

HIV INFECTION AND NUTRITION: THE INDIAN EXPERIENCE



C RAMACHANDRAN MEMORIAL LECTURE 28.11.2017

AIDS (acquired immuno-deficiency syndrome) was first described in 1981 as an obscure disease of unknown aetiology, affecting young men who had sex with men (MSM) and intravenous drug users (IVDU) in USA.

In the next two years, AIDS patients from these two groups were reported across North America, Western Europe and Australia.

Simultaneously, a severe wasting disease in young men, women and young children (Slim's disease) was reported from Sub-Saharan Africa.

In both settings AIDS was characterized by severe wasting, high morbidity due to infections, and death within a short period after infection was detected

In 1984, human immunodeficiency virus (HIV) was isolated from AIDS cases.

In 1985, ELISA tests for detection of antibodies to HIV were developed.

The ELISA tests showed that AIDS cases reported in USA, Europe, Australia and Sub-Saharan epidemic of Slim's disease were caused by the same virus.

AIDS was recognized as a major global pandemic and the global registry for reporting of AIDS cases was set up by the WHO in 1986.

ICMR'S SEARCH FOR HIV INFECTION

ICMR Task Force on AIDS, met in October 1985 and recommended that in view of the potential threat posed by HIV infection, ICMR should initiate sero-surveillance of HIV infection (using the ELISA test) among high risk groups and find out whether the infection has reached India.

Many experts in India and outside felt that AIDS was an infection that was affecting men who had sex with men and IV drug users. No AIDS case had been reported in India or South East Asia. India with high burden of infectious diseases should concentrate on combating these common infectious diseases and not invest in research looking for a rare new infection.

Others opined that though the AIDS in developed countries was seen in IVDU and MSM, the African component had the characteristics of a new sexually transmitted disease. Therefore India should explore whether the infection exists in the country by screening commercial sex workers.

NIV, Pune and CMC, Vellore, tested serum samples from female sex workers in Chennai and Mumbai, respectively and in April 1986, reported presence of HIV infection in India.

In May 1986, ICMR AIDS Task Force reviewed the data and recommended that a national sero-surveillance programme for screening high risk and vulnerable groups for HIV infection should be initiated.

ICMR established the network sero-surveillance centres.

Over the next five years ICMR provided monthly updates of the sero-surveillance data.

ICMR SERO-SURVEILLANCE CENTRES FOR HIV INFECTION



For reasons still not clearly understood, HIV epidemic reached Asia and India late.

The epidemic was detected early even before AIDS cases were detected.

Indian physicians had past experience in combating under-nutrition and infections but the huge disease burden and problems in effective implementation of programmes, led to relatively slow decline in under-nutrition and morbidity.

Physicians often wished that they could get a chance for effectively tackling an epidemic detected in the early phase, when the number of infected persons is low.

AIDS epidemic gave them that chance.

In this presentation we will see how the Indian health care systems and the population responded to early detection of HIV epidemic in India.

We will review

- **Evolution of HIV epidemic in India**
- **Impact of HIV infection nutritional status**
- **impact of food or nutrient supplements on HIV infection**
- **Effect of antiretroviral therapy on nutritional status**
- **Interventions to combat HIV epidemic in India**
- **Impact of HIV on nutritional and health status of Indians**
- **MDG targets for HIV infection**

HIV SERO-SURVEILLANCE AND HEALTH SERVICE RESPONSE TO FINDING

India became first country in the world to initiate a systematic national sero-surveillance during the silent phase of the epidemic before AIDS cases were reported.

Sero- surveillance among men and women belonging to high risk and vulnerable groups were initiated to determine the major modes of transmission of HIV in the country and estimate the magnitude of the infection.

Data from ICMR sero-surveillance for HIV infection between 1986 and 1991 showed that:

- HIV infection transmission in India was occurring through all known modes of transmission;**
- HIV infection was present in all the recognised high risk groups and general population in all states, both in urban and rural areas;**
- prevalence of HIV infection was not high even in the high risk groups; highest prevalence was reported in iv drug users; female sex workers had the second highest prevalence; and**
- prevalence of HIV infection in general population was very low**

The first two AIDS cases in Indians were reported in May 1986; one had received blood transfusion abroad and the other received blood product infusion abroad.

This led to the Initiation of **ICMR AIDS clinical case reporting net work**.

India imposed **mandatory HIV free certificate** required for imported blood products.

Attempts were made to screen for HIV infection donated blood and those persons receiving repeated blood transfusions or blood product infusions.

In July 1987 the HIV antibodies were detected in donated blood

Screening of all donated blood for HIV infection was taken up on priority in selected blood banks

Over the next few years all blood banks were strengthened for screening of donated blood for **all transfusion transmitted infections** with the aim to ensure none got HIV or other infections through transfusion/blood product infusion.

Findings from sero-surveillance were fully utilized to initiate effective interventions in health care settings which will reduce infection transmission through donated blood.

STRENGTHENING OF HOSPITAL INFECTION CONTROL

In August 1986 a man attending an STD clinic was detected to be HIV sero-positive.

This led to the inclusion of STD clinic patients in sero-surveillance and strengthening of STD clinics for providing needed care for those seeking health care for STD including HIV infection.

It is possible that persons seeking health care for unrelated health problems, may be HIV positive but they had never been tested for HIV infection.

