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MONITORING TT COVERAGE THROUGH ROUTINE REPORTING: PRESENT AND PROPOSED METHODS

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BACKGROUND

In 1987, the VIII International Conference on Tetanus met in Leningrad and passed a resolution calling for the elimination of neonatal tetanus (NT). The annual Global Advisory Group of the WHO Expanded Program on Immunization (EPI) during its annual meeting in November, 1987 endorsed the Leningrad recommendations and further stressed the need for improving monitoring and evaluation of coverage with tetanus toxoid (TT). Although national policies and control strategies against NT are undergoing review in many countries, there has been relatively little attention paid to the methods currently in use for monitoring TT coverage.

Despite the renewed interest in NT control, reported TT coverage lags considerably behind coverage with the childhood vaccines in practically all countries. Based on routine service statistics, WHO estimates coverage of pregnant women in developing countries with two doses of TT (TT2) to be less than 20% as of July 1987, with a range from 2% in the American Region (excluding the USA and Canada) to 34% in the South-East Asian Region. (1) Coverage in the African Region is 12%. By comparison, reported infant coverage with a third dose of DPT or polio vaccine exceeds 50% in developing countries and has nearly doubled in the past four years.

Estimates of coverage of pregnant women with two doses of TT also vary considerably according to the organization providing the estimate. (Figure 1) Thus, for 1985-1986 UNICEF estimated in May 1987 (2) that 34% of pregnant women in developing countries (excluding China) were immunized against tetanus with two doses. Their figure for Africa was 23%. On the other hand, WHO estimated coverage of pregnant women in the developing world (excluding China) to be only 11% in 1985 and 12% in 1986. (1) The WHO/UNICEF Technical Group meeting in Abidjan in 1987 estimated coverage in Africa to be also 11% in 1985 and 12% in 1986. (3)

Reasons for this disparity between two of the principal organizations engaged in the global immunization effort deserve attention. The differences cannot be explained by the fact that WHO and UNICEF include a different set of countries within their respective African regions. Present efforts to standardize and share a common computerized reporting system will help to prevent such discrepancies in the future.

However, a more fundamental problem exists. As low as reported coverage is, it is undoubtedly higher than currently estimated by WHO. The TT indicators being used by WHO globally and within the national EPI lack validity. Current estimates of annual coverage systematically disregard TT2 immunizations given during recent past years, even though the duration of protection from TT2 is three years.

Furthermore, by counting only a single year's TT2 immunizations, the present method of calculating coverage encourages inappropriate delivery strategies and targets. Health workers are implicitly expected to reach women with a 2nd dose of TT in each pregnancy or to reach women of childbearing age with an annual dose of TT2.

Figure 1:

REPORTED COVERAGE OF PREGNANT WOMEN WITH TWO DOSES OF TETANUS TOXOID BY YEAR, AREA, AND REPORTING ENTITY

AREA	COVERAGE ESTIMATED BY UNICEF	COVERAGE ESTIMATED BY WHO
developing world, excluding China	34% (1985-86)[2]	11% (1985)[1] 12% (1986)[1]
Africa	23% (1985-86)[2]	11% (1985)[3] 12% (1986)[3]

In an attempt to stimulate discussion of this relatively neglected aspect of TT monitoring, this paper critiques the present method of tracking reported TT coverage and proposes an alternative method. To calculate current coverage with TT2, one must accumulate in the numerator the number of TT2 immunizations performed during the past three complete years.

This paper also reviews other monitoring tools such as indicators for measuring completion rates. Recording, registering and reporting requirements specific to tetanus immunization monitoring are also discussed.

PRESENT MONITORING METHODS

One objective of the WHO EPI is to immunize women with TT to ensure that by 1990 all the world's infants are protected at birth against NT. (1) Other agencies state their goals differently. For example, the U.S. Centers for Disease Control's African Child Survival Initiative - Combatting Childhood Communicable Diseases Program is attempting to reach 80% coverage with two doses of TT in pregnant women by the time of delivery. (4)

WHO recommends that routine reporting of immunizations performed should be done continuously in all health units and areas by dose, vaccine and age group in order to monitor performance and vaccine requirements. (5) Routine reports should be used to estimate immunization coverage levels and set future targets. Although the goal of immunization programs is to reduce morbidity and mortality, disease surveillance systems in many countries are not yet capable of reliably monitoring disease trends.

Measuring and monitoring TT coverage using routinely reported statistics is particularly difficult. Unlike in the case of infants, a cohort which renews itself annually and is consequently easily calculated, multiple doses of TT are administered with varying intervals over a 30 year reproductive span, and women enter and leave the eligible age range all the time.

WHO routinely monitors coverage in each country by dividing the number of second doses of TT given to pregnant women during the year by the number of pregnancies. For ease of calculation, they do not consider the rate of stillbirth or abortion. The denominator (number of pregnant women) is assumed to be equal to the number of newborns in a year.

However, this formula for measuring routine coverage is flawed. It has the merit of being simple, but it is not valid. Largely as a result of WHO's recommendations, many countries (particularly in the South-East Asia Region) are beginning to expand the TT target group to include all women of childbearing age, rather than only pregnant women. This widened target group is particularly appropriate in countries lacking developed antenatal services capable of reaching women during pregnancy. Despite this change in strategy, TT coverage is still being expressed as a per cent of pregnant women receiving two doses of TT -- even though service data reported from some countries to WHO do not break down immunizations into the recommended categories of "pregnant women" and "women of childbearing age."

