

**WHO/UNICEF  
Review of National Immunization Coverage  
1980-2008**

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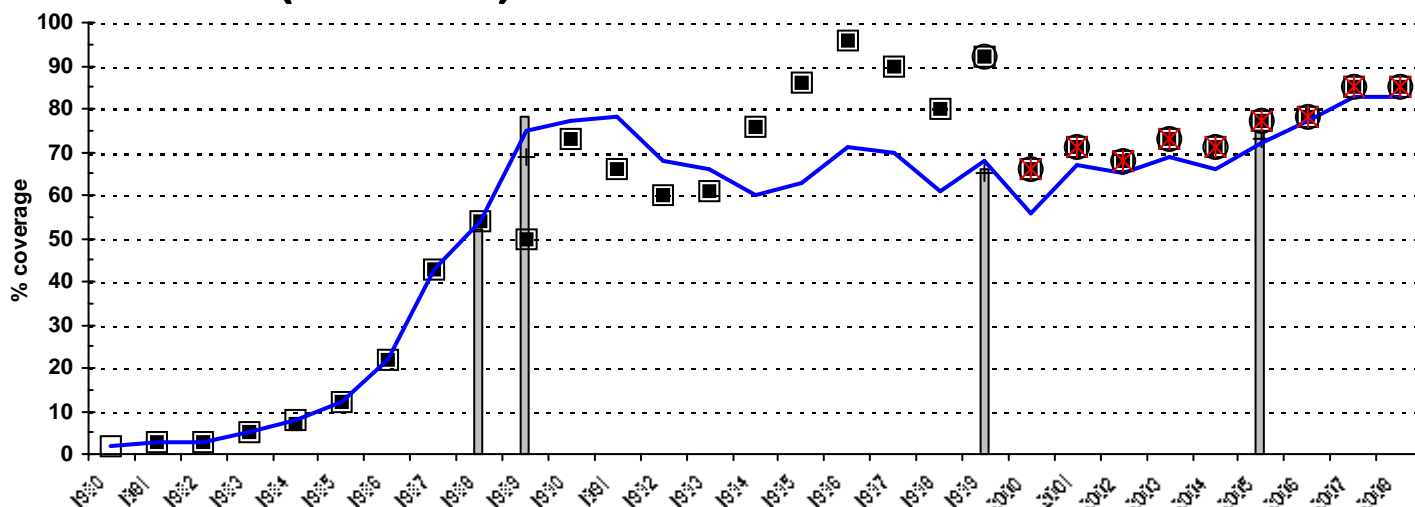
***Sudan***

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**July, 2009**

# Sudan







## BCG (1980-2008)



### Description of trend

From 1980-1993 estimates are based on data reported by the Ministry of Health. After 1990 coverage declines due to reduction of external support. Donor support returns after 1994, partly as a response to an extensive polio outbreak. Officially reported data appear to overestimate coverage during the late 1990s due to problem with denominator (1993 census) and internal population movement. From 1994-1999 the estimated BCG coverage is based on the estimated DPT3 coverage adjusted for 15% drop-out observed in the 1990 survey. 1999 estimate is based on MICS 2000 results including both northern and southern sections of the country. Estimates of the target population from 2000 onward are based on data from the United Nations Fund for Population Activities (UNFPA) and the Central Bureau of Statistics/Sudan. Estimated number of children vaccinated from 2000-2005 are based on reports by the Ministry of Health. From 2006 onward the estimate is based on reported immunizations from the northern section of Sudan (approximately 85% of the total live births) and reported immunizations from the southern section (approximately 15% of total live births) reported to UNICEF. Since 2001 Sudan has increased the number of both fixed and outreach and Data Quality Audits (2003 and 2004) show marked improvement in the quality of the routine monitoring system. 2005 survey results are considered; sample size of children 12-23 months of age not reported. WHO and UNICEF recommend a national survey to provide independent evidence of current levels of coverage.

## Data presented in chart

Year	WHO/ UNICEF estimate (%) 	Reported to:*		Government official estimate (%) 	Reported doses administered (%)** 	Survey data (%)***	
		WHO (%) 	UNICEF (%) 			Survey 12-23 months 	Survey <12 months +
1980	2	2					
1981	3	3	3				
1982	3	3	3				
1983	5	5	5				
1984	8	8	7				
1985	12	12	12				
1986	22	22	22				
1987	43	43	43				
1988	54	54	54			52	
1989	75	50	50			78	69
1990	77	73	73				
1991	78	66	66				
1992	68	60	60				
1993	66	61	61				
1994	60	76	76				
1995	63	86	86				
1996	71	96	96				
1997	70	90	90				
1998	61	80	80				
1999	68	92	92	92	102	66	65
2000	56	66	66	66	66		
2001	67	71	71	71	71		
2002	65	68	68	68	68		
2003	69	73	73	73	73		
2004	66	71	71	71	71		
2005	72	77	77	77	77	75	73
2006	77	78	78	78	78		
2007	83	85	85	85	85		
2008	83	85	85	85	85		