As health care services were delivered without knowing the HIV status of the individual, priority was accorded to strengthening hospital infection control and waste management to minimise if not eliminate accidental infection to health care providers or health care seekers.

This visible change in health care institutions ensured that:

- population realised the seriousness of the HIV epidemic
- the fear of accidental HIV infection among health care workers and patient seeking care was to some extent alleviated.

PREVENTION OF MOTHER-TO-CHILD TRANSMISSION OF HIV INFECTION

In September 1986 first sero-positive pregnant woman from antenatal clinic was detected indicating that HIV infection had reached the general population.

This led to inclusion of pregnant women in sero-surveillance

Antenatal clinics were strengthened for screening pregnant women and providing needed care for sero-positive women and labour rooms were strengthened to prevent accidental infection with HIV

It has been estimated that about 30-50% perinatal transmission of HIV occur during labour

NACO initiated screening of pregnant women attending antenatal clinic and providing perinatal ART (Nevirapine) to prevent transmission of HIV infection during labour

This initiative has succeeded in substantially reducing the mother-to-child transmission of HIV infection

Currently the WHO recommendation is to provide ART to pregnant women right from the time when they tested positive and continue the therapy life long.

This will ensure elimination of mother-to-child transmission of HIV infection.

HIV INFECTION AND BREAST FEEDING

In October 1987 the first sero-positive woman delivered in a hospital and there was a question whether she should breast-feed her child

HIV infections gets transmitted to the foetus in utero and during labour. Infants infected in utero benefit from breast feeding.

Uninfected infants of sero-positive mothers can get infected during breast feeding.

Tests to assess HIV status of the newborn to find out whether the infant was HIV infected or not were not available three decades ago

To prevent breast-milk related mother-child transmission of HIV infection, WHO/CDC recommended that **infants born to sero-positive mothers should not be breast-fed.**

Majority of women in USA irrespective of HIV status did not breast-feed. Therefore this recommendation was perhaps appropriate.

HIV INFECTION AND BREAST-FEEDING

In view of the WHO/CDC recommendation, infants born to sero-positive women in India were given infant milk formulae and closely monitored.

Despite supply of adequate quantities of infant milk formulae free of cost, close supervision and counseling, the formula-fed infants had repeated infections and showed severe growth retardation.

THIS WAS THE FIRST MAJOR HIV RELATED NUTRITIONAL PROBLEM REPORTED IN INDIA

In India breast-feeding is nearly universal.

Breast-feeding is essential for prevention of infection, infant nutrition and growth.

Available limited data showed that infant formula feeding can be much more hazardous to child health and nutritional status as compared to the risk of HIV transmission through breast-milk.

Therefore ICMR recommended that sero-positive mothers should be advised to exclusively breast-feed the infants for six months.

Exclusive breast-feeding for six months was recommended to all mothers - who had never been tested for HIV infection.

WHO/UNAIDS/UNICEF INFANT FEEDING GUIDELINES

India's efforts to protect and promote breast-feeding irrespective of HIV status of women (known or unknown) were soon recognised as the appropriate one for developing countries with high breast-feeding rates

WHO revised the guidelines for infant feeding:

- For women who are known not to be infected with HIV, and for women whose infection status is unknown: protect, promote and support exclusive breast-feeding for 6 months;
- When replacement feeding is acceptable, feasible, affordable, sustainable and safe, HIV-positive mothers may avoid breast-feeding;
- To minimise HIV transmission risk, breast-feeding should be discontinued as soon as feasible;
- When HIV-infected mothers choose not to breast-feed from birth or stop breast-feeding later, they should be provided with specific guidance and support for at least the first 2 years of the child's life to ensure adequate replacement feeding.

HIV INFECTION BREAST FEEDING: CURRENT RECOMMENDATIONS

In 1998 UNICEF, distributed free infant formula to governments in Africa, to be given to HIV positive mothers who wanted to avoid breast-feeding but could not afford to do so.

Four years later UNICEF abandoned the scheme because formula was often given to women who were incapable of preparing it safely resulting high infection rates in infants.

This debate about breast-feeding in the HIV sero-positive mothers was finally settled with the current recommendation that **all sero-positive mothers will get ART, from the time mother was detected to be sero-positive through pregnancy and lactation and the infant will also receive anti-retroviral drugs from birth.**

Continued retroviral therapy for mother and the infant eliminates HIV transmission through breast milk.

IMPACT OF HIV INFECTION NUTRITIONAL STATUS

EFFECT OF HIV INFECTION ON POVERTY AND HOUSEHOLD FOOD INSECURITY

In Africa HIV/AIDS had a devastating impact on:

- agriculture and food production at the national level and**
- livelihoods, and food security at household level**