The present method of calculating coverage is flawed even for those countries employing a strategy of immunizing pregnant women only. While the number of immunizations given in a single year is a useful indicator to gauge progress towards achievement of annual targets, this indicator is frequently inappropriately used for calculating the current level of coverage. Current coverage may be high or low, not as a result of current activity only, but also due to the level of past immunization performance. We cannot know by applying WHO's present formula whether a current reported rate of 20% is due to unsuccessful current performance in a program without past high achievement, or due to successful maintenance of past high coverage levels.

WHO in 1986 introduced the use of a new formula for monitoring coverage among those areas using a strategy aimed at women of childbearing age irrespective of pregnancy (6). The formula is:

$$\frac{\text{women of childbearing age receiving a second dose of TT}}{\text{total number of women of childbearing age}} \times 100$$

This approach represents some improvement over using a single formula irrespective of strategy.

However, this new formula still does not address the need to have an indication of the <u>cumulative</u> per cent coverage with TT2. We need a point prevalence of maternal protection versus a period prevalence for any particular one year.

Table 1 provides hypothetical country data showing the apparent annual TT2 coverage rates according to the new WHO formula in a very successful program vaccinating all women of childbearing age (1,100,000 TT2 doses given) during the first four years of the program. Although all women have received TT2, the apparent annual coverage in year four is only 20% (200/1000), the same figure as in year one of the program when only 200,000 women had ever been immunized. In "real life," TT boosters would occur at varying intervals, completion rates would fluctuate secularly and by dose, etc. The resulting "apparent" annual coverage rates would be even more difficult to interpret.

The standard WHO formula which analyzes TT coverage only for pregnant women suffers from the same limitations since it also overlooks immunizations performed in recent past years and implicitly suggests that pregnant women need TT2 (or more) each year.

Table 1:

Hypothetical TT2 Immunization Coverage by Year in a Country with Five Million Population and One Million Women of Childbearing Age [a]

Year	TT2 ('000's) given during year	Apparent TT2 Coverage[b]
1 (start)	200	20% (200/1000)
2	300	30% (300/1000)
3	400	40% (400/1000)
4	200	20% (200/1000)
	1,100,000	

[a] The population of women of childbearing age is assumed to remain constant with 50,000 unimmunized 15 year-olds annually replacing 50,000 unimmunized and immunized 44 year-olds.

[b] Calculated according to the WHO formula (6):

$$\frac{\text{women of childbearing age receiving TT2}}{\text{total number of women of childbearing age}} \times 100$$

The distinction between target numbers to be immunized in a single year and per cent of the population to be protected by a certain date is important but not always appreciated by program managers. For example, in one country, a private voluntary organization covering a total population of 4287 persons established clear benchmarks for monitoring progress. One

of their final outputs of the four-year program is to reach 80% (3430) of childbearing women aged 15-45 years with TT2 by 1991. However, the yearly benchmarks are as follows:

1988: 40% of women aged 15-45 (1715)
1989: 60% of women aged 15-45 (2570)
1990: 70% of women aged 15-45 (3000)
1991: 80% of women aged 15-45 (3431)

In other words, 10,716 women are targetted for immunization. To meet these targets, staff need to immunize each woman in the community an average of two and a half times with TT2. Such an inflated set of successive yearly targets disregards past immunizations performed and overlooks the cumulative nature of coverage. Front-line health workers in such a situation become demoralized by incomprehensible and unreachable targets established by higher levels. Furthermore, the community may object to repeated attempts to immunize the women. Few programs can afford the wastage in manpower and vaccine resulting from achieving such inappropriate targets.

This same confusion between per cent immunized with TT2 in a single year and the cumulative per cent coverage surfaced in a recent UNICEF review document which lamented that "in almost all countries, immunization coverage of children with DPT is at least twice as high as that of women with TT. If mothers were immunized at the time they bring their children, coverage would be at least doubled." (7)