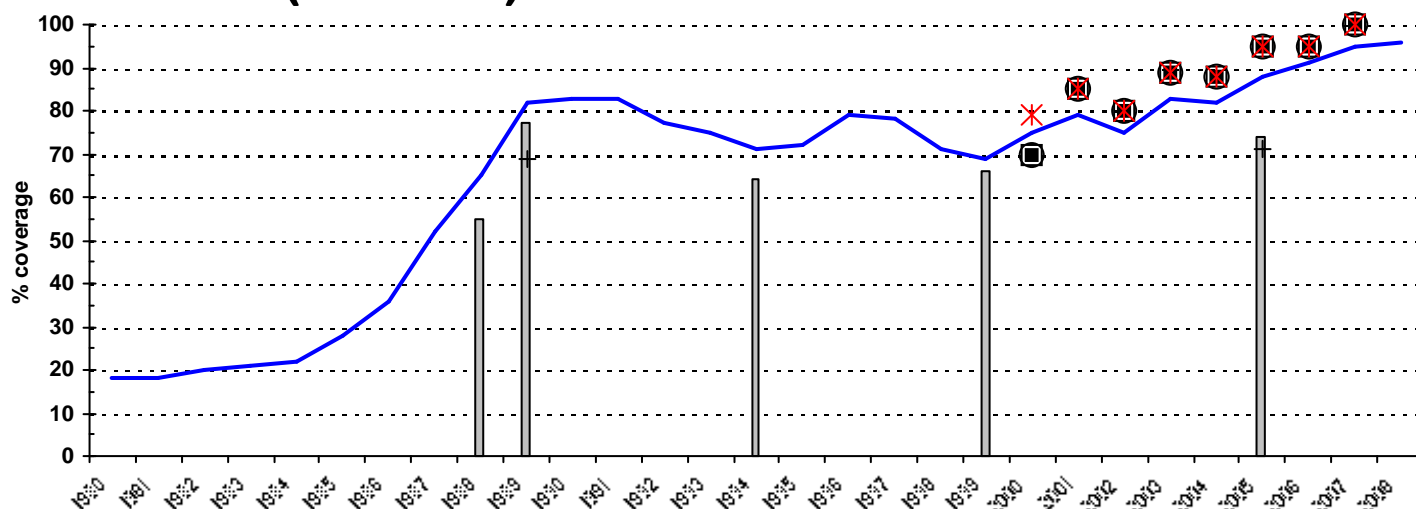
\*Prior to 1998 national reports to WHO/UNICEF did not specify whether information was derived from administrative records, surveys or other sources.

\*\*Coverage based on registration of doses administered by health care providers.

\*\*\*In case more than one survey was implemented in a certain year the highest value is presented. Details of all data are presented in the second section of this report.

# Sudan

## DTP1 (1980-2008)



### Description of trend

WHO and UNICEF began requesting data on DTP1 coverage in 2001 and have received national reports reflecting DTP1 coverage from 2001 onward. The estimates are derived from the WHO UNICEF estimates of DTP3 and the relationship between the levels of DTP3 coverage and dropout between DTP1 and DTP3. This relationship results from an analysis of 282 surveys conducted in 101 countries which were published between 1980 and 2004. Estimates of the target population from 2000 onward are based on data from the United Nations Fund for Population Activities (UNFPA) and the Central Bureau of Statistics/Sudan. Estimated number of children vaccinated from 2000-2005 are based on reports from the Ministry of Health. From 2006 onward the estimate is based on reported immunizations from the northern section of Sudan (approximately 85% of the total live births) and reported immunizations from the southern section (approximately 15% of total live births) reported to UNICEF. Since 2001 Sudan has increased the number of both fixed and outreach sites and a Data Quality Audit shows marked improvement in the quality of the routine monitoring system. 2005 survey results are not considered; sample size of children 12-23 months of age not reported. WHO and UNICEF recommend a national survey to provide independent evidence of current levels of coverage.

### Data presented in chart

Year	WHO/ UNICEF estimate (%)	Reported to:*		Government official estimate (%)	Reported doses administered (%)**	Survey data (%)***	
		WHO (%)	UNICEF (%)			Survey 12-23 months	Survey <12 months
1980	18						
1981	18						
1982	20						
1983	21						
1984	22						
1985	28						
1986	36						
1987	52						
1988	65					55	
1989	82					77	69
1990	83						
1991	83						
1992	77						
1993	75						
1994	71					64	
1995	72						
1996	79						
1997	78						
1998	71						
1999	69					66	
2000	75	70	70	70	79		
2001	79	85	85	85	85		
2002	75	80	80	80	80		
2003	83	89	89	89	89		
2004	82	88	88	88	88		
2005	88	95	95	95	95	74	71
2006	91	95	95	95	95		
2007	95	100	100	100	100		
2008	96	101	101	101	101		