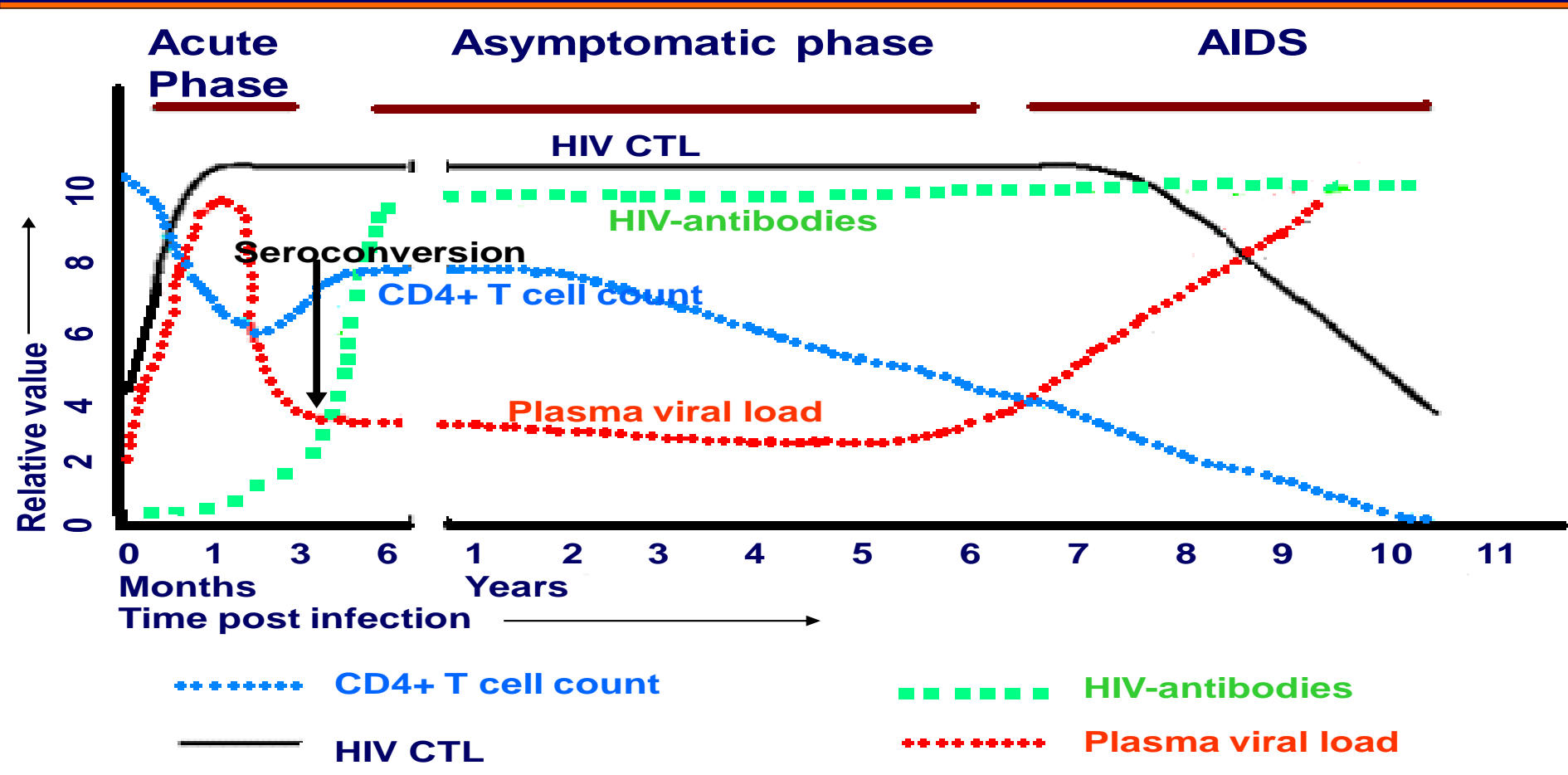
In India agricultural and industrial production continued to grow because of the low prevalence of HIV infection.

However poverty rates were reported to be higher among households affected by HIV and AIDS than among unaffected families.

Income loss is substantially higher among the poorest households depending upon the wages for manual labour

HIV infection and death of the earning member of the family can perpetuate household poverty and result in under-nutrition.

ENERGY EFFICIENCY IN HIV INFECTION



In HIV infection there is impairment in efficiency of energy utilization. Energy needs increase by 10% in asymptomatic persons; by 25-30% in those with TB, infection and 50-100% when the person is severely under-nourished and suffering from infection.

These extra energy needs have to be met through balanced diet.

WEIGHT LOSS IN HIV INFECTION

Weight loss is a major feature of HIV infection right from the asymptomatic period.

It increases during episodes of infection.

Wasting can be a sign of progression of the disease towards AIDS

With the onset of AIDS weight loss becomes severe and irreversible.

Weight loss is due to both muscle and fat mass reduction

Wasting can also occur during ART.

It is essential to obtain the data from the NACO network of centres to assess the magnitude and extent of deterioration in nutritional status in different period during HIV infection.

WEIGHT LOSS IN HIV INFECTION

Major factors responsible for weight loss in HIV infection include:

- **decreased appetite and low dietary intake due to nausea, loss of appetite, opportunistic infections, mouth or tooth infections which make eating difficult, and overwhelming fatigue;**
- **common infections like diarrhoeas, respiratory infections;**
- **mal-absorption with or without diarrhoea, may lead to an inability to absorb nutrients and contribute to weight loss;**
- **co-morbidities due to TB and opportunistic infections aggravate weight loss in HIV infected persons;**
- **in poorer segments of population weight loss could be due to loss of wages of the bread winner due to illness and consequent poverty food insecurity and low food consumption.**

FOOD OR NUTRIENT SUPPLEMENTATION IN HIV INFECTION

Evidence from research studies in other countries suggest that nutrition interventions may reduce risk of HIV transmission, progression of HIV infection, and risk of opportunistic infections.