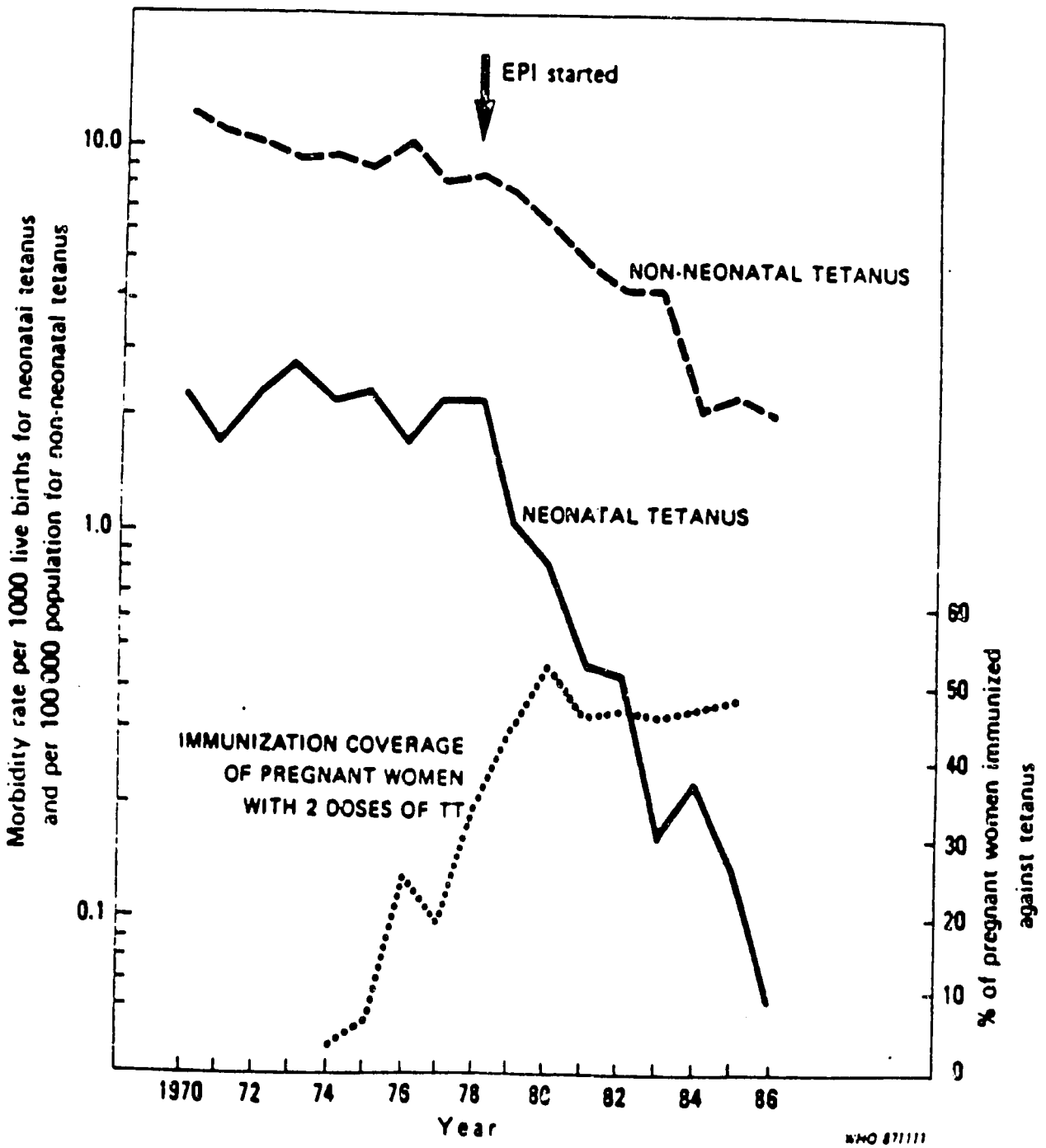
Immunization of women at the time they bring their children for immunization is a sound strategy. But the expectation that in any single year the per cent of women needing TT should equal the per cent of infants receiving DPT3 is not, since women do not require yearly TT2 while new cohorts of infants do require three doses of DPT. However, the cumulative per cent coverage of the female population with TT2 should be at least equal to per cent infant coverage with DPT3.

In Sri Lanka, NT incidence declined 36-fold from 216 to 6 per 100,000 live births during the period 1978 to 1985, while non-neonatal tetanus declined only 4-fold. (Figure 2) (1) WHO attributes this decline to the increasing per cent of pregnant women immunized -- from 5% in 1978 to about 50% in 1985. Figure 2 gives the misleading impression that only 50% coverage with TT2 is needed to reduce drastically the incidence of NT.

A 36-fold decline in the face of only an apparent 10-fold increase in coverage is puzzling for a variety of reasons. The efficacy of TT2 is not 100%; it has been estimated at 80%, with a range of 60-90% (6). Although counted in the service statistics, TT2 doses are obviously not effective against NT in those cases where the woman delivers a stillbirth or suffers an abortion. Contrary to the other EPI-target diseases, the concept of "herd immunity" does not apply to tetanus. Every unimmunized person is susceptible regardless of the overall level of coverage, since the disease is more of an environmental hazard than a trasmittable disease. Rapid improvement in obstetric care is an unlikely explanation for the reduced

FIGURE 2 :

MORBIDITY RATES FOR NEONATAL AND NON-NEONATAL TETANUS AND IMMUNIZATION COVERAGE OF PREGNANT WOMEN, SRI LANKA 1970 – 86



incidence. The puzzling dramatic decline in NT is likely due to the fact that cumulative per cent coverage with TT2 is considerably higher than the most recent year's coverage rate of 50%.

The number of deliveries actually protected is a function not only of the gross number of TT immunizations given, but also of its efficacy, duration of protection and of the fertility of those immunized. A model showing these relationships appears in Annex 1. The model uses data from Nepal to estimate the number of deaths prevented per 10,000 doses of TT2 (or more) immunizations given. The duration of protection was assumed to be on average three 3 years (6). The actual duration increases with later doses in the series, but the majority of immunizations in this particular model were TT2.

What is needed is a management tool that will allow program managers and field staff to monitor TT coverage levels, track progress towards targets, and guide target-setting. It is possible to construct various models and devise tools which are valid, but which must be incredibly complex to account for some of the following factors:

a) varying target populations depending on immunization schedules and strategies, which change over time and in different locales within the same country;

b) the age structure of the female population, rate of population growth, and rate of first pregnancies;

c) the average interval between repeat doses, duration of immunity, and age-specific fertility rates of the immunized and unimmunized population; and

d) the levels of past DPT or DT coverage in child populations.

