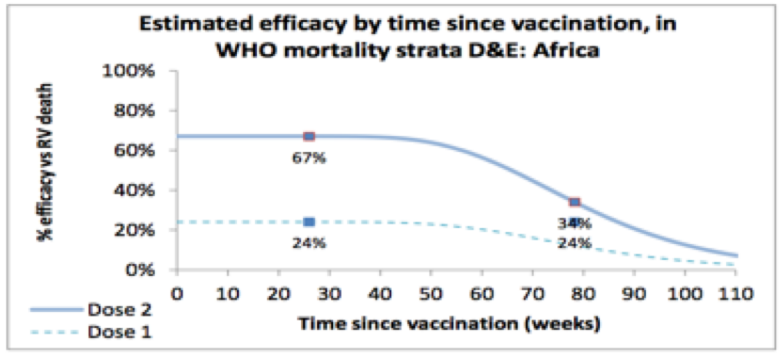
1. To maximize its impact rotavirus vaccine has to be given before RVGE occurs.

Rotavirus vaccine helps to prevent a leading cause of severe diarrhoea in children (c. 40% of hospitalizations in children aged <5 years globally). It is estimated that nearly all children will be exposed to rotavirus before age 5, regardless of where they are born. Children in low-income countries may acquire the infection early during the first year of life. For Malawi, this age distribution was based on a global literature review and regression analysis using data from Kenya, Malawi, South Africa. Source: Sanderson 2012



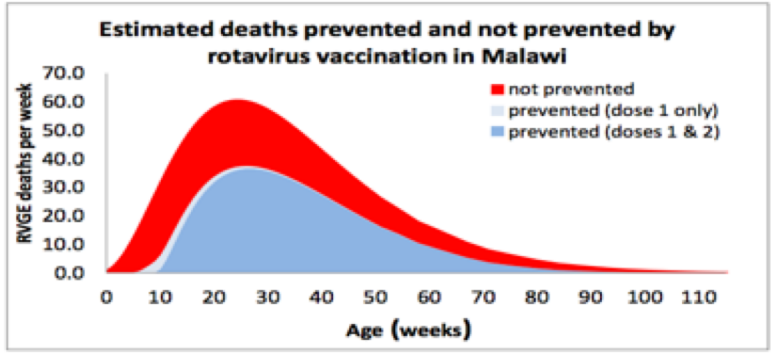
2. It is critical to administer each dose of vaccine at the recommended age and to achieve high coverage

Vaccination should be scheduled as early as possible. This is especially important for rotavirus vaccine as many children will be exposed during the first months of life. Thus it is very important to ensure that each dose is given at the recommended age and not delayed. In Malawi, age-specific vaccination coverage was based on household surveys (DHS/MICS) or a regression analysis in countries without a survey. Timeliness of vaccination was scaled to the 2011 estimates of DTP coverage as reported by WHO. Countries with surveys in the relevant WHO sub-region were: Burundi, Central African Republic, Congo, DR Congo, Cote d'Ivoire, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe. Source: Sanderson 2012



3. It is important to use regionally appropriate estimates of vaccine efficacy

The efficacy of the rotavirus vaccine against severe disease and hospitalisation has been found to be lower in Africa and Asia than in other parts of the world, so it is important to consider whether efficacy assumptions are regionally appropriate. Clinical trials have reported vaccine efficacy during the first and second year of life. This allows the duration of clinical protection to be estimated over time. A sigmoid shape is assumed. In Malawi, modelling studies have used 67% efficacy against severe rotavirus disease (as a proxy for rotavirus mortality) based on studies conducted in other countries with a similar mortality profile. Source: Brieman Vaccine (Bang, Viet, Ghn, Ken, Mal, RV5)



4. Maximizing the benefits of rotavirus vaccine requires that each dose is given on at the recommended age and high coverage is achieved

The number of RVGE (rotavirus gastroenteritis) deaths prevented by vaccination is determined by: the age at which cases occur, coverage, timeliness of each dose, and vaccine efficacy (taking time since vaccination into account). If rotavirus vaccine is given at the same visits as doses of DTP/pentavalent vaccine, a model estimates that the numbers of cases represented by the blue shaded area shown above could be prevented by the vaccine. Rotavirus vaccine will prevent many but not all cases and deaths of RVGE, partly because the vaccine is not 100% effective, but partly because some children will get RVGE before they are vaccinated. Provision of the vaccine is also an opportunity to remind caregivers about other things they can do to prevent diarrhoea deaths, such as breast feeding, ORS, zinc etc.

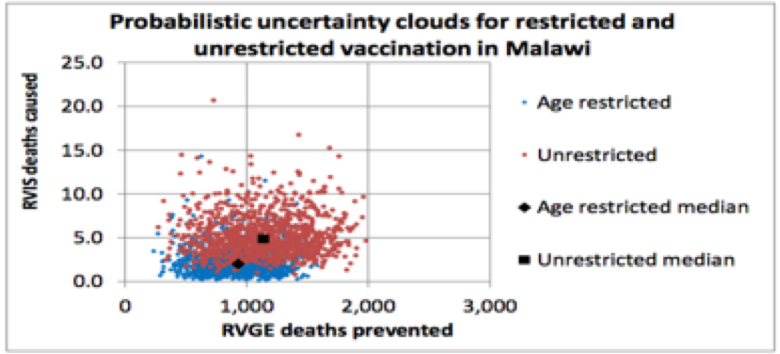
Estimated deaths caused and prevented by rotavirus vaccination

	Potential RVIS deaths caused	*Potential RVGE deaths averted*	*Risk benefit ratio*
Age restricted	2.4	926	388
Age un-restricted	5.3	1,139	214
Difference	2.9	213	73

RVIS: vaccine-related intussusception RVGE: rotavirus gastro-enteritis
Relative risk of RVIS vs background risk = 5.5 after 1st dose and 1.7 after 2nd dose

5. The benefits of rotavirus vaccine (rotavirus deaths averted) outweigh the risks (rotavirus vaccine-related intussusception deaths)

In some countries (Australia, Mexico, Brazil) post-licensure data on intussusception (blockage of the bowel) associated with rotavirus vaccine (RVIS) suggest a low-level risk of RVIS of approximately 1-2 cases per 100,000 vaccinees. In other countries such as the US no increased risk has been documented to date, but there are insufficient data to exclude the possibility. All data available on RVIS are from vaccinees who received the 1st dose by 15 weeks of age and the last dose by 32 weeks of age. Thus there is a very limited basis for estimating RVIS risk when the 1st dose is given after 15 weeks of age. Natural intussusception rarely occurs before 3 months of age but the incidence increases ten-fold between 3 and 6 months of age. Health care staff should be aware of the possibility of an increased although very small risk of RVIS, and must be encouraged to strengthen the detection, reporting and investigation of intussusception cases.



6. The benefits of rotavirus vaccination continue to outweigh the risks after accounting for uncertainty in the calculations

Each dot on the chart above represents a different combination of possible model parameter values. The chart shows the result of 1000 possible combinations. The orange dots are for 'unrestricted' vaccination and the blue are for 'restricted' vaccination. SAGE, the principal advisory group to WHO on vaccination, has recommended that age restrictions be removed in settings with high rotavirus mortality to increase the potential number of lives that could be saved by the vaccine. Note very the different scales on the two axes.

‘Scientific’ and decision-support modelling

	Scientific	*Decision-driven*
Starting point	What can we find out about X? eg values of transmission parameters	What should be done about X? eg should we change the EPI schedule?
Tasks	Fit model/predict/learn/revise	+ explore policy options and scenarios
Inputs	Scientific evidence Assumptions/hypotheses	Scientific evidence + estimates, preferences/values, consensus, attitudes to risk
Output	Understanding of causal chains Inconsistencies in the data Plausibility of hypotheses Important gaps in knowledge	+ pros and cons of options for different outcomes Robustness of choices to scenarios/preferences Important gaps in knowledge

- In DS modelling, uncertainty may arise not just from imprecision of observable data, but from the effects of events yet to come, including decisions by other ‘players’.
- Exploring the implications of different *scenarios* or ‘futures’ is thus an important part of it.