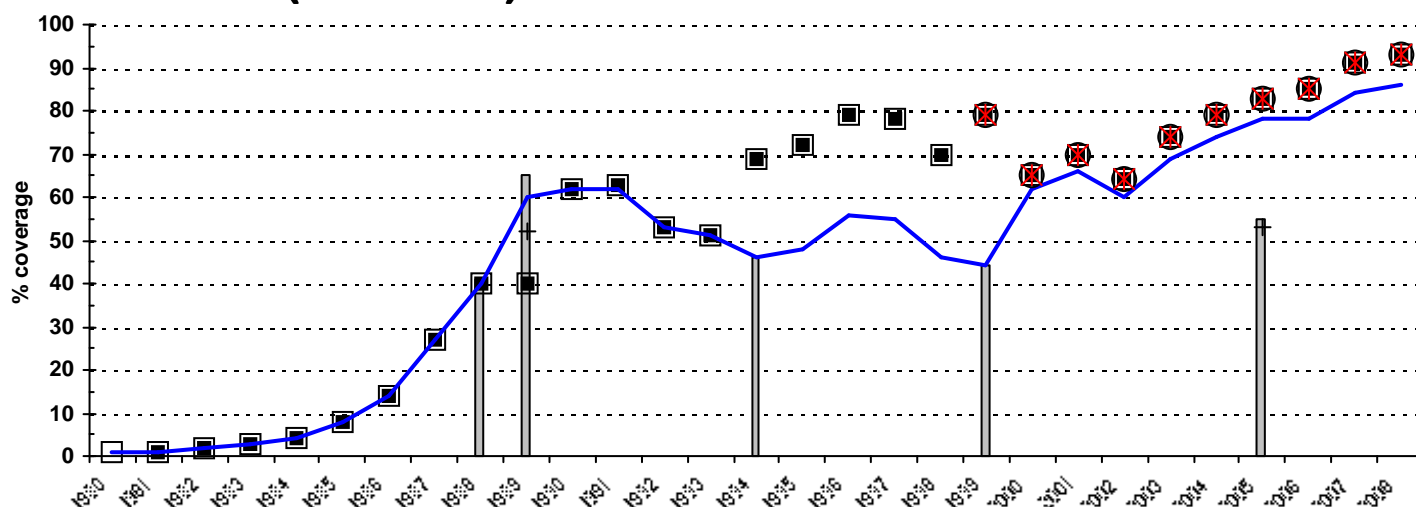
\*Prior to 1998 national reports to WHO/UNICEF did not specify whether information was derived from administrative records, surveys or other sources.

\*\*Coverage based on registration of doses administered by health care providers.

\*\*\*In case more than one survey was implemented in a certain year the highest value is presented. Details of all data are presented in the second section of this report.

# Sudan

## DTP3 (1980-2008)



### Description of trend

Trend follows officially reported data in the early/mid 1980s. After 1990 coverage declines due to reduction of external support. Donor support gradually returns following 1994, partly due to extensive polio outbreak. Officially reported data overestimates coverage during the late 1990s to problem with denominator (last census 1993) and internal population movement. Following 1994 trend follows reported data but with level established by the 1994 survey. 1999 estimate is based on MICS 2000 results including both northern and southern sections of the country. Estimates of the target population from 2000 onward are based on data from the United Nations Fund for Population Activities (UNFPA) and Central Bureau of Statistics/Sudan. Estimated number of children vaccinated from 2000-2005 are based on reports by the Ministry of Health. From 2006 onward the estimate is based on reported immunizations from the northern section of Sudan (approximately 85% of the total live births) and reported immunizations from the southern section (approximately 15% of total live births) reported to UNICEF. Since 2001 Sudan increased the number of both fixed and outreach sites and a Data Quality Audit shows marked improvement in the quality of the routine monitoring system. 2005 survey results are not considered; sample size of children 12-23 months of age not reported. WHO and UNICEF recommend a national survey to provide independent evidence of current levels of coverage.

### Data presented in chart

Year	WHO/ UNICEF estimate (%)	Reported to:*		Government official estimate (%)	Reported doses administered (%)**	Survey data (%)***	
		WHO (%)	UNICEF (%)			Survey 12-23 months	Survey <12 months
1980	1	1					
1981	1	1	1				
1982	2	2	2				
1983	3	3	3				
1984	4	4	4				
1985	8	8	8				
1986	14	14	14				
1987	27	27	27				
1988	40	40	40			41	
1989	60	40	40			65	52
1990	62	62	62				
1991	62	63	63				
1992	53	53	53				
1993	51	51	51				
1994	46	69	69			46	
1995	48	72	72				
1996	56	79	79				
1997	55	78	78				
1998	46	70	70				
1999	44	79	79	79	79	44	
2000	62	65	65	65	65		
2001	66	70	70	70	70		
2002	60	64	64	64	64		
2003	69	74	74	74	74		
2004	74	79	79	79	79		
2005	78	83	83	83	83	55	53
2006	78	85	85	85	85		
2007	84	91	91	91	91		
2008	86	93	93	93	93		