However, to be useful in the field, management tools must be simple. Simplicity has been elusive. Some authorities have therefore argued that TT coverage percentages cannot be derived from routine reports at all. Instead, they prefer to use the WHO standard 30-cluster sample survey methodology (8) to provide baseline, trend and impact data.

Surveys are important where routine coverage data are absent, incomplete or of dubious quality. They can provide additional information unavailable from routine reports and can be used to validate the routine reporting system. But the results are unlikely to be reliable unless maternal tetanus vaccination cards are widely used and retained. Also it is extremely unlikely from logistic, financial and managerial points of view that surveys could be performed with the required yearly frequency in each administrative area.

PROPOSED MONITORING METHOD

There is no choice but to rely on a simple valid management tool which can depend on the routine reporting system. Health workers need guidance, but guidelines are presently unavailable. The remainder of this paper proposes a system of monitoring. It is certainly not intended as the final answer to the problem, but it will hopefully stimulate discussion on the relatively neglected subject of TT monitoring.

Figure 3 shows a management tool introduced by the Caribbean Epidemiology Center in 1980 (9) for continuously monitoring immunization coverage relative to an annual target. Cumulative monthly immunizations given are plotted on the graph to permit managers to know early enough in the year whether annual coverage targets are being met.

The graph can be adapted as in Figure 4 to illustrate the cumulative per cent of the female population covered with two doses of TT, regardless of whether the immunization strategy is aimed at pregnant women only or at women of childbearing age. The figure plotted on the graph for each year is the accumulation of TT2 immunizations given during the past three complete years, which is the duration of protection for women and future newborns estimated by WHO. (6)

For the time being, only TT2 coverage is monitored. However, TT3, TT4 or TT5 coverage could also be monitored by means of a separate graph for each dose. For example, if TT3 were to be monitored, the previous five years of TT3 immunizations would be accumulated, since this is the duration of protection estimated by WHO. (6)

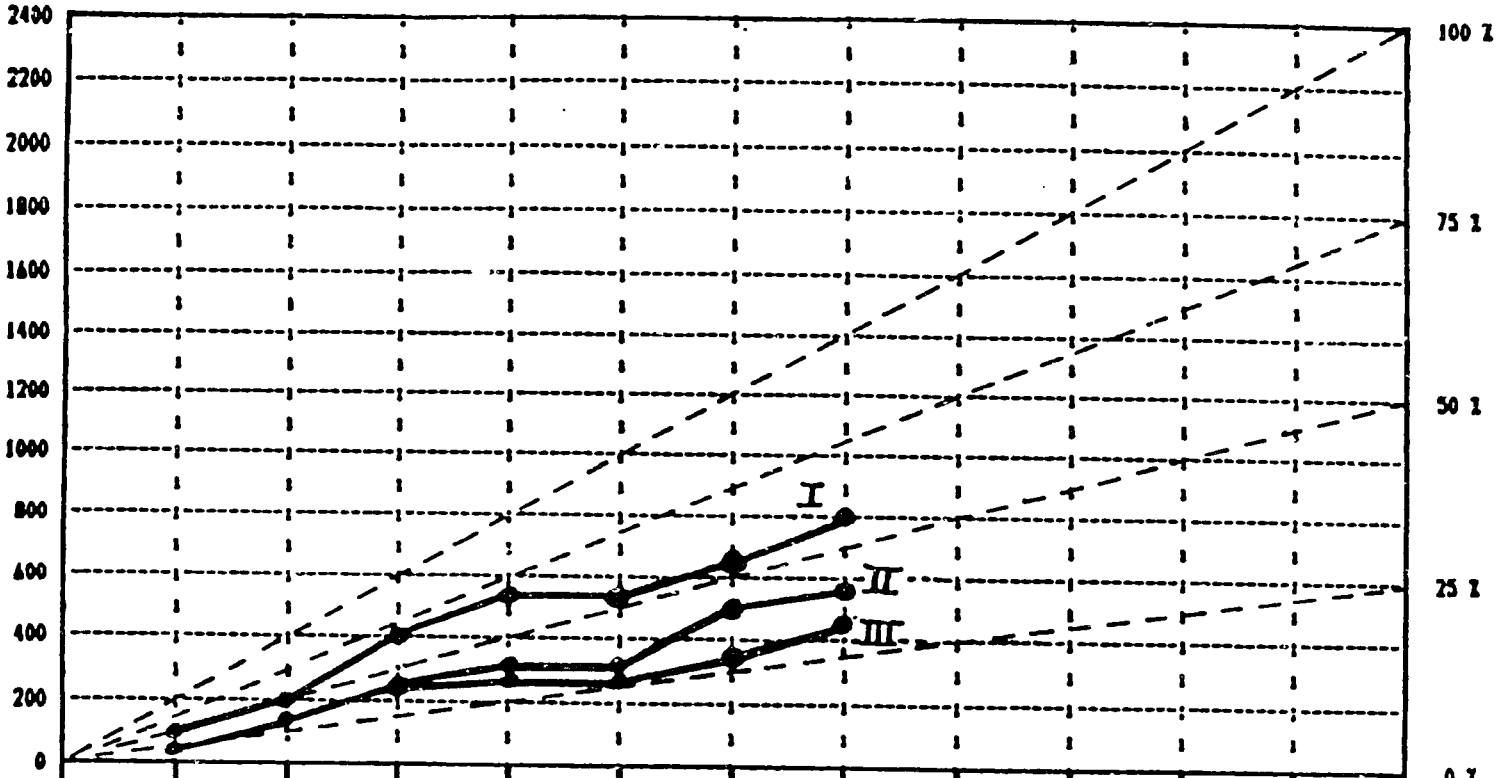
For the sake of simplicity, Figure 4 uses the current level of eligible and target population over the past three years without showing any change in these levels from year to year. A health statistician can further refine the target and eligible levels. For example, the level of eligibles can show a step-wise increase each year to reflect population increase. Similarly, the target level can be drawn in steps to reflect the actual targets in effect in each of the last three years. Such calculations become more important if TT3, TT4 or TT5 coverage is to be monitored, since these doses provide a longer period of protection. Immunizations performed over a greater number of past years are accumulated, during which time a large number of females newly enter the eligible population.