Prototype DS model for exploring alternative schedules

Excel: familiar interface

users can examine formulae and trace cause-effect links

relatively simple to develop and amend

Graphics: users can ‘see’ the data used, and the impact of scenarios on intermediate variables

eg coverage

Simplified: model outcome is *not* lives or cases prevented; it is cases in a pre-vaccine cohort

who would have had 1, 2, 3 and 4 doses of vaccine under a given schedule.

Ie any assumptions about vaccine effectiveness or herd immunity are outside the model.

Setup

Country Bangladesh (BGD) — *Diseases* 2: Pertussis (Pert) | 3: Hib (Hib) | 4: SP IPD (IPD) | 5: Rotavirus (Rota) — *Impact on* Severe cases (2) — Year 2020 (3)

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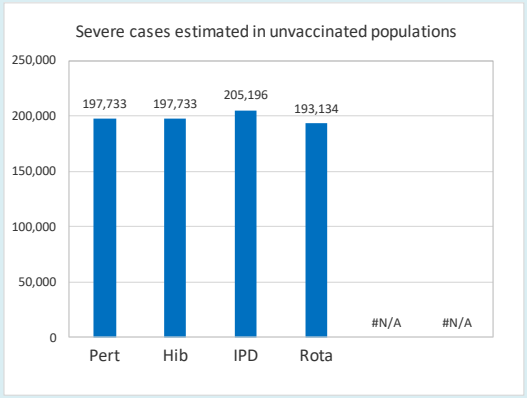
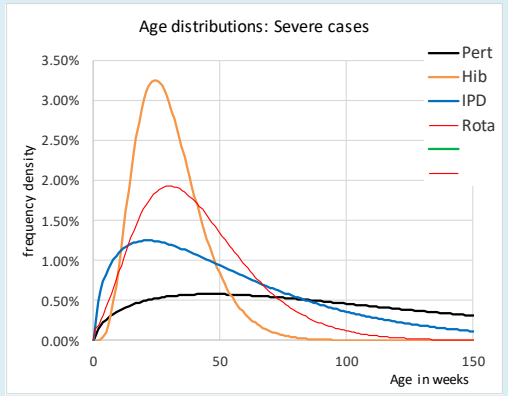
Schedules decision support model_v6.xlsm

Data

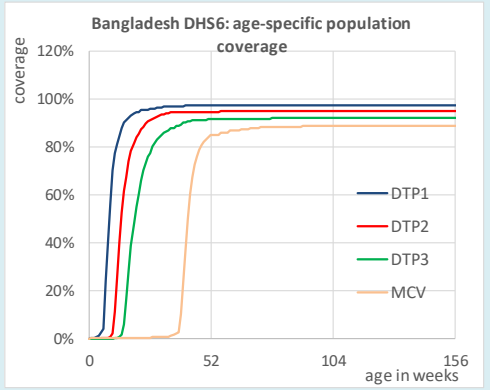
Numbers of cases aged < 5y at risk from GDB studies



Age distribution by disease, from the literature



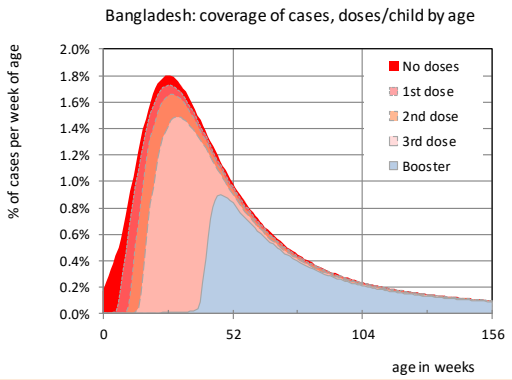
Age-specific vaccine coverage: most recent survey



Protection: duration

	duration in years
1st dose	5
2nd dose	5
3rd dose	5
Booster	5

Results



Scenario

Age distributions and adjustments

Use this scenario as baseline in SA

Add this scenario to trial set for SA

Clears current

			Default	Adjusted
Pert	location?	0.0%	1.578	1.578
	shape?	0.0%	79.09	79.09
Hib	location?	0.0%	5.00	5.00
	shape?	0.0%	6.00	6.00
IPD	location?	0.0%	1.56	1.56
	shape?	0.0%	37.18	37.18
Rota	location?	0.0%	4.35	4.35
	shape?	0.0%	11.03	11.03
			No data	
	location?	0.0%	#N/A	#N/A
	shape?	0.0%	#N/A	#N/A
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	location?	0.0%	#N/A	#N/A
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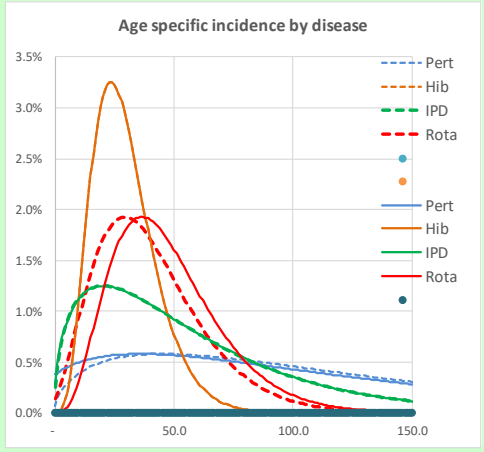
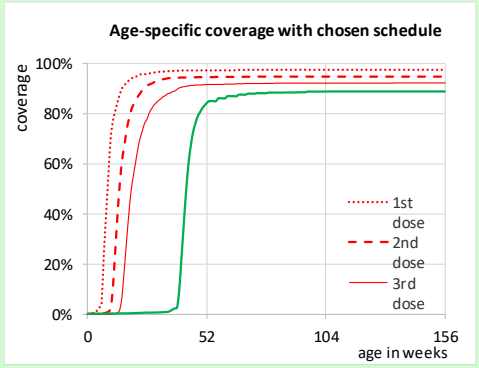


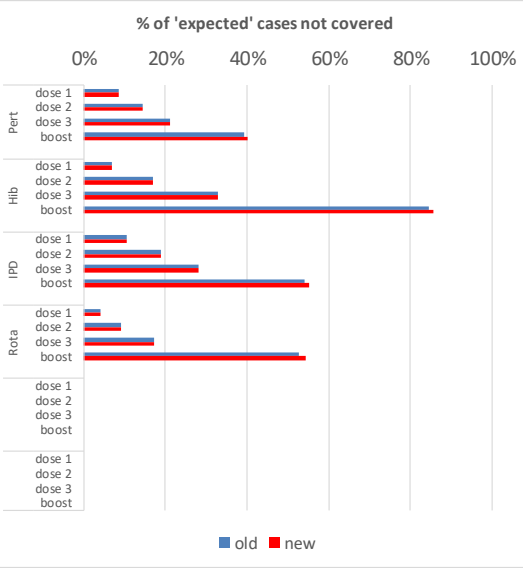
Current schedule

	given with	*target age*	*coverage at 36m*
1st dose	DTP1	6	97.3%
2nd dose	DTP2	10	94.9%
3rd dose	DTP3	14	92.0%
Booster	MCV1	38	88.8%

Proposed schedule

include this dose?	*target age (wks)*	*final(36m) coverage*	*timeliness of coverage*		
yes	6	as DTP1	as DTP1	1	1
yes	10	as DTP2	as DTP2	2	2
yes	14	as DTP3	as DTP3	3	3
yes	39	as MCV	as MCV	4	4