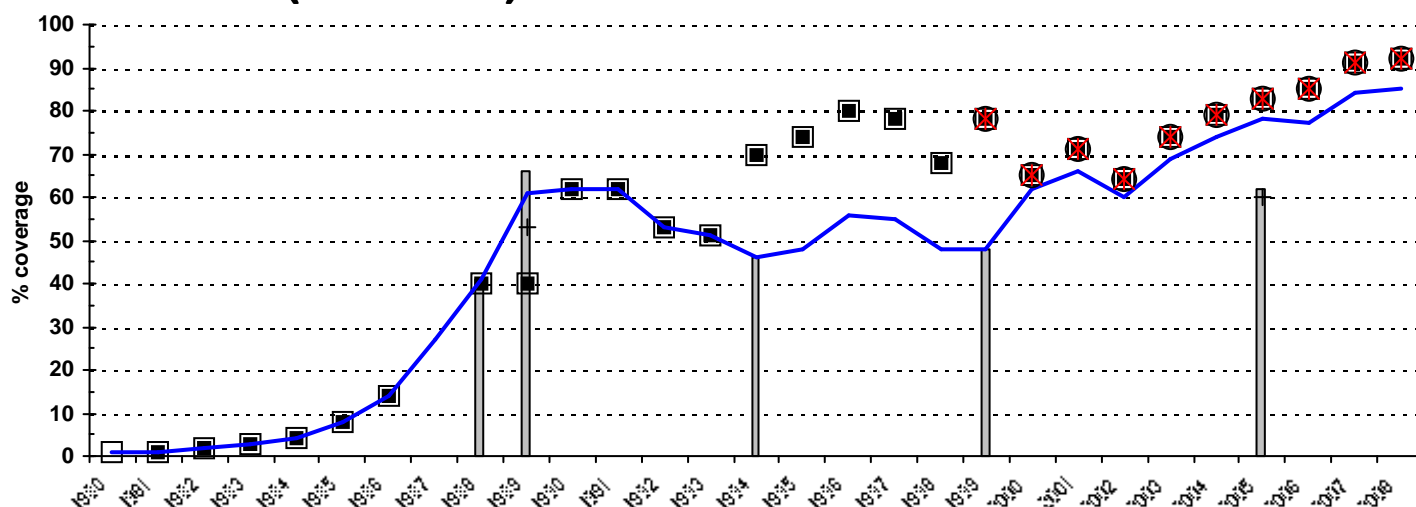
\*Prior to 1998 national reports to WHO/UNICEF did not specify whether information was derived from administrative records, surveys or other sources.

\*\*Coverage based on registration of doses administered by health care providers.

\*\*\*In case more than one survey was implemented in a certain year the highest value is presented. Details of all data are presented in the second section of this report.

# Sudan

## Pol3 (1980-2008)



### Description of trend

Trend follows officially reported data in the early/mid 1980s. After 1990 coverage declines due to reduction of external support. Donor support gradually returns following 1994, partly due to extensive polio outbreak. Officially reported data overestimate coverage during the late 1990s due to problem with denominator (last census 1993) and internal population movement. Following 1994 trend follows reported data but with level estimated by the 1994 survey. 1999 estimate is based on MICS 2000 results including both northern and southern sections of the country. Estimates from 2000-2005 are based on reports by the Ministry of Health using estimates of surviving infants based on data from the United Nations Fund for Population Activities (UNFPA) and the Central Bureau of Statistics/Sudan. The 2006 estimate is based on reported immunizations from the northern section of Sudan (approximately 85% of the surviving infants) and estimated immunizations from the southern section (approximately 15% of surviving infants) based on a 2005 report to UNICEF. Since 2001 Sudan has increased the number of both fixed and outreach sites and a D Quality Audit shows marked improvement in the quality of the routine monitoring system. 2005 survey results are not considered; sample size children 12-23 months of age not reported. WHO and UNICEF recommend a national survey to provide independent evidence of current level of coverage.

### Data presented in chart

Year	WHO/ UNICEF estimate (%)	Reported to:*		Government official estimate (%)	Reported doses administered (%)**	Survey data (%)***	
		WHO (%)	UNICEF (%)			Survey 12-23 months	Survey <12 months
1980	1	1	1				
1981	1	1	1				
1982	2	2	2				
1983	3	3	3				
1984	4	4	4				
1985	8	8	8				
1986	14	14	14				
1987	27						
1988	41	40	40			41	
1989	61	40	40			66	53
1990	62	62	62				
1991	62	62	62				
1992	53	53	53				
1993	51	51	51				
1994	46	70	70			46	
1995	48	74	74				
1996	56	80	80				
1997	55	78	78				
1998	48	68	68				
1999	48	78	78	78	78	48	
2000	62	65	65	65	65		
2001	66	71	71	71	71		
2002	60	64	64	64	64		
2003	69	74	74	74	74		
2004	74	79	79	79	79		
2005	78	83	83	83	83	62	60
2006	77	85	85	85	85		
2007	84	91	91	91	91		
2008	85	92	92	92	92		