There have been efforts to provide food grain supplements or micro-nutrient fortified food grains to People Living with HIV or AIDS (PLHA) through PDS.

Multiple micro-nutrient supplements have been provided through health care providers.

So far the impact these supplementation programme on the quality of life and nutritional status either of the PLHA or their families have not been systematically evaluated.

Can early identification and targeted nutrition interventions improve pregnancy outcomes, promote child growth and development, work capacity, and resistance to infections?

Carefully collected data from NACO network of centres can be analysed to provide the answers.

HIV TB CO-INFECTION

Research studies in India have compared the nutritional status of:

- ✚ individuals with human immunodeficiency virus (HIV) infection alone,
- ✚ individuals with HIV infection and tuberculosis (even after completion of anti-tuberculosis treatment), and
- ✚ HIV-negative individuals

These studies showed that:

- prevalence of under-nutrition, anaemia and hypoalbuminemia were higher in HIV-positive patients with tuberculosis.
- Weight loss was associated with fat loss in women and with lean body mass in men.

We do not have data on how TB HIV co-infected persons fare under programme condition, in urban and rural areas and in states with different levels of under-nutrition.

Data from NACO centres can be analysed to provide this answer.

EFFECT OF ART ON NUTRITIONAL STATUS

ART AND NUTRITIONAL STATUS

ART is associated with metabolic alterations both in adults and children.

These include:

- increased energy requirements,**
- increased insulin resistance,**
- abnormally high levels of blood cholesterol and triglycerides,**
- osteoporosis and osteopenia.**

Both wasting and lipodystrophy have been reported in ART users

Body Mass Index (BMI) at time of entry for treatment is an independent and significant predictor of mortality in HIV infected persons receiving ART.

Under-nutrition and micro-nutrient deficiencies have an adverse effect on response to anti-retroviral therapy.

Loss of body fat, called lipoatrophy, is another phase of lipodystrophy.

Fat loss generally occurs in cheeks, buttocks, arms and legs.

In addition to medications, factors such as age, gender, weight, genetic predisposition, length of time he/she has been HIV-positive, and severity of the disease may be associated with development of lipodystrophy

In India we do not have any data on prevalence of lipodystrophy or lipoatrophy in long term ART users or factors associated with their development.

LIPODYSTROPHY AND CVD RISK

Indians' proneness to the "metabolic syndrome" (combination of obesity, hypertension, dyslipidemias, insulin insensitivity) has been well documented

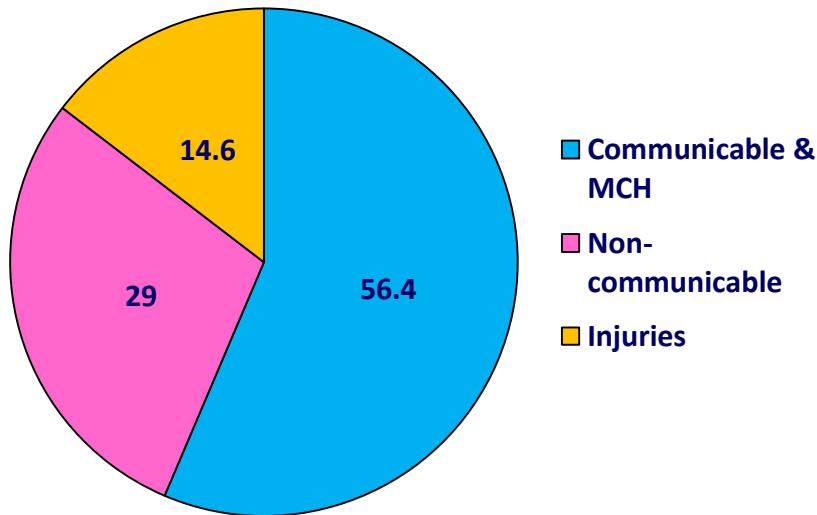
Metabolic syndrome in ART users can increase the risk morbidity and mortality due to cardiac disorders

With wider and longer duration of use of antiretroviral therapy, larger number of persons living with HIV may develop metabolic syndrome and face adverse health consequences associated with it.

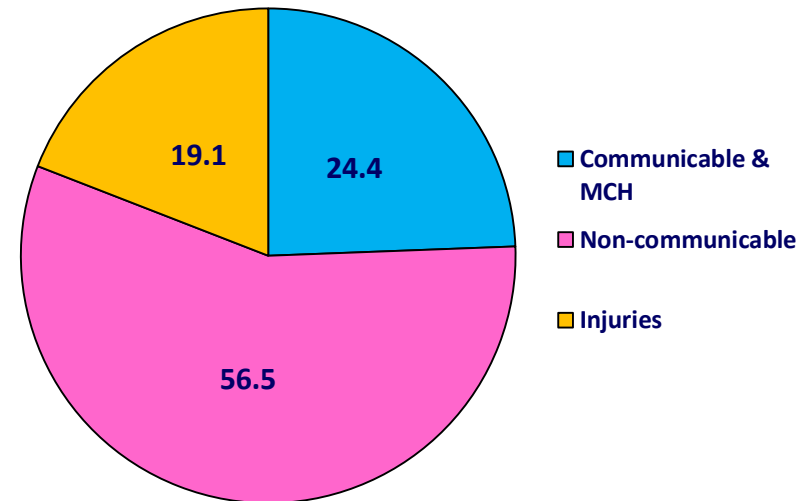
Early identification of changes in BMI and adiposity and interventions to combat them through modification of dietary intake and ensuring adequate exercise may be required.