For the same hypothetical country as appeared in Table 1, Table 2 compares the apparent annual TT2 coverage according to the new WHO formula against the cumulative TT2 coverage according to the proposed formula. By year three, 90% of the eligible population has received TT2 according to the proposed formula, compared to an apparent 40% annual coverage according to the WHO formula: the number of TT2 immunizations performed in year four and five decreased compared to year three. However, coverage in year five is still 70% (reflecting past high achievement) versus 10% using the WHO formula.

FIGURE 3 : IMMUNIZATION MONITOR

Health Centre: Valla Year: 1984

Target population: 2400 Vaccine: DPT 1,2,3



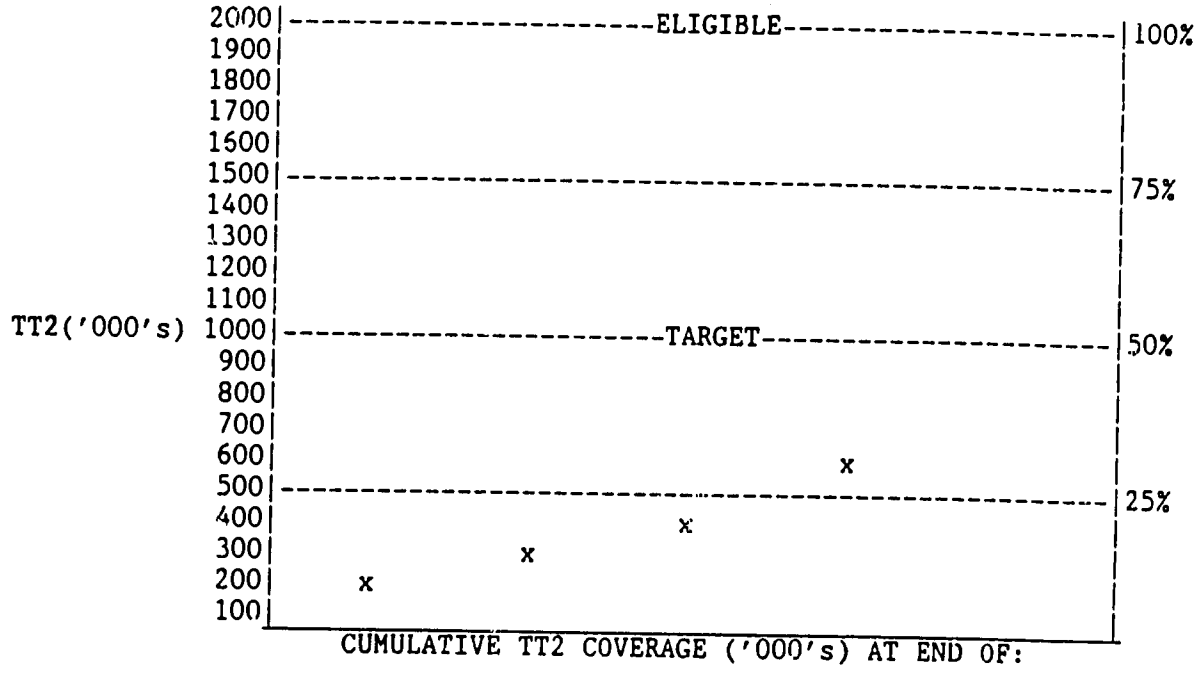
	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	
DPT 1	100	100	200	150	0	100	150						No.immunized in month
	100	200	400	550	550	650	800						Cumulative total for year
DPT 2	50	90	100	70	0	150	100						No.immunized in month
	50	140	240	310	310	460	560						Cumulative total for year
DPT 3	60	70	100	50	0	100	70						No.immunized in month
	60	130	230	280	280	380	450						Cumulative total for year

Figure 4 :

CUMULATIVE PERCENT OF FEMALE POPULATION COVERED WITH TT2

AREA: Fictitia
TOTAL POPULATION (19): 10,000,000

ELIGIBLE POPULATION (19): 2,000,000
TARGET POPULATION (19): 1,000,000



No. TT2 during:	1984	1985	1986	1987	1988
	225	315	430	600	
1982	70				
1983	75	75			
1984	80	80	80		
1985		160	160	160	
1986			190	190	
1987				250	

Table 2:

HYPOTHETICAL TT2 IMMUNIZATION COVERAGE BY YEAR IN A COUNTRY WITH 5 MILLION POPULATON AND 1 MILLION WOMEN OF CHILDBEARING AGE [a]

Year	TT2 ('000s) given during 1 year	Apparent TT2 Coverage [b]	TT2 ('000s) given during 3 years	Cumulative TT2 Coverage[c]
1(start)	200	$20\%(\frac{200}{1000})$	200	$20\%(\frac{200}{1000})$
2	300	$30\%(\frac{300}{1000})$	500	$50\%(\frac{500}{1000})$
3	400	$40\%(\frac{400}{1000})$	900	$90\%(\frac{900}{1000})$
4	200	$20\%(\frac{200}{1000})$	900	$90\%(\frac{900}{1000})$
5	100	$10\%(\frac{100}{1000})$	700	$70\%(\frac{700}{1000})$

[a] The population of women of childbearing age is assumed to remain constant at 50,000 unimmunized 15 year olds annually replacing 50,000 unimmunized and immunized 44 year olds.

[b] Calculated according to the WHO formula (6):

$$\frac{\text{women of childbearing age receiving TT2}}{\text{total of women of childbearing age}} \times 100$$

[c] Calculated according to the proposed formula:

$$\frac{\text{women of childbearing age receiving TT2 during last 3 years}}{\text{total number of women of childbearing age}} \times 100$$

Table 3:

WORKSHEET FOR CALCULATING TT2 COVERAGE: 1987

a)	total population of area:		10,000,000
b)	target group:		women 15-44 years old
c)	population of eligible females:		2,000,000
d)	no. of TT2 given to eligible females during:		
	-most recent complete year (1987):	250,000	
	-year before (1986):	190,000	
	-year before (1985):	160,000	
	Total (1985-1987):		600,000
e)	cumulative per cent covered with TT2:		

$$\frac{d}{c} \times 100 = \frac{600,000}{2,000,000} \times 100 = 30\%$$

A worksheet appears as Table 3 to assist program managers in calculating cumulative per cent TT2 coverage in any given year. In the example, the population of eligible females is 2,000,000 out of a total population 10,000,000. This is in a country where all women 15-44 years old, typically 20% of the total population, are eligible for TT2.

The worksheet and graph can also be used in areas employing other strategies or a mix of strategies. Some countries immunize only pregnant women. In that case, the number of pregnant women is assumed to be equal to the number of newborns. In other countries, where some districts immunize only pregnant women and others immunize all women of childbearing age, the number of eligibles are separately calculated by district.

To test its validity, this proposed model to monitor cumulative per cent coverage with TT2 should be compared to results of WHO 30-cluster surveys in areas where clinic or individual records are retained. The proportion of deliveries protected among children 0-11 months old at the time the survey is conducted can then be compared both to the cumulative per cent coverage with TT2 according to this model and also to percent coverage with TT2 as currently calculated without regard to past performance.

When setting targets for the coming year, it is also important to consider coverage over the past three years. An example of how this can be done for any administrative area is given in Table 4 for a country which began TT immunization in 1981 and whose use of TT has been expanding each year to include more districts. In 1987, there are 2,463,958 women eligible for TT2. A 50% target set for 1987 would mean that 1,231,979 women are to receive TT2.

This particular model portrays a country immunizing all women 15-44 years old (column 2) but can easily be modified for a country immunizing only pregnant women or for a country whose strategy changes. As in the previous worksheet and graph, for the sake of simplicity the number of unvaccinated 15 year olds entering the eligible age group each year and the number of vaccinated and unvaccinated 45 year olds leaving is not considered. Again, such considerations become more important when calculating coverage with TT3, TT4 and TT5.

MONITORING DROP-OUT RATES

Another important use of routine reports is for monitoring completion rates. Drop-out rates continue to be high for TT. UNICEF (2) in 1987 estimated that one third of women drop out from the first to the second dose of TT.

The cumulative per cent of TT2 coverage, as calculated above, should be compared to DPT3 infant coverage and should be at least as high. Contrary to a recent WHO/UNICEF recommendation, it is inappropriate to expect TT2 coverage in a single year to be as high as infant DPT3 coverage, since each woman does not need a TT2 each year, whereas each infant does need a DPT3. Expressed differently, each woman needs only a single TT2 over her lifetime, whereas she may have five surviving children during her life, each of whom will require a DPT3 during infancy. (3) Such inappropriate comparisons appeared recently for each WHO region and globally. (1)

EPI managers can use the following indicators to monitor drop-out rates:

a) $\frac{\text{cumulative TT2 immunizations given during past 3 years}}{\text{DPT3 immunizations given to infants during past one year}} \times 100$

b) $\frac{TT1 - TT2}{TT1} \times 100$

c) $\frac{TT1 - TT3}{TT1} \times 100$

d) $\frac{TT2 - TT3}{TT2} \times 100$

e) $\frac{TT1 - (TT2 + TT3)}{TT1} \times 100$

Table 4:

TARGET SETTING FOR TT2

Eligibles for and Coverage With TT2

(1) Fiscal Year	(2) Female Population[b] (15-44 years old)	(3) Cumulative TT2 for previous three years	(4) Eligibles (2)-(3)	(5) TT2 Performed During Current Year	(6) Coverage (5)/(4)
1981[a]	-	-	-	147097	
1982	-	-	-	246954	
1983	2549892	394051	2155841	340684	16%
1984	2827114	734735	2092379	348842	17%
1985	30999661	936480	2163481	358903	17%
1986	3276841	1048429	2228412	519569	23%
1987	3691272	1227314	2463958	-	-

[a] First year TT was offered
[b] Programme expanded year by year to include more districts

NOTE WELL: Assumptions:

- Average duration of protection from TT2 lasts three years.
- Number of unvaccinated 15 year olds entering and vaccinated and unvaccinated 44 year olds leaving the eligible age span are not considered.