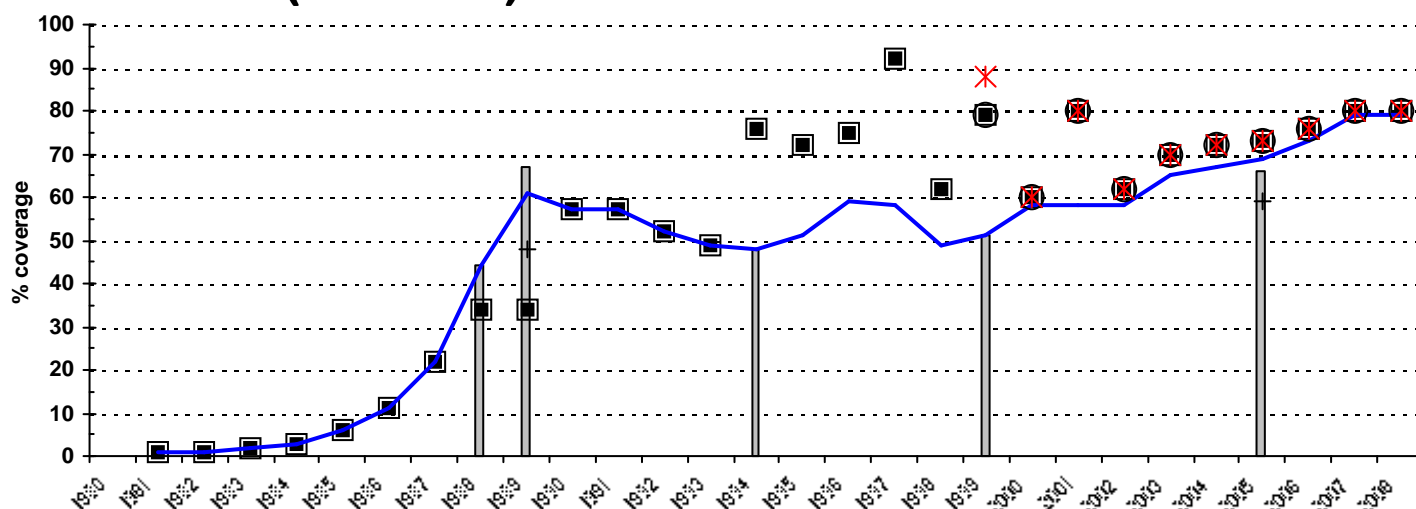
\*Prior to 1998 national reports to WHO/UNICEF did not specify whether information was derived from administrative records, surveys or other sources.

\*\*Coverage based on registration of doses administered by health care providers.

\*\*\*In case more than one survey was implemented in a certain year the highest value is presented. Details of all data are presented in the second section of this report.

# Sudan

## MCV (1980-2008)



### Description of trend

Trend follows officially reported data in the early/mid 1980s. After 1990 coverage declines due to reduction of external support. Donor support gradually returns following 1994, partly due to extensive polio outbreak. Officially reported data overestimate coverage during the late 1990s (problem with denominator (last census 1993) and internal population movement). Following 1994 trend follows reported data but with level established by the 1994 survey. 1999 estimate is based on MICS 2000 results including both northern and southern sections of the country. Estimates of the target population from 2000 onward are based on data from the United Nations Fund for Population Activities (UNFPA) and Central Bureau of Statistics/Sudan. Estimated number of children vaccinated from 2000-2005 are based on reports by the Ministry of Health. From 2006 onward the estimate is based on reported immunizations from the northern section of Sudan (approximately 85% of the total live births) and reported immunizations from the southern section (approximately 15% of total live births) reported to UNICEF. Since 2001 Sudan increased the number of both fixed and outreach sites and a Data Quality Audit shows marked improvement in the quality of the routine monitoring system. 2005 survey results are not considered; sample size of children 12-23 months of age not reported. WHO and UNICEF recommend a national survey to provide independent evidence of current levels of coverage.

### Data presented in chart

Year	WHO/ UNICEF estimate (%)	Reported to:*		Government official estimate (%)	Reported doses administered (%)**	Survey data (%)***	
		WHO (%)	UNICEF (%)			Survey 12-23 months	Survey <12 months
1980							
1981	1	1	1				
1982	1	1	1				
1983	2	2	2				
1984	3	3	3				
1985	6	6	6				
1986	11	11	11				
1987	22	22	22				
1988	44	34	34			44	
1989	61	34	34			67	48
1990	57	57	57				
1991	57	57	57				
1992	52	52	52				
1993	49	49	49				
1994	48	76	76			48	
1995	51	72	72				
1996	59	75	75				
1997	58	92	92				
1998	49	62	62				
1999	51	79	79	79	88	51	
2000	58	60	60	60	60		
2001	58	80	80	80	80		
2002	58	62	62	62	62		
2003	65	70	70	70	70		
2004	67	72	72	72	72		
2005	69	73	73	73	73	66	59
2006	73	76	76	76	76		
2007	79	80	80	80	80		
2008	79	80	80	80	80		