HEALTH TRANSITION IN INDIA

**Disease Burden estimates
India 1990**



**Disease burden projections
India 2020**



With increasing ART coverage and duration of ART use ART centers will be taking care of increasing number of persons with lipodystrophy and cardiovascular disease (CVD).

Careful collection of data in these centers and analysis will provide useful information on management of lipodystrophy and CVD in persons living with HIV under Indian conditions.

NATIONAL AIDS CONTROL PROGRAMME

NATIONAL AIDS CONTROL PROGRAMME (NACO)

In 1990s NACO established:

- Network of ICT centres for pre- and post-test counselling and follow-up care for persons seeking voluntary testing for HIV infection
- Network of ART centres for:
 - ✚ follow-up and monitoring of sero-positive persons,
 - ✚ providing ART totally free of cost for HIV infected persons who needed ART and
 - ✚ follow-up care for persons under ART.
- Linkages between ICT and ART centres with district hospital and tertiary care centres so that PLHA can be referred for treatment of complication or opportunistic infections

NACO also

- re-energised STD control programmes for reducing *of sexual* transmission of all STDs including HIV
- built close linkage with TB control programme to manage HIV TB co-infection
- strengthened *care of HIV infected* persons and AIDS patients *within the existing hospitals* and ensured that there is no adverse effect on health care for persons with other health problems

NATIONAL AIDS CONTROL PROGRAMME

NACO focussed on practical intervention that would reduce HIV transmission in health care settings

- *prevention of blood/blood product transmission of HIV infection; through strengthening and streamline safe blood banking in the country;*

- *Strengthening of hospital infection control and waste management systems to prevent accidental infection in health care settings through simple barrier nursing and use of disinfectant (bleaching powder).*

Indian pharmaceutical companies have played an important role in scaling up of ART in India and globally by making available generic ART drugs at an affordable cost.

This was a major contribution for achievement of MDG goal 6, target 7 across the world.

In India ART (Antiretroviral Therapy) has led to 29% reduction in estimated annual AIDS-related deaths between 2007–2011

It is estimated that the scale-up of free ART since 2004 has saved cumulatively over 1.5 lakh lives in the country till 2011.

With the current scale up of ART services it is estimated to avert around 50,000–60,000 deaths annually in the next five years.

India has successfully provided care and treatment for HIV infected persons without any adverse impact on treatment of persons with other ailments in the country.

Currently there is an attempt to provide ART to all persons who test positive for HIV, right from the time they were detected and continue treatment life long

This is in an effort to prolong the asymptomatic phase and improve quality of life

Experience with non-communicable disease requiring life-long treatment shows that compliance with long-term medication is far from satisfactory

Experience with treatment of TB shows that despite use of multiple drugs for therapy there is a potential for steep increase in drug resistance

Careful monitoring and evaluation can help in mid-course correction in the strategy.

HIV INFECTION AND HEALTH CARE SYSTEM

HIV INFECTION AND HEALTH CARE IN SUB-SAHARAN AFRICA

HIV infection was detected in Africa the early eighties when the epidemic was a decade old and prevalence of HIV infection was high.

These countries faced major problems in delivering health and nutrition services to HIV infected persons and to the general population because of the case load of treating nutrition health problems of HIV infected persons

Their clinical studies as well as national surveys have reported:

- profound deterioration in health and nutritional status of HIV infected persons;**
- some deterioration in nutrition and health status of the general population and**
- some increase in national mortality rates in the first twenty years**

HIV INFECTION AND HEALTH CARE IN INDIA

By and large clinical course and outcome of HIV infection and its impact on nutrition and health status of the affected individuals were comparable to the effects reported in Sub-Saharan Africa.

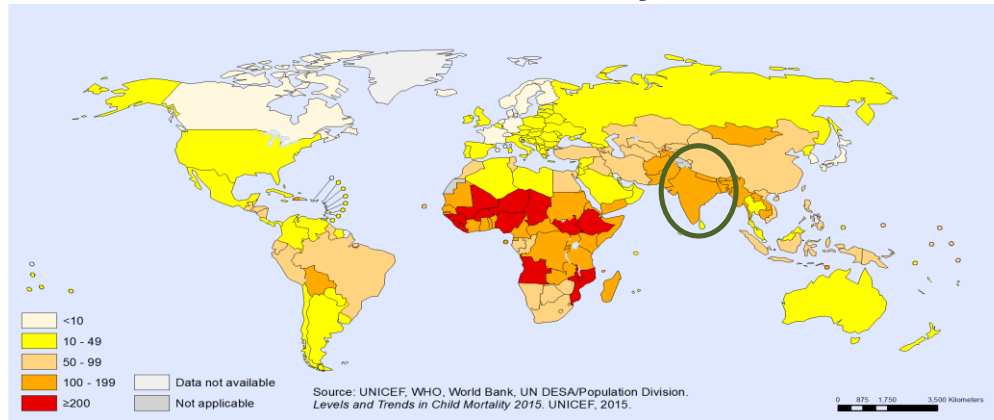
BUT

- HIV infection was detected early in the course of the epidemic,
- Prevalence of infection was low and interventions were initiated early,
- Within a decade after its detection, there was decline in new infection rates,
- Health services coped well with the epidemic and
- There were no disruptions in the delivery of health care or implementation of other health and nutrition programmes.