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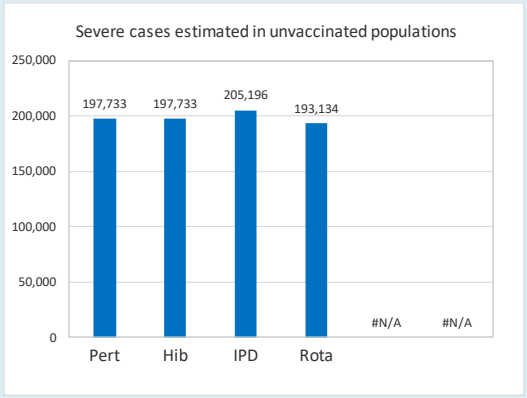

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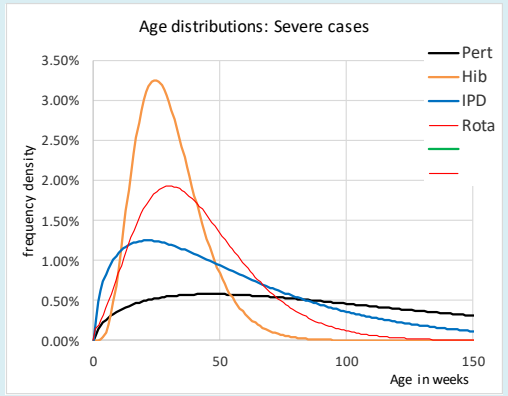

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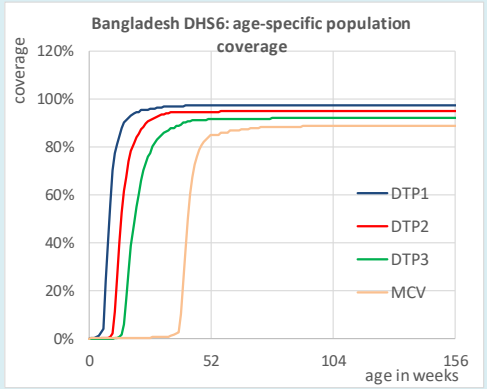

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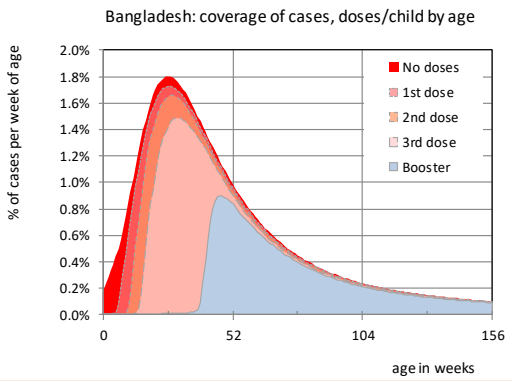

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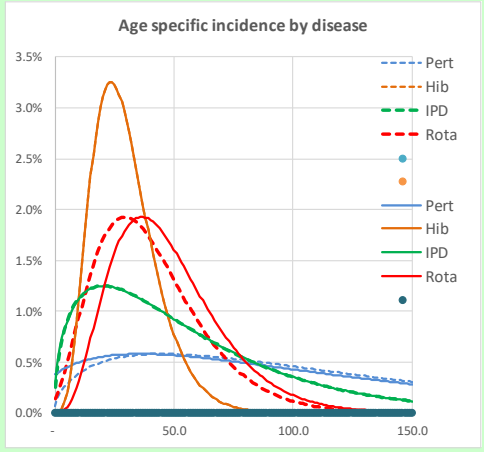
	shape?	0.0%	#N/A	#N/A



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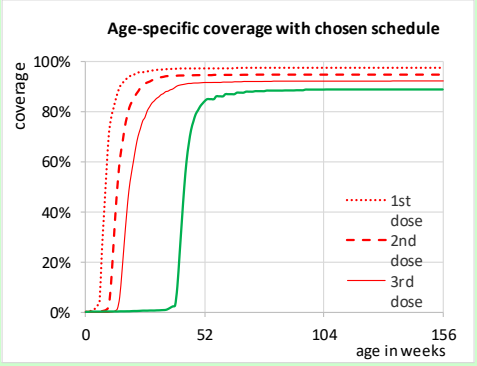
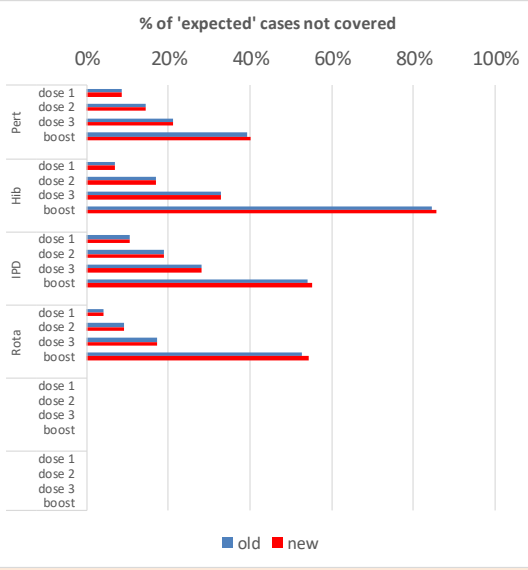


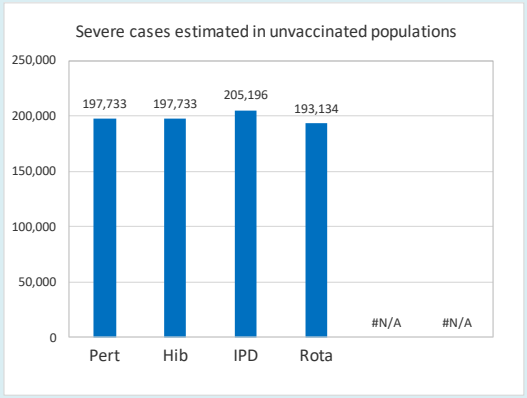


Setup

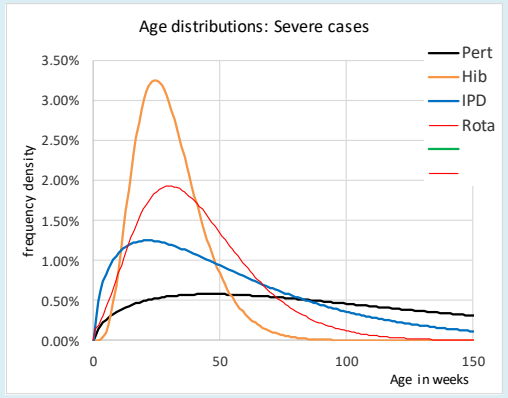
Country Bangladesh BGD | *Diseases* Pertussis (Pert) | Hib (Hib) | SP IPD (IPD) | Rotavirus (Rota) | *Impact on* Severe cases | Year 2020 | Schedules decision support model_v6.xlsm | 14/12/2016 15:59

Data

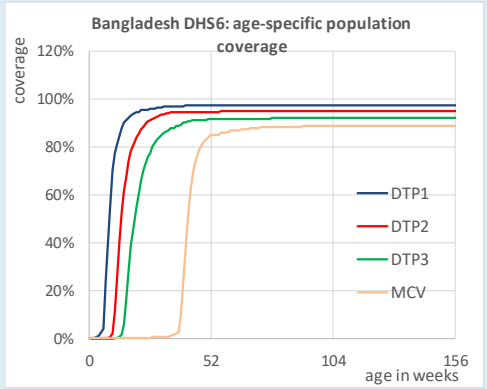
Numbers of cases aged < 5y at risk from GDB studies