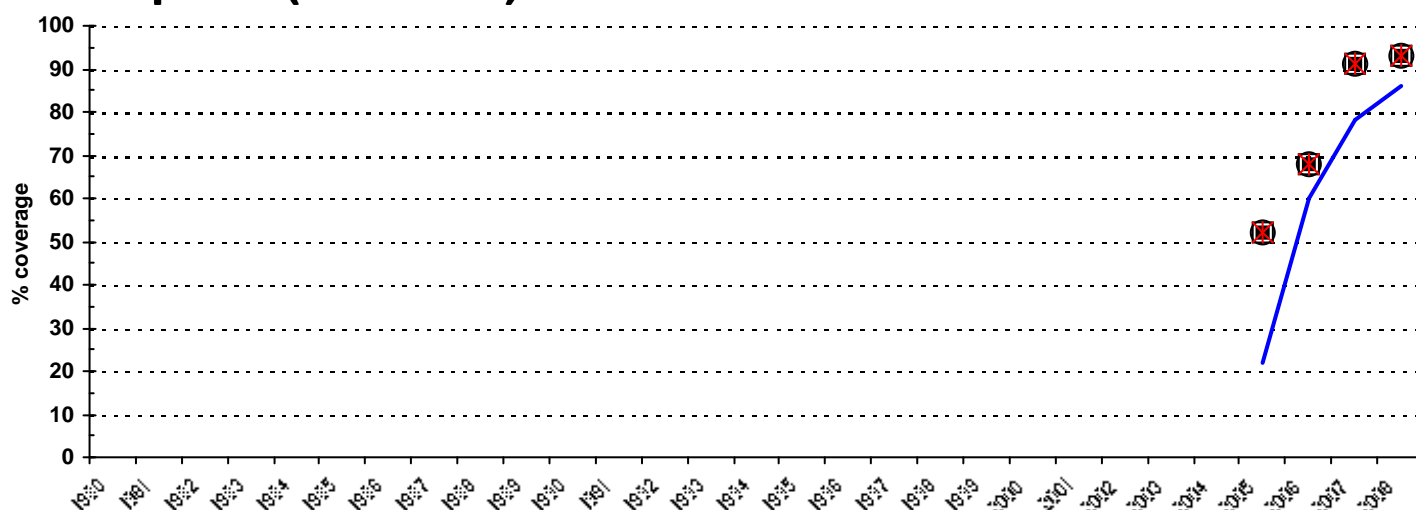
\*Prior to 1998 national reports to WHO/UNICEF did not specify whether information was derived from administrative records, surveys or other sources.

\*\*Coverage based on registration of doses administered by health care providers.

\*\*\*In case more than one survey was implemented in a certain year the highest value is presented. Details of all data are presented in the second section of this report.

# Sudan

## HepB3 (1980-2008)



### Description of trend

Hepatitis B vaccine introduction began in 2004 and available throughout the country in 2006. Estimates from 2005 are based on reports by t Ministry of Health using estimates of surviving infants based on data from the United Nations Fund for Population Activities (UNFPA) and the Central Bureau of Statistics/Sudan. DTP-HepB-Hib pentavalent vaccine introduced in Northern Sudan in 2008.

### Data presented in chart

Year	WHO/ UNICEF estimate (%)  —	Reported to:*		Government official estimate (%)  ○	Reported doses administered (%)**  ✖	Survey data (%)***	
		WHO (%)  □	UNICEF (%)  ■			Survey 12-23 months  	Survey <12 months  +
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	22	52	52	52	52		
2006	60	68	68	68	68		
2007	78	91	91	91	91		
2008	86	93	93	93	93		