IMPACT OF HIV EPIDEMIC ON NUTRITION AND MORTALITY

HIV INFECTION – IMPACT ON IMR AND U5 MORTALITY

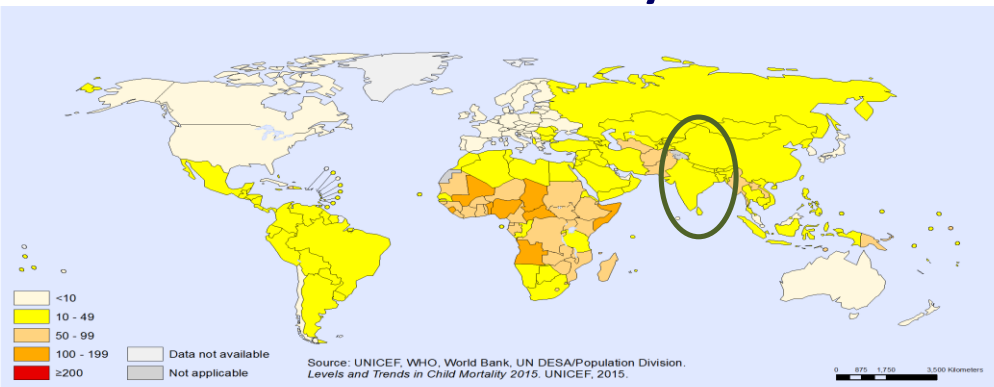
Under five mortality 1990



In India LBW rates (30%) and under-nutrition rates (>40%) in pre-school children had always been high.

Despite these, NNMR, IMR and U5MR in India both in 1990 and in 2015 are relatively low

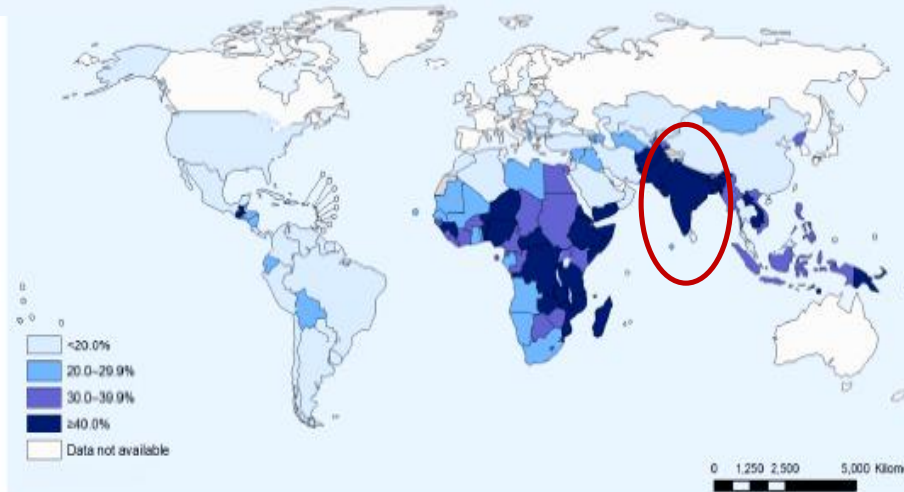
Under five mortality 2015



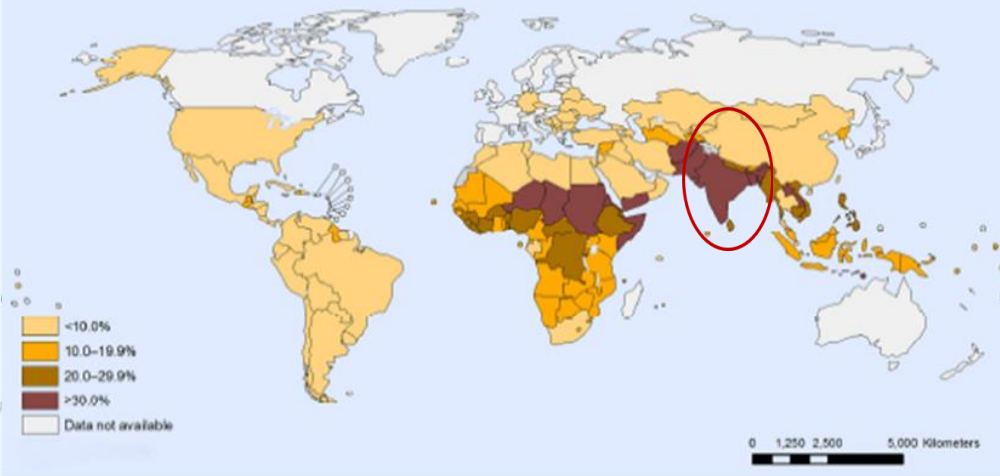
HIV epidemic in India did not have any adverse impact on rate of reduction in IMR or under-five mortality.