Age distribution by disease, from the literature



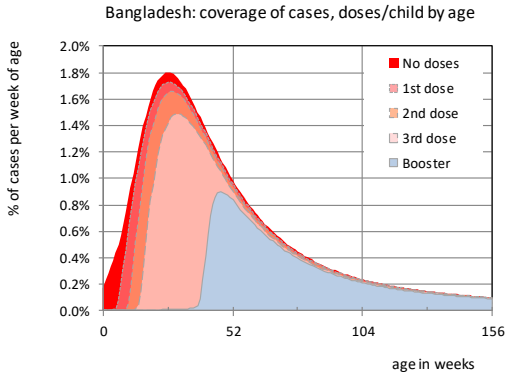
Age-specific vaccine coverage: most recent survey



Protection: duration

	duration in years
1st dose	5
2nd dose	5
3rd dose	5
Booster	5

Results



Scenario

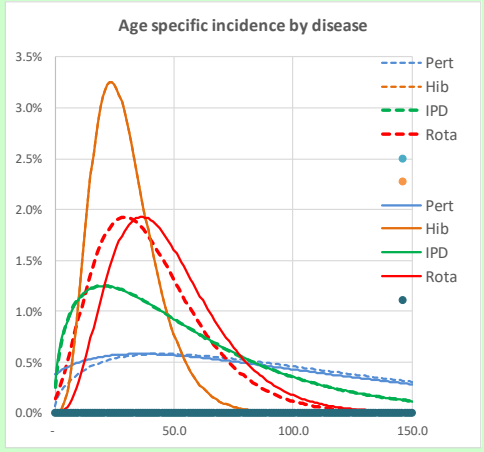
Age distributions and adjustments

Use this scenario as baseline in SA

Add this scenario to trial set for SA

Clears current

			Default	Adjusted
Pert	location?	0.0%	1.578	1.578
	shape?	0.0%	79.09	79.09
Hib	location?	0.0%	5.00	5.00
	shape?	0.0%	6.00	6.00
IPD	location?	0.0%	1.56	1.56
	shape?	0.0%	37.18	37.18
Rota	location?	0.0%	4.35	4.35
	shape?	0.0%	11.03	11.03
			No data	
	location?	0.0%	#N/A	#N/A
	shape?	0.0%	#N/A	#N/A
			No data	
	location?	0.0%	#N/A	#N/A
	shape?	0.0%	#N/A	#N/A

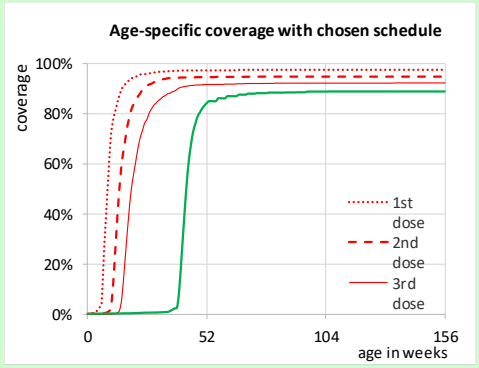


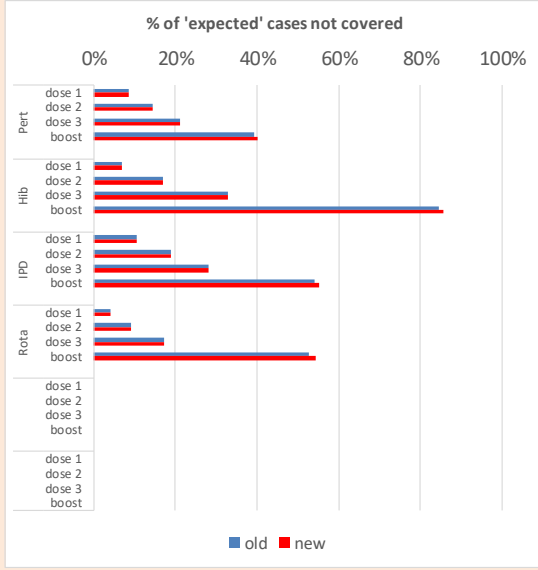
Current schedule

	given with	target age	coverage at 36m
1st dose	DTP1	6	97.3%
2nd dose	DTP2	10	94.9%
3rd dose	DTP3	14	92.0%
Booster	MCV1	38	88.8%

Proposed schedule

include this dose?	target age (wks)	final(36m) coverage	timeliness of coverage		
yes	6	as DTP1	as DTP1	1	1
yes	10	as DTP2	as DTP2	2	2
yes	14	as DTP3	as DTP3	3	3
yes	39	as MCV	as MCV	4	4





Setup

Country: Bangladesh (BGD) — 5

Diseases: 2 Pertussis (Pert) | 3 Hib (Hib) | 4 SP IPD (IPD) | 5 Rotavirus (Rota)

Impact on: Severe cases — 2

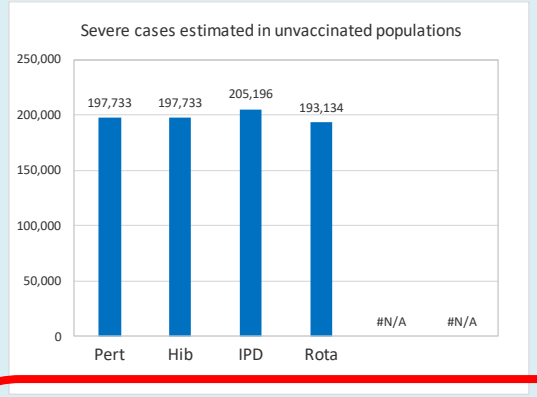
Year: 2020 — 3

14/12/2016 15:59

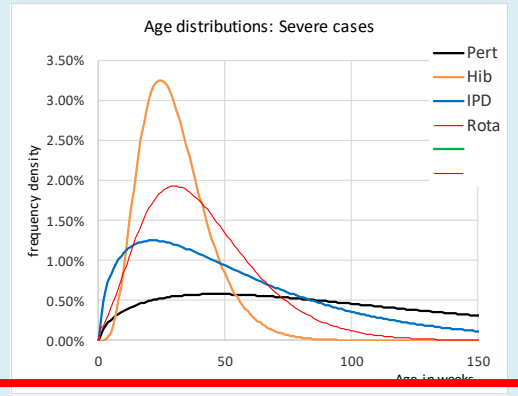
Schedules decision support model_v6.xlsm

Data

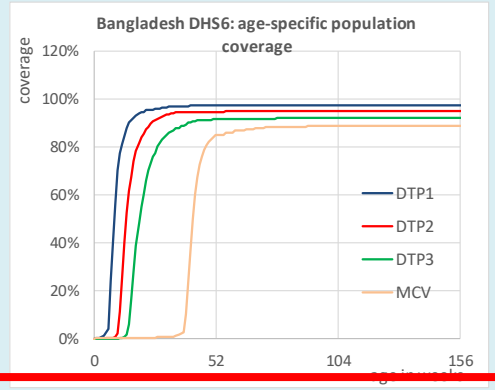
Numbers of cases aged < 5y at risk from GDB studies



Age distribution by disease, from the literature



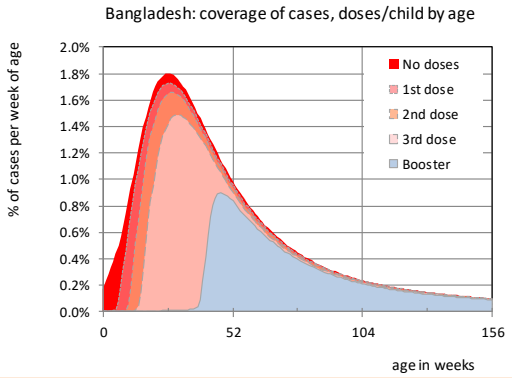
Age-specific vaccine coverage: most recent survey