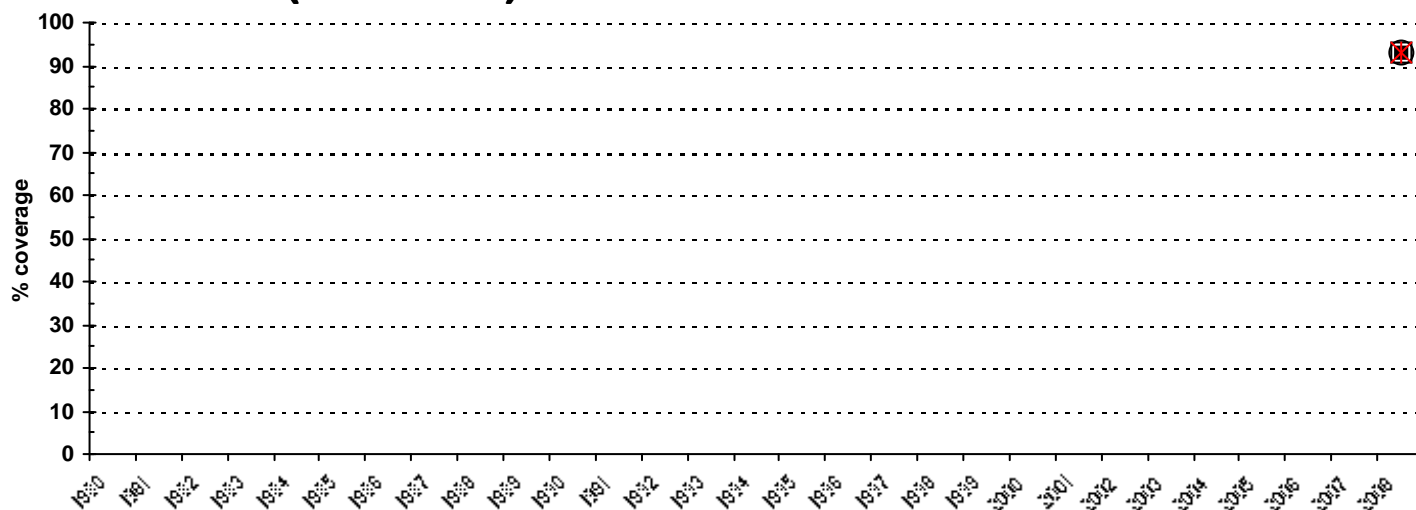
\*Prior to 1998 national reports to WHO/UNICEF did not specify whether information was derived from administrative records, surveys or other sources.

\*\*Coverage based on registration of doses administered by health care providers.

\*\*\*In case more than one survey was implemented in a certain year the highest value is presented. Details of all data are presented in the second section of this report.

# Sudan

## Hib3 (1980-2008)



### Description of trend

DTP-HepB-Hib pentavalent monovalent vaccine introduced in Northern Sudan in 2008.

### Data presented in chart

Year	WHO/ UNICEF estimate (%)	Reported to:*		Government official estimate (%)	Reported doses administered (%)**	Survey data (%)***	
		WHO (%)	UNICEF (%)			Survey 12-23 months	Survey <12 months
1980							
1981							
1982							
1983							
1984							
1985							
1986							
1987							
1988							
1989							
1990							
1991							
1992							
1993							
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1996							
1997							
1998							
1999							
2000							
2001							
2002							
2003							
2004							
2005							
2006							
2007							
2008	86	93	93	93	93		

\*Prior to 1998 national reports to WHO/UNICEF did not specify whether information was derived from administrative records, surveys or other sources.

\*\*Coverage based on registration of doses administered by health care providers.

\*\*\*In case more than one survey was implemented in a certain year the highest value is presented. Details of all data are presented in the second section of this report.

# Sudan

## Details Survey Data

### Year Source

Antigen	Confirmation method	% coverage	Compliance with schedule	Age group	Sample size	% cards seen	Survey year	Comments
<b>2005 Sudan Household Health Survey 2006</b>								
BCG	Card or History	74.9		12-23 m	1165621	34.6	2006	
BCG	C or H <12 month	72.9		12-23 m	1165621	34.6	2006	
DTP1	Card or History	74.1		12-23 m	1165621	34.6	2006	
DTP1	C or H <12 month	71.2		12-23 m	1165621	34.6	2006	
DTP3	Card or History	54.8		12-23 m	1165621	34.6	2006	
DTP3	C or H <12 month	52.9		12-23 m	1165621	34.6	2006	
Pol3	Card or History	61.9		12-23 m	1165621	34.6	2006	
Pol3	C or H <12 month	59.5		12-23 m	1165621	34.6	2006	
MCV	Card or History	66.4		12-23 m	1165621	34.6	2006	
MCV	C or H <12 month	59.3		12-23 m	1165621	34.6	2006	
<b>1999 Sudan Multiple Indicator Cluster Survey 2001</b>								
BCG	History	41.5		12-23 m	3720	27.4	2000	
BCG	Card or history	66.2		12-23 m	3720	27.4	2000	
BCG	Card	24.7		12-23 m	3720	27.4	2000	
BCG	C or H <12 month	65		12-23 m	3720	27.4	2000	
DTP1	History	42.2		12-23 m	3720	27.4	2000	
DTP1	Card or history	66.5		12-23 m	3720	27.4	2000	
DTP1	Card	24.3		12-23 m	3720	27.4	2000	
DTP1	C or H <12 month	64.7		12-23 m	3720	27.4	2000	
DTP3	History	24		12-23 m	3720	27.4	2000	
DTP3	Card or history	44.1		12-23 m	3720	27.4	2000	
DTP3	Card	20.1		12-23 m	3720	27.4	2000	
DTP3	C or H <12 month	42		12-23 m	3720	27.4	2000	
Pol3	History	27.3		12-23 m	3720	27.4	2000	
Pol3	Card or history	47.7		12-23 m	3720	27.4	2000	
Pol3	Card	18.4		12-23 m	3720	27.4	2000	
Pol3	C or H <12 month	43.7		12-23 m	3720	27.4	2000	
MCV	History	34.4		12-23 m	3720	27.4	2000	
MCV	Card or history	50.7		12-23 m	3720	27.4	2000	
MCV	Card	18.3		12-23 m	3720	27.4	2000	
MCV	C or H <12 month	45.3		12-23 m	3720	27.4	2000	
<b>1994 Sudan Multiple Indicator Cluster Survey 1995</b>								
BCG	Card or History			12-23 m		41	1995	
DTP1	Card or History	64.3		12-23 m		41	1995	
DTP3	Card or History	45.5		12-23 m		41	1995	
Pol3	Card or History	45.5		12-23 m		41	1995	
MCV	Card or History	48.2		12-23 m		41	1995	
<b>1989 Demographic and Health Surveys Comparative Studies No. 22, Immunization, Sommerfelt et al., Institute for Resourse Development/Macro Systems, 1997</b>								
BCG	C or H <12 month	69.3		12-23 m	1150	46.1	1989/90	
DTP1	C or H <12 month	68.9		12-23 m	1150	46.1	1989/90	
DTP3	C or H <12 month	51.5		12-23 m	1150	46.1	1989/90	
Pol3	C or H <12 month	53.1		12-23 m	1150	46.1	1989/90	
MCV	C or H <12 month	47.6		12-23 m	1150	46.1	1989/90	
<b>1989 Sudan Demographic and Health Survey 1989/90, 1991</b>								
BCG	Card or History	76.2		12-23 m	1150	46.1	1989/90	