UNDER-NUTRITION IN UNDER-FIVE CHILDREN IN INDIA

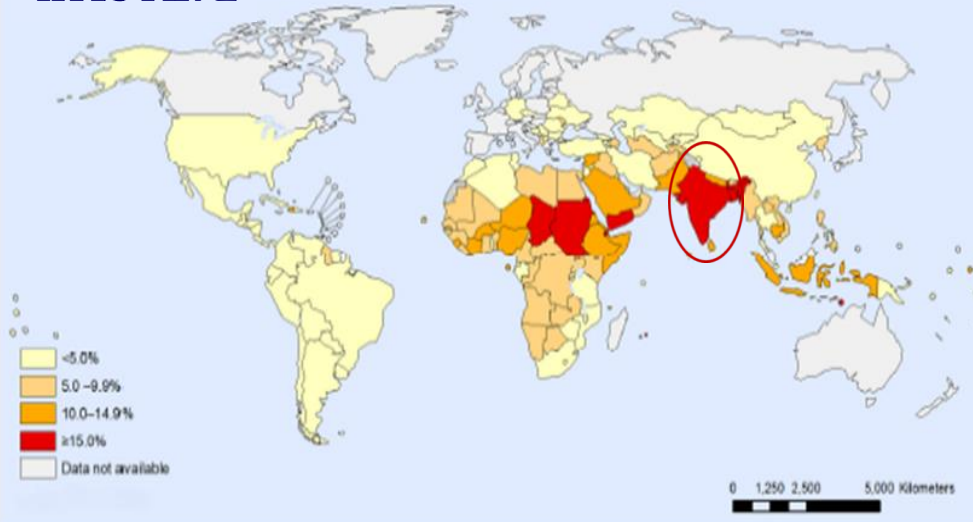
STUNTING



UNDERWEIGHT

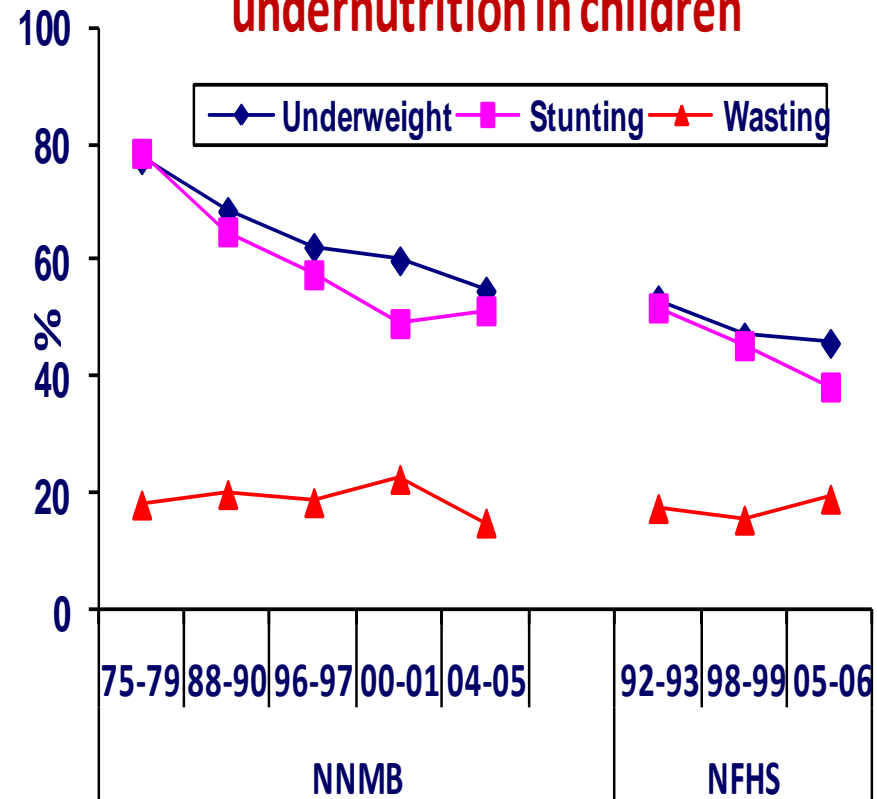


WASTING

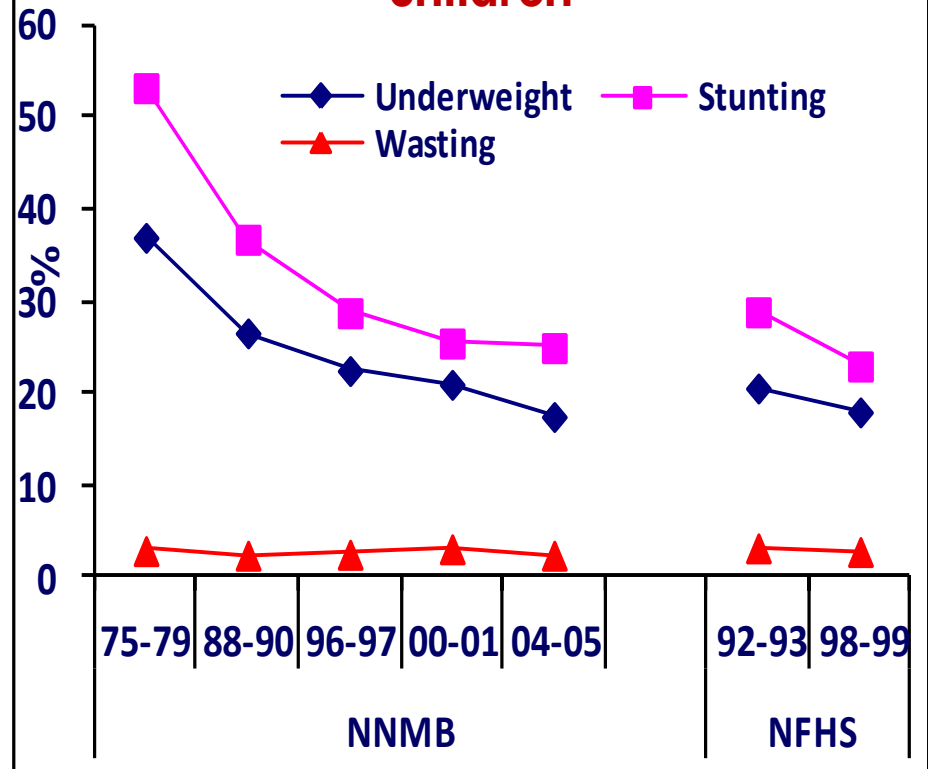


Stunting, underweight & wasting rates in Indian pre-school children are among the highest in the world even in the pre-HIV era.