Indicator "a" has already been discussed. Indicator "b" has been the standard measure and is well-known to program managers. Indicator "c" becomes increasingly important as countries move away from the present two-dose mentality. Two doses of TT is insufficient for long-term protection and fails to protect from 10% to 40% of vaccinees. The third dose of TT is "an important part of the basic immunization," according to recommendations from the VIII International Conference on Tetanus. (1)

Indicator "d" complements "c" by allowing managers to pinpoint between which doses drop-out is occurring. Indicator "e" is conceptually more difficult. However, in a single year, it is unlikely that the same woman will receive both TT2 and TT3. Therefore, as countries begin to adopt a primary series consisting of three doses of TT, indicator "e" will come to be used increasingly as a composite of "b", "c", and "d".

TT RECORDING, REGISTRATION AND REPORTING FORMS

Tetanus immunizations to the woman 15-44 years old can be recorded on:

a) an antenatal card or mother's card

b) child's growth chart or immunization card

c) tetanus protection card.

The day, month and year of the dose of TT is recorded.

An antenatal or mother's health card has a broad utility. It can be used to "facilitate the early recognition of women at risk, encourage self-care, generate service statistics, help the teaching process and improve referral linkages." (10) Such a card is more useful for recording TT immunizations if it is designed to be used for all pregnancies and if it is retained by the woman. An antenatal or mother's card is less useful for TT recording in countries aiming at all women 15-44 years old, since this target group includes women before the inception of any pregnancy or between pregnancies.

The TT immunization history of a mother should also appear on a child's growth chart or immunization card. This reminds the health worker to screen the mother for TT immunization whenever she brings the child for a visit. It is not intended to be a permanent TT record since the child's card is unlikely to be retained for more than a few years.

As with an antenatal or mother's card, use of a child's growth chart or immunization card for recording TT is not an option to reach target women 15-44 years old before or during their first pregnancy.

A tetanus protection card as recommended by WHO appears in Figure 5. This particular card shows that five doses are needed for life-long protection. Since it will be needed to record TT immunizations given over many years, the card should be designed to encourage mothers to retain it. Culturally-important colors and symbols -- such as religious, fertility, or good luck symbols -- should adorn the card. A clear plastic envelope

FIGURE 5 :

(FRONT)

TETANUS PROTECTION CARD

AMILY NAME _____

RST NAME _____ YEAR OF BIRTH _____

DDRESS _____

STRICT _____

ATE _____

ILDHOOD DPT/DT IMMUNIZATION

Number of Doses _____

No information _____

ULT TETANUS TOXOID

	DATE		
	DAY	MONTH	YEAR
1st DOSE		/	/
2nd DOSE		/	/
3rd DOSE		/	/
4th DOSE		/	/
5th DOSE		/	/

ou did not receive immunization before, you need two doses etanus toxoid (with four weeks interval between) and one e in any future pregnancy.

(REVERSE)

RECOMMENDED IMMUNIZATION SCHEDUL FOR YOUR CHILDREN

at birth	BCG and polio
at 6 weeks	DPT and polio
at 10 weeks	DPT and polio
at 14 weeks	DPT and polio
at 9 months	measles

should be provided to protect it. A health message, such as the recommended immunization schedule for infants, can be included. The same card can be used for either pregnant or non-pregnant women. The tetanus protection card can also be used by adult males and for wound management.

An estimation of the year of birth is recorded on the card rather than the age of the woman on any particular visit. There is room to record DPT/DT immunizations received by the woman during her childhood. This may be important in some countries with long-standing immunization services and good records. If a written document is available, these child DPT/DT immunizations can replace some of the required TT series. Table 5 gives TT immunization guidelines to help health workers decide which dose of TT to administer.

Many countries use a registration book to record the name of children and dates of immunization given by dose. Many also use a separate registration book to record TT given to women. Some health facilities providing continuous health care to small catchment populations are able to use a single registration book to record TT immunizations for adults alongside their childrens' immunizations.

Registration books can be organized chronologically by the date of the first TT dose administered or sub-divided first into villages or some other administrative unit. The woman's name is registered a single time.

Tally sheets to register the number of TT immunizations given are usually needed to easily calculate monthly totals. Otherwise, one would have to look on each page of the register to find all the second or repeat TT doses given during any particular month. An alternative to tally sheets in some programs is to organize the registration book such that the name of the woman receiving TT is registered on <u>each</u> of her visits and the appropriate TT dose recorded.

The minimum information which should be reported routinely to supervisors is shown in Figure 6 and includes number of TT immunizations by dose (TT1, TT2, TT3, TT4, and TT5) and by target group (pregnant women, other women of childbearing age, and others).

