Annex 4: Health Impact Methodology and Assumptions

Projecting the total impact of vaccination administered between 2011–2020, relative to a no vaccination scenario, for selected vaccines

FORECAST IMPACT OF VACCINATION ADMINISTERED BETWEEN 2011–2020

A. SAMPLE DATA OUTPUT

Data shown for persons vaccinated for DoV impact scenario

GROUP	VACCINE-PREVENTABLE DISEASE	VACCINATION STRATEGY	NUMBER OF FUTURE DEATHS AVERTED	NUMBER OF DEATHS AVERTED PER 1,000 PERSONS VACCINATED
Original EPI vaccines	Measles – 1st dose	routine	10.6M	16.5
	Measles – 2nd dose	routine	0.4M	1.9
	Measles – SIA	campaign	3.1M	3.5
New or underutilized vaccines	Hepatitis B	routine	5.3-6.0M	8.3
	Hib	routine	1.4-1.7M	2.6
	Pneumococcal	routine	1.6-1.8M	4.3
	Rotavirus	routine	0.8-0.9M	3.1
	Human papillomavirus	routine	0.5M	15.1
	Yellow fever	routine	0.03-0.04M	0.2
	Meningococcal meningitis A	campaign & routine	0.03M	0.8
	Japanese encephalitis	campaign & routine	0.07M	0.1
	Rubella	campaign & routine	0.4M	0.4
TOTAL (2011-2020)			24.6-25.8M	

B. INDICATOR

Future deaths averted calculated over period of mortality risk in vaccinated cohorts, relative to a no vaccination scenario, for vaccines delivered during the period 2011–2020.

C. COUNTRIES

94 countries, consisting of all those classified as low (35) or lower-middle-income (57) by the World Bank in 2011, as well as two countries that are now in the process of graduating from GAVI Alliance eligibility and are classified as upper-middle-income countries were considered in scope for the purposes of this analysis. Due to data availability, 13 countries with small populations were omitted; it will not alter the directional nature of this analysis.

D. POPULATION PROJECTIONS

UN Population Division 2008 (hepatitis B, YF, NmA, JE, HPV, rubella) or 2010 (Hib, rotavirus, Sp, measles) revision.

E. COVERAGE PROJECTIONS

GAVI Strategic Demand Forecast 4.0, 4 October 2011; GAVI Adjusted Demand Forecast (SDF 4.4 October 2011 was used for the 73 GAVI eligible countries.) A different projection, however, was used for the non-GAVI eligible countries.

F. VACCINES AND VACCINATION STRATEGIES		G. MODEL SOURCE AND STRUCTURE	
HEPATITIS B	Routine infant	Centers for Disease Control	Static natural history population-based cohort
HIB	Routine infant	Johns Hopkins University (Lives Saved Tool model)	Static cohort
PNEUMOCOCCAL	Routine infant	Johns Hopkins University (Lives Saved Tool model)	Static cohort
ROTAVIRUS	Routine infant	Johns Hopkins University (Lives Saved Tool model)	Static cohort
HUMAN PAPILLOMAVIRUS	Routine 10-13 year old girls	Harvard University	Static cohort
YELLOW FEVER	Routine infant (following SIAs conducted prior to 2011)	GAVI (Long Range Cost and Impact model)	Estimate of 0.2 deaths averted per 1,000 vaccinated from a static cohort model estimate for Nigeria applied to projected numbers vaccinated during 2011-2020
MENINGOCOCCAL MENINGITIS	Routine infant + one-time SIA (all 1-29 year olds)	GAVI (Long Range Cost and Impact model)	Estimate of 1.04 (SIA) and 0.08 (routine infant) deaths averted per 1,000 vaccinated from a static cohort model estimate of the NmA investment case applied to projected numbers vaccinated by each strategy during 2011-2020
JAPANESE ENCEPHALITIS	Routine infant + one-time SIA (all 1-15 year olds)	PATH	Static cohort
RUBELLA	One-time SIA v (all 9 month-14 year old boys and girls)	UK Health Protection Agency Centre for Infections, CDC, WHO	Dynamic cohort
MEASLES Measles – 1st dose Measles – 2nd dose Measles – SIA	 Routine infant Routine childhood Variable	WHO/Department of Immunization, Vaccines and Biologicals (2012)	Dynamic natural history model informed by surveillance data

H. UNDERLYING DISEASE BURDEN	
HEPATITIS B	Pre-vaccination HBsAg serosurvey data (many countries)
HIB	WHO/CHERG 2008 under-5 pneumonia deaths (many countries) x pre-vaccination proportion radiographic pneumonia cases due to Hib (probe studies in 6 countries)
PNEUMOCOCCAL	WHO/CHERG 2008 under-5 pneumonia deaths (many countries) x pre-vaccination proportion radiographic pneumonia cases due to Sp (probe studies in 3 countries)
ROTAVIRUS	WHO/CHERG 2008 under-5 diarrhoea deaths (many countries) x pre-vaccination proportion severe gastroenteritis due to rotavirus infection (many countries)
HUMAN PAPILLOMAVIRUS	Pre-vaccination retrospective surveys of women with invasive cervical cancer with use of molecular techniques to determine the proportion due to HPB and due to specific HPV genotypes (many countries)
YELLOW FEVER	Pre-vaccination 1993 study modelling the impact of vaccination in Nigeria during 1991-2026. Model based on several disease burden studies in Nigeria (one country, little comparable data elsewhere). Only epidemic disease burden considered. Impact based on marginal increase in coverage since year prior to start of GAVI support
MENINGOCOCCAL MENINGITIS	Based on a pre-vaccination prospective hospital surveillance study in Niger conducted during 1981-1996 (one country, little comparable data elsewhere)
JAPANESE ENCEPHALITIS	Based on a 2011 review of population-based surveillance studies. Some pre-vaccination some post-vaccination) (several countries)
RUBELLA	Pre-vaccination retrospective rubella serosurveys to determine age-specific incidence (many countries)
MEASLES	Case fatality ratios from Wolfson et al 2009 review of CFRs for children under five. CFRs for 5-9 years old assumed 50% of CFRs for 1-4 year olds and CFRs were assumed to be 0 above 10 years of age. Age distribution derived from case based surveillance data, using first dose coverage and regions as covariates