Protection: duration

	duration in years
1st dose	5
2nd dose	5
3rd dose	5
Booster	5

Results



Scenario

Age distributions and adjustments

Use this scenario as baseline in SA

Add this scenario to trial set for SA

Clears current

			Default	Adjusted
Pert	location?	0.0%	1.578	1.578
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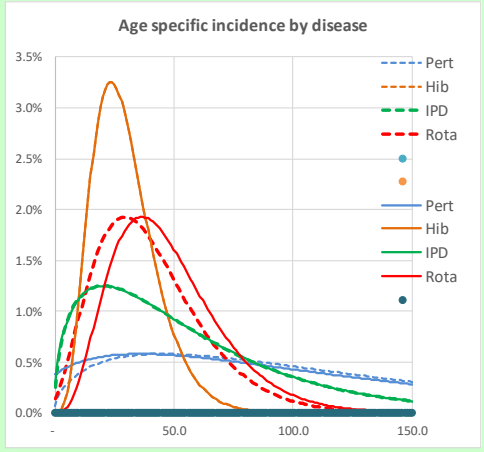
	shape?	0.0%	37.18	37.18
Rota	location?	0.0%	4.35	4.35
	shape?	0.0%	11.03	11.03
			No data	
	location?	0.0%	#N/A	#N/A
	shape?	0.0%	#N/A	#N/A
			No data	
	location?	0.0%	#N/A	#N/A
	shape?	0.0%	#N/A	#N/A



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	given with	target age	coverage at 36m
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Booster	MCV1	38	88.8%

Proposed schedule

include this dose?	target age (wks)	final(36m) coverage	timeliness of coverage		
yes	6	as DTP1	as DTP1	1	1
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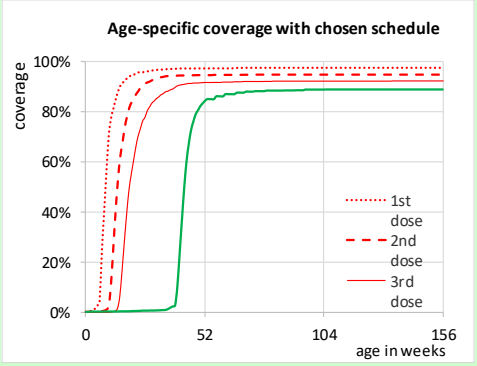
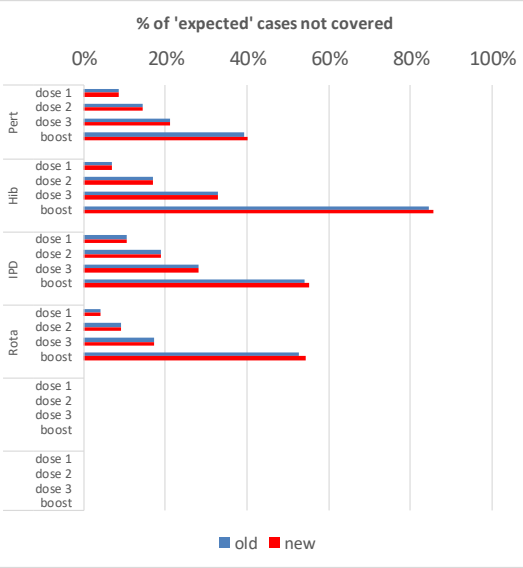




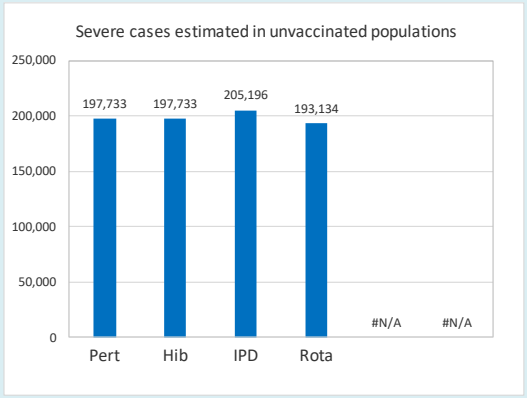
Setup

Country Bangladesh (BGD) — *Diseases* Pertussis (Pert) | Hib | SP IPD (IPD) | Rotavirus (Rota) — *Impact on* Severe cases — Year 2020

14/12/2016 15:59 Schedules decision support model_v6.xlsm

Data

Numbers of cases aged < 5y at risk from GDB studies



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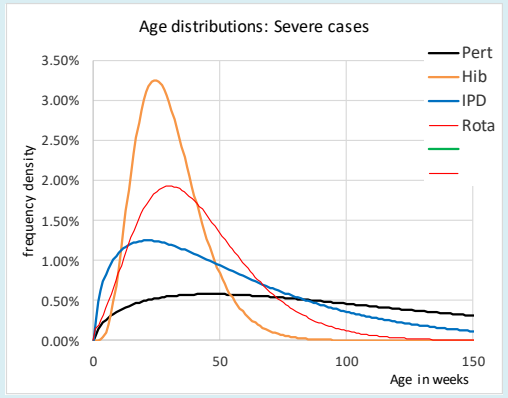

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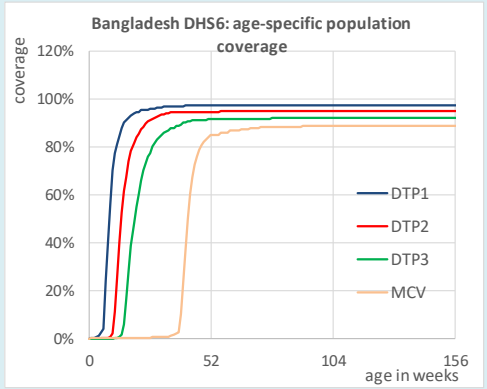

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duration in years	
1st dose	5
2nd dose	5
3rd dose	5
Booster	5

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			No data	
	location?	0.0%	#N/A	#N/A
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	location?	0.0%	#N/A	#N/A
	shape?	0.0%	#N/A	#N/A

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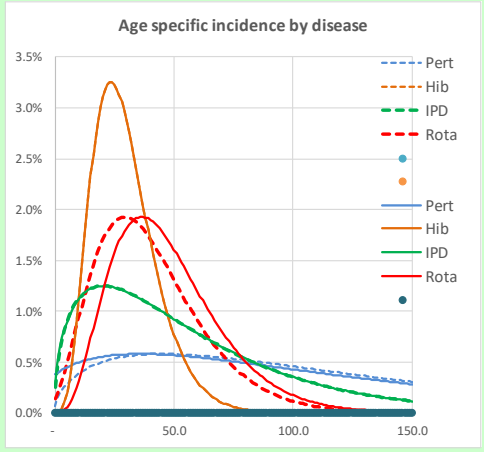
Add this scenario to trial set for SA

Clears current



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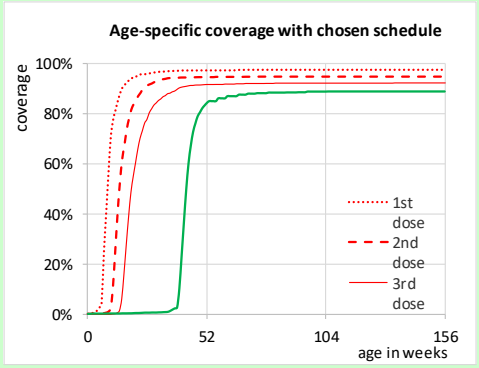
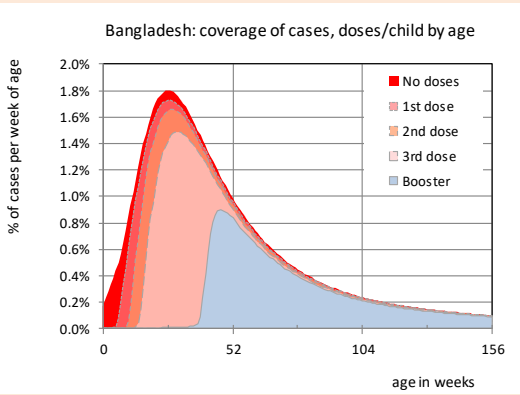
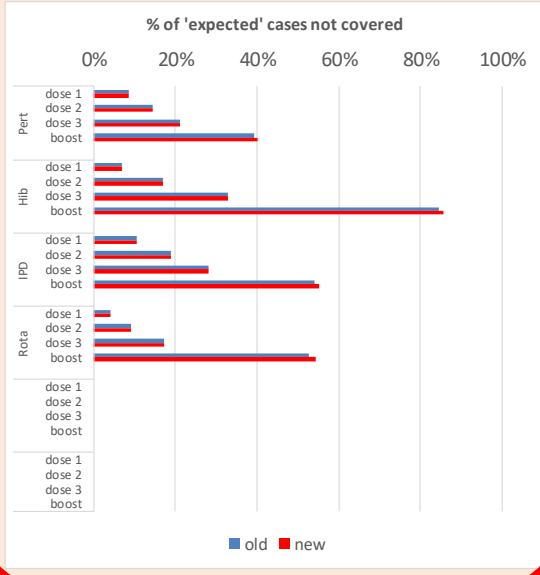