Table 5

TETANUS IMMUNIZATION GUIDELINES FOR WOMEN

If previously vaccinated with:	ACTION	Protection Lasts
- No TT or no written document on TT, DPT, or DT	Give TT I	-
- TTI or 2 doses of DPT or DT	Give TT 2 at least one month after previous dose	Three years
- TT2 or three doses of DPT or DT	Give TT3 at least six months after previous dose	Five years
- TT3	Give TT4 at least one year after TT3	Ten years
- TT4	Give TT5 at least one year after TT4	Life-long

REMEMBER:
1) If no written document on previous TT immunizations is available, consider the woman as not immunized.
2) Take advantage of any contact to give TT whether or not the woman is pregnant.
3) Give TT to eligible pregnant women as early as possible during pregnancy.
4) Do not restart the TT series if intervals between doses are too long.
5) Give women a record of TT immunizations.
6) Tell the woman:
   - Tetanus vaccination protects you and your future babies against tetanus. Some babies get tetanus soon after birth, stop sucking and die with spasms.
   - Return for another dose after _____.
   - Bring this card each time you visit a health worker for any reason.
   - Fever or soreness are common and normal after any injection.
   - Infants can die from tetanus measles, polio, TB, whooping cough, diphtheria. Protect them from these diseases by vaccinating them on 3-5 occasions before they are 12 months old.

Figure 6:

NUMBER OF IMMUNIZATIONS PERFORMED

Dose	Pregnant women	Other women of childbearing age	Other (specify)
TT1			
TT2			
TT3			
TT4			
TT5			

CONCLUSIONS

Measuring and monitoring TT coverage using routinely reported service statistics is particularly difficult. Unlike in the case of infants, a cohort which renews itself annually and is consequently easily calculated, multiple doses of TT are administered with varying intervals over a thirty year reproductive span, and women enter and leave the eligible age range all the time.

The VIII International Conference on Tetanus held in Leningrad in 1987 stressed the need for improving monitoring of TT coverage. Although national policies and control strategies against TT are undergoing review in many countries, there has been relatively little attention paid to the monitoring methods currently in use. Estimates of coverage with TT2 vary considerably according to the organization providing the estimate. Recent UNICEF figures are 2-3 times higher than WHO's.

Present methods of monitoring TT coverage lack validity by disregarding the durability of protection of immunizations given during recent past years. While the number of immunizations given in a single year is a useful indicator to gauge progress towards achievement of annual targets, this indicator is inappropriately used for calculating actual levels of coverage. With the present indicator, program managers cannot know whether in a given area an annual TT2 coverage rate of 20%, for example, is due to unsuccessful recent performance in a program without past high achievement, or due to successful maintenance of past high coverage levels.

Furthermore, by counting only a single year's TT2 immunizations, the present method of calculating coverage encourages inappropriate delivery strategies and targets. Health workers are implicitly expected to reach women with a second dose of TT in each pregnancy or to reach women of childbearing age with a second dose of TT each year.

Due to limitations in using routine service statistics for monitoring, some authorities have argued that only the WHO standard 30-cluster sample survey should be used to derive TT coverage levels. However, for logistic, financial and managerial reasons, it is extremely unlikely that such surveys could be conducted with the required annual frequency in each administrative area.

This paper proposes use of a simple alternative management tool that relies on the routine reporting system already in place. It will allow program managers to monitor actual TT coverage levels, track progress towards targets, and guide rational annual target-setting. To calculate actual TT2 coverage, one must accumulate in the numerator the number of TT2 immunizations given during the past three complete years -- since this is the expected duration of immunity. This method gives a point prevalence of maternal protection versus a period prevalence in any particular year. The method can be used whether the target group is pregnant women or all women of childbearing age. Coverage with TT3 or further doses can also be monitored using this method by accumulating past years' immunizations according to their presumed dose-specific duration of immunity.

Record-keeping also poses a particular problem with TT. Antenatal or mothers' health cards are less useful for recording TT immunizations in those programs targeting women of childbearing age, since this target group includes women before the inception of any pregnancy or between pregnancies. Use of a child's growth chart or child's immunization card for recording maternal TT is not an option where women must be immunized before or during their first pregnancy. Also these cards are not retained for more than a few years.

TT protection cards encased in inexpensive transparent plastic envelopes are needed. They should have space for 5 doses of TT and include important cultural symbols (religious, fertility, good luck, etc.). Current reporting forms should include TT immunization by dose (TT1, TT2, TT3, TT4, and TT5) and by target group (pregnant women, other women of childbearing age, and others) to permit valid monitoring.

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ESTIMATED PREVENTED CASES AND DEATHS FROM NEONATAL TETANUS IN RELATION TO IMMUNIZATION ACTIVITIES, NEPAL

Disease	Number of Immunizations	Efficacy of Vaccine	General Fertility Rate	Average Duration of Protection	No. of Births Protected	Cases Prevented	Deaths Prevented	In absence of immunization, number of yearly national[b]	
								CASES	DEATHS
Neonatal[a] Tetanus	10,000 (TT2+boosters)	95%	200/1000	3 years	5,7000	134	114	16,800	14,280

[a] assumes 95% vaccine efficacy; GFR of 200/1000; 3 years average duration of protection; and neonatal tetanus mortality rate of 20/1000 live births, with CFR of 85%.

[b] assumes total population is 17,000,000 and crude birth rate is 42/1000.