# Sudan

## Details Survey Data

### Year Source

Antigen	Confirmation method	% coverage	Compliance with schedule	Age group	Sample size	% cards seen	Survey year	Comments
BCG	Card or History	77.7		24-35 m	1198		1989/90	
DTP1	Card or History	76.4		12-23 m	1150	46.1	1989/90	
DTP1	Card or History	77.2		24-35 m	1198		1989/90	
DTP3	Card or History	59.7		12-23 m	1150	46.1	1989/90	
DTP3	Card or History	64.9		24-35 m	1198		1989/90	
Pol3	Card or History	61.3		12-23 m	1150	46.1	1989/90	
Pol3	Card or History	66		24-35 m	1198		1989/90	
MCV	Card or History	61.2		12-23 m	1150	46.1	1989/90	
MCV	Card or History	67.3		24-35 m	1198		1989/90	

### 1988 Joint Review of EPI Programme 1989

BCG	Card or History	52.3		12-23 m			1989	
DTP1	Card or History	55.1		12-23 m			1989	
DTP3	Card or History	40.6		12-23 m			1989	
Pol3	Card or History	40.6		12-23 m			1989	
MCV	Card or History	43.7		12-23 m			1989	

## **Sudan**

### **WHO/UNICEF Estimates of Protection at Birth (PAB) against tetanus**

In countries where tetanus is recommended for girls and women coverage is usually reported as "TT2+", i.e. the proportion of (pregnant) women who have received their second or superior TT dose in a given year. TT2 + coverage, however, can under-represent the actual proportion of births that are protected against tetanus as it does not include women who have previously received protective doses, women who received one dose without documentation of previous doses, and women who received doses in TT (or Td) supplemental immunization activities (SIA). In addition, girls who have received DTP in their childhood and are entering childbearing age, may be protected with TT booster doses.

WHO and UNICEF have developed a model that takes into account the above scenarios, and calculates the proportion of births in a given year that can be considered as having been protected against tetanus - "Protection at Birth".

In this model, annual cohorts of women are followed from infancy through their life. A proportion receive DTP in infancy (estimated based on the WHO-UNICEF estimates of DTP3 coverage). In addition some of these women also receive TT through routine services when they are pregnant and may also receive TT during SIAs. The model also adjusts reported data, taking into account coverage patterns in other years, and/or results available through surveys. The duration of protection is then calculated, based on WHO estimates of the duration of protection by doses ever received. The proportion of births that are protected against tetanus as a result of maternal immunization reflects the tetanus immunization received by the mother throughout her life rather than simply the TT immunizations received during the current pregnancy.

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<sup>1</sup> This model is described in: Griffiths U., Wolfson L., Quddus A., Younus M., Hafiz R.. Incremental cost-effectiveness of supplementary immunization activities to prevent neo-natal tetanus in Pakistan. Bulletin of the World Health Organization 2004; 82:643-651.

## Sudan

<b>Year</b>	<b>PAB coverage estimate (%)</b>
1980	
1981	1
1982	1
1983	2
1984	3
1985	4
1986	7
1987	14
1988	20
1989	30
1990	72
1991	72
1992	64
1993	62
1994	68
1995	76
1996	64
1997	69
1998	71
1999	76
2000	61
2001	63
2002	62
2003	65
2004	68
2005	68
2006	70
2007	72
2008	70