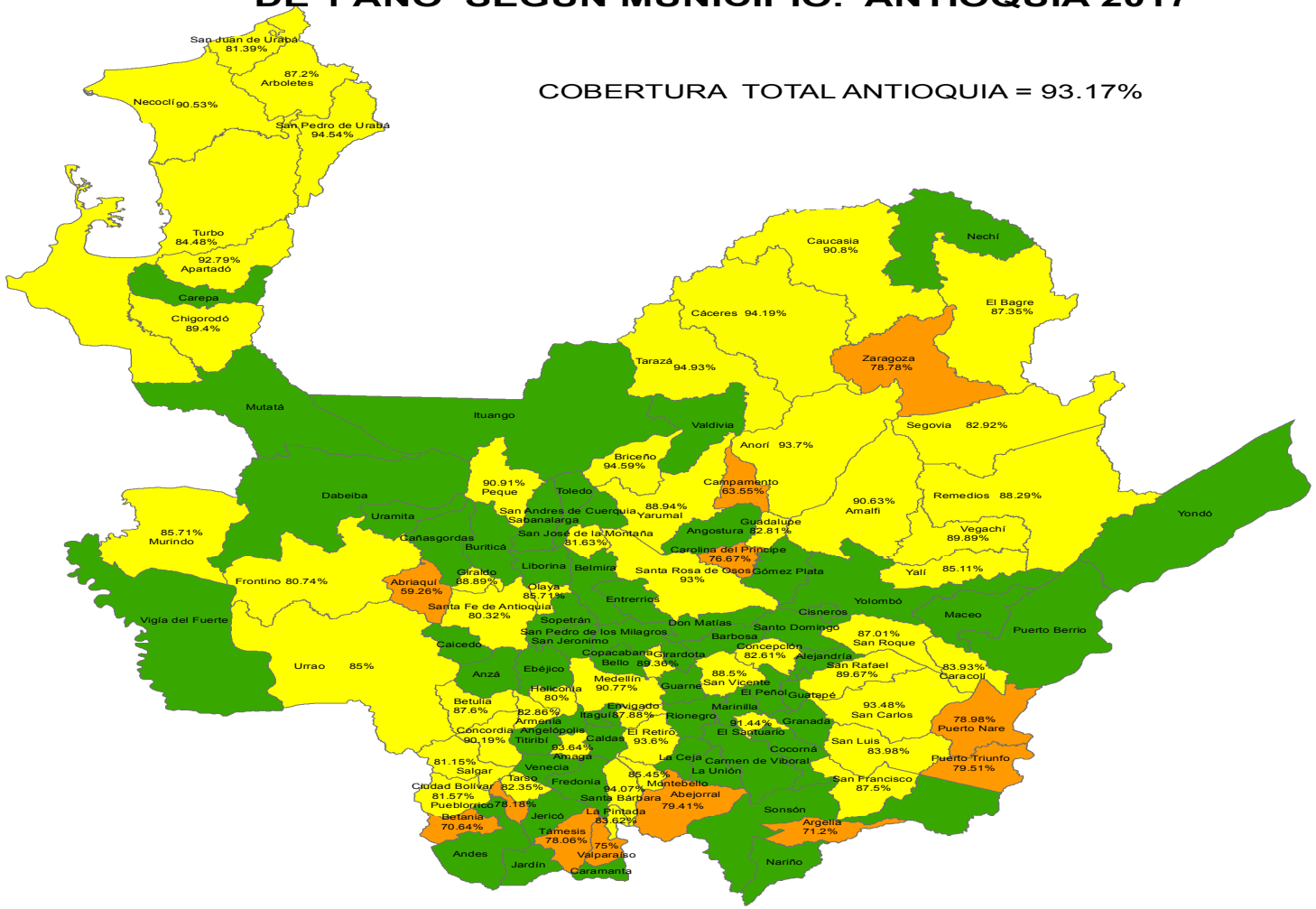
Results





COBERTURAS DE VACUNACION CON DPT EN MENORES DE 1 AÑO SEGÚN MUNICIPIO. ANTIOQUIA 2017

COBERTURA TOTAL ANTIOQUIA = 93.17%



GOBERNACIÓN DE ANTIOQUIA
República de Colombia
ANTIOQUIA PIENSA EN GRANDE

1 cm en el mapa impreso en Carta equivale a 19,684 metros en terreno

21,000 10,500 0 21,000 42,000 metros

1:1,968,383

Sistema de Coordenadas Proyectadas:MAGNA Colombia Bogotá
Proyección:Tranversal de Mercator
Falso Este: 1.000.000
Falso Norte: 1.000.000
Meridiano Central: -74,07750792
Factor de Escala: 1,00000000
Latitud de Origen: 4,59620042
Unidad Lineal: Metros
Sistema de Coordenadas Geográficas: Bogotá MAGNA
Datum: Magna Sirgas