Trends in prevalence (%) of undernutrition in children



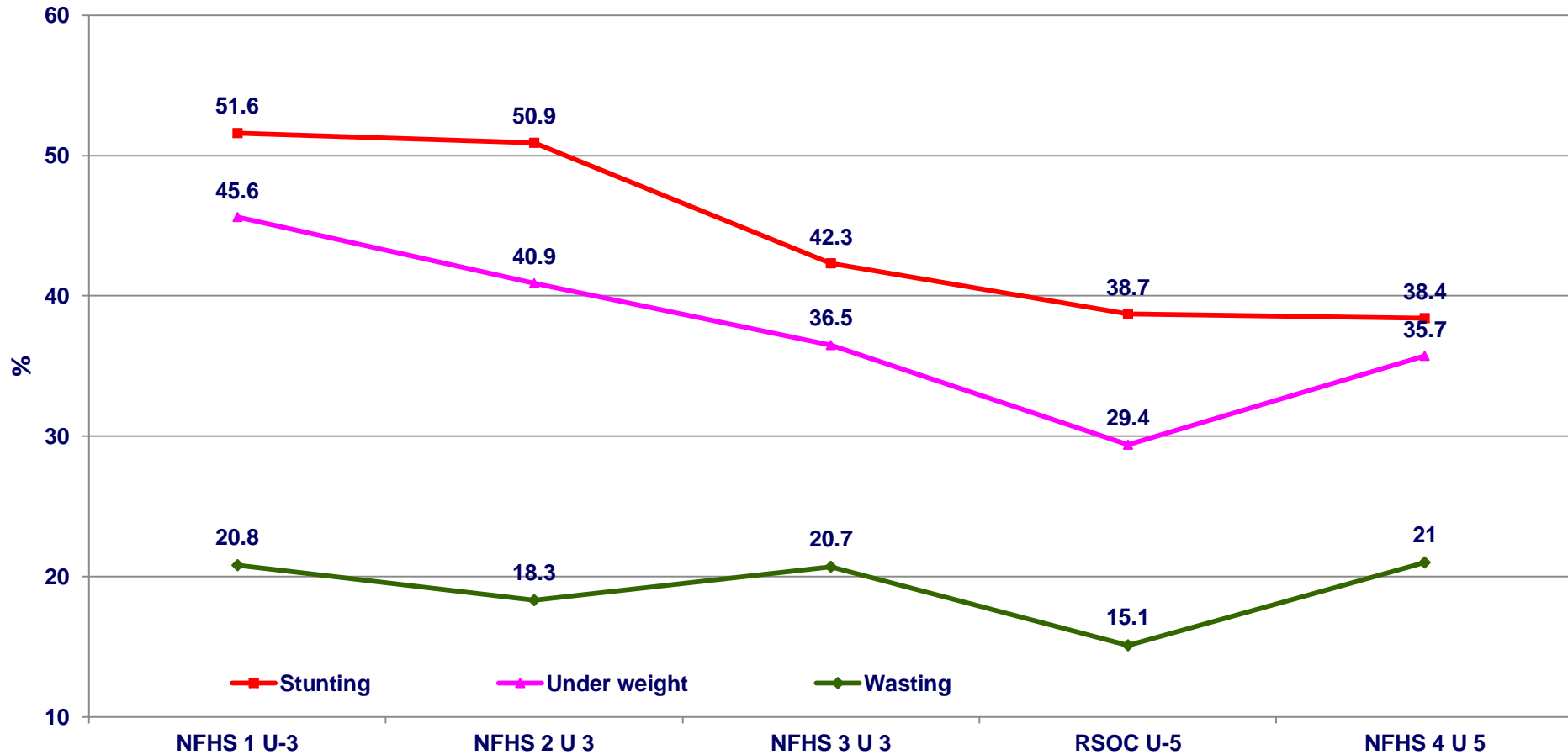
Trends in prevalence (%) of severe undernutrition in children



Data from NNMB surveys indicate that since 1970s there has been a steady decline in stunting and underweight.