CONVENCIONES

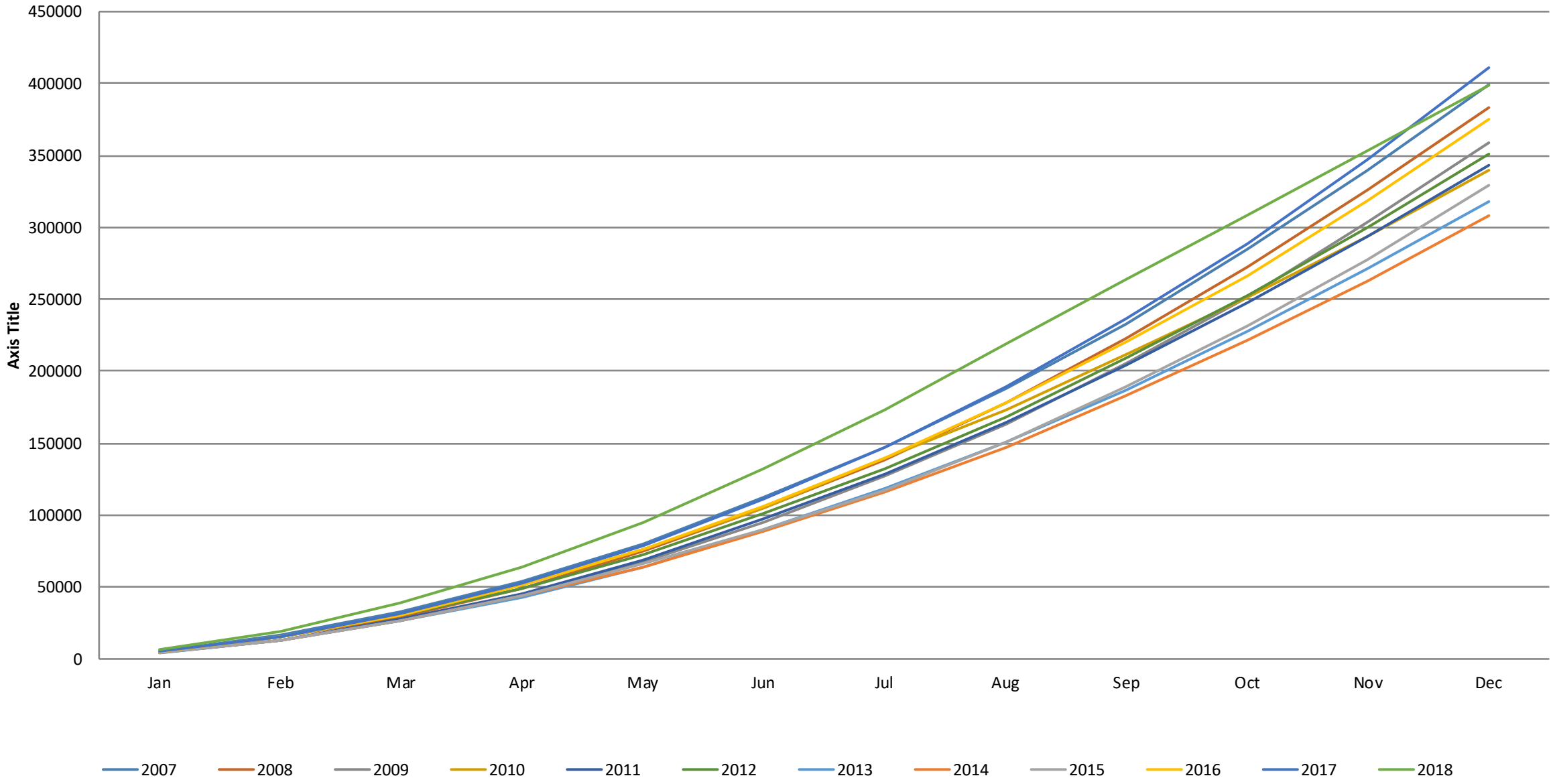
COBERTURAS DE VACUNACION CON DPT EN MENORES DE 1 AÑO SEGÚN MUNICIPIO. ANTIOQUIA 2017

- Coberturas Útiles (95% o más)
- Coberturas Bajo Riesgo (94.9% a 80%)
- Coberturas Alto Riesgo (79.9% a 50%)
- Coberturas Críticas (49.9% o menos)

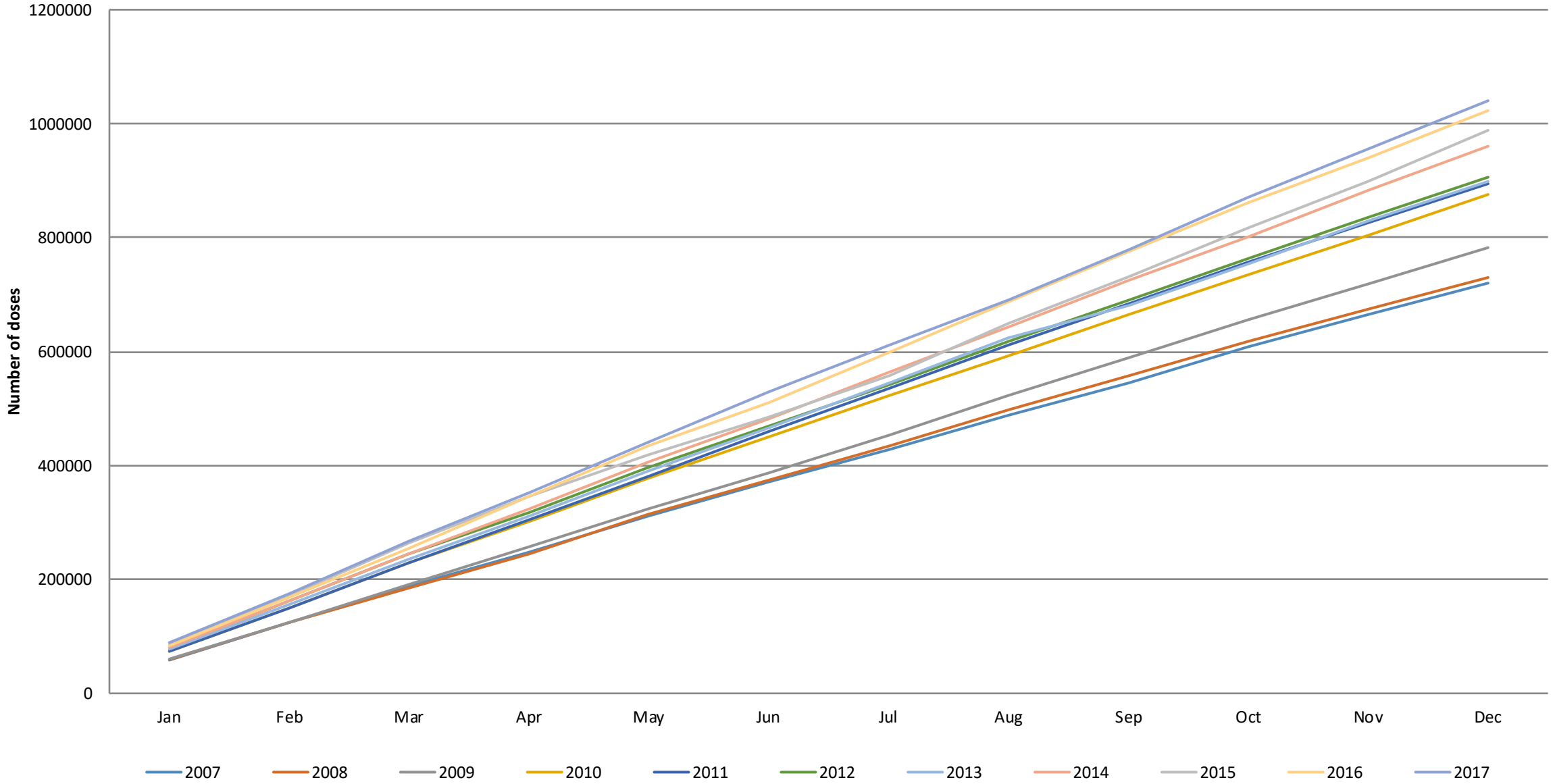
Fuente de Cartografía base: Dirección de Sistemas de Información y Catastro - Gobernación de Antioquia 2012

Autor	Secretaria de Salud
Fecha de Elab:	05 de Junio de 2018
Elaboró	Jaime Jiménez - Jaime Zuluaga
Aprobó	Dr. Ricardo Castrillón Quintero
Numeración	

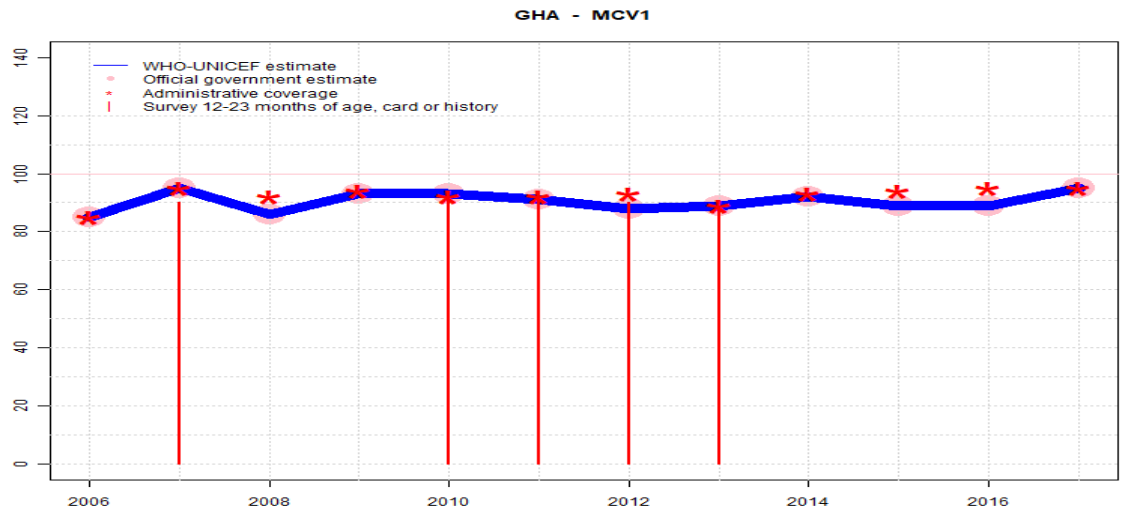
Monthly cumulative doses of MCV by year, Accra District, Ghana



Monthly cumulative number of MCV doses in Ghana



Ghana - MCV1



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Estimate	85	95	86	93	93	91	88	89	92	89	89	95
Estimate GoC	●	●	●	●	●	●	●	●	●	●	●	●
Official	85	95	86	93	93	91	88	89	92	89	89	95
Administrative	85	95	92	94	92	92	93	89	93	94	95	95
Survey	NA	90	NA	NA	94	94	90	89	NA	NA	NA	NA

The WHO and UNICEF estimates of national immunization coverage (wuenic) are based on data and information that are of varying, and, in some instances, unknown quality. Beginning with the 2011 revision we describe the grade of confidence (GoC) we have in these estimates. As there is no underlying probability model upon which the estimates are based, we are unable to present classical measures of uncertainty, e.g., confidence intervals. Moreover, we have chosen not to make subjective estimates of plausibility/certainty ranges around the coverage. The GoC reflects the degree of empirical support upon which the estimates are based. It is not a judgment of the quality of data reported by national authorities.

●●● Estimate is supported by reported data [R+], coverage recalculated with an independent denominator from the World Population Prospects: 2017 revision from the UN Population Division (D+), and at least one supporting survey within 2 years [S+]. While well supported, the estimate still carries a risk of being wrong.

●● Estimate is supported by at least one data source; [R+], [S+], or [D+]; and no data source, [R-], [D-], or [S-], challenges the estimate.

● There are no directly supporting data; or data from at least one source; [R-], [D-], [S-]; challenge the estimate.

In all cases these estimates should be used with caution and should be assessed in light of the objective for which they are being used.

Description:

2017: Estimate based on coverage reported by national government. WHO and UNICEF are aware of the 2017 EPI coverage survey and await the report. Estimate challenged by: D-

2016: Estimate based on coverage reported by national government. Official estimate are based on 2017 EPI coverage survey results. Estimate challenged by: D-

2015: Estimate based on coverage reported by national government. Reported official government coverage level based on results of 2014 DHS. Estimate challenged by: D-

2014: Estimate based on coverage reported by national government. Estimate challenged by: D-

2013: Estimate based on coverage reported by national government supported by survey. Survey evidence of 89 percent based on 1 survey(s). Measles rubella vaccine introduced in September 2013. Estimate challenged by: D-

2012: Estimate based on coverage reported by national government supported by survey. Survey evidence of 90 percent based on 1 survey(s). Estimate challenged by: D-

2011: Estimate based on coverage reported by national government supported by survey. Survey evidence of 94 percent based on 1 survey(s). Estimate challenged by: D-

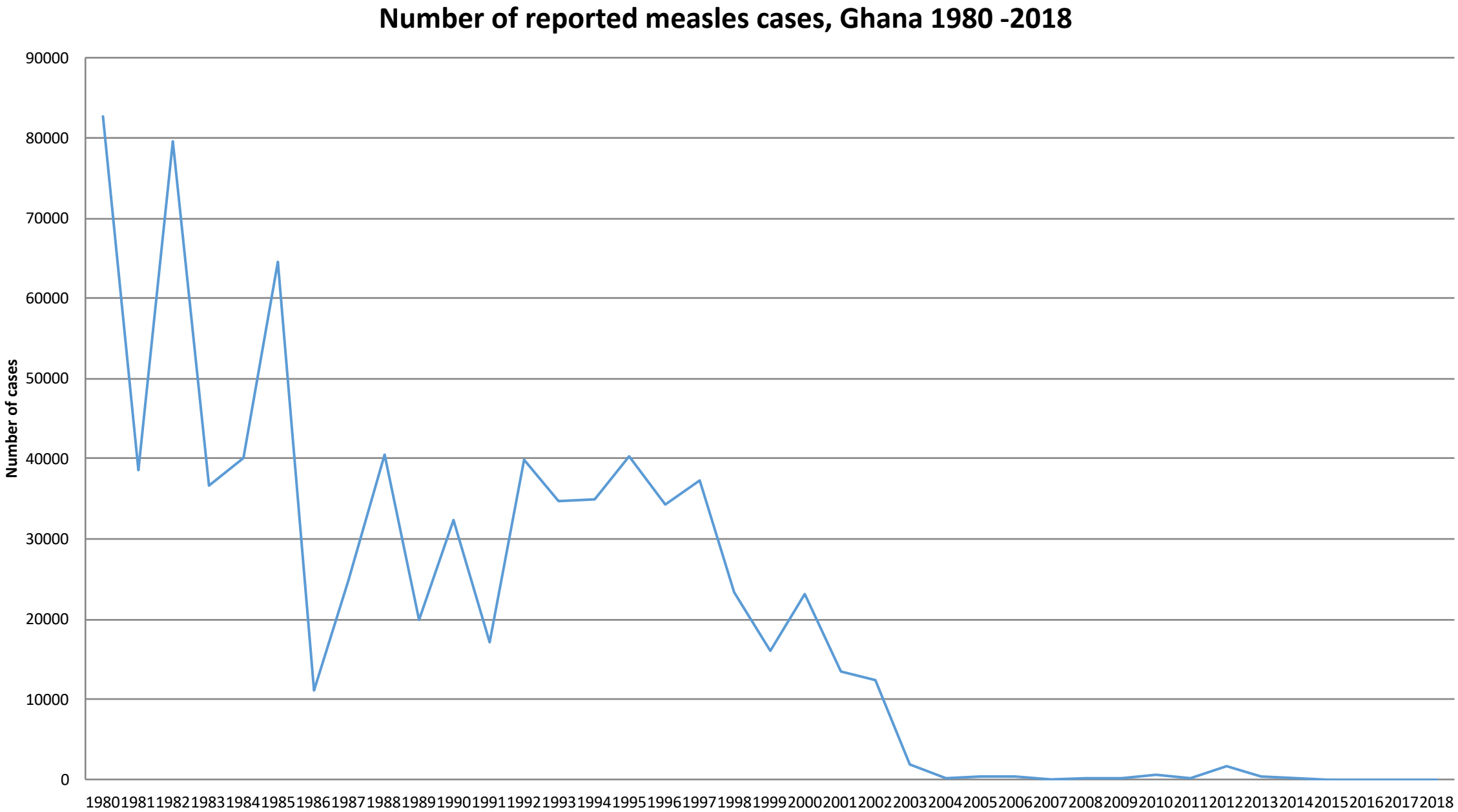
2010: Estimate based on coverage reported by national government supported by survey. Survey evidence of 94 percent based on 1 survey(s). Estimate challenged by: D-

2009: Estimate based on coverage reported by national government. Estimate challenged by: D-

2008: Estimate based on coverage reported by national government. Estimate challenged by: D-

2007: Estimate based on coverage reported by national government supported by survey. Survey evidence of 90 percent based on 1 survey(s). Estimate challenged by: D-

2006: Estimate based on coverage reported by national government. Estimate challenged by: D-


Number of reported measles cases, Ghana 1980 -2018
Number of cases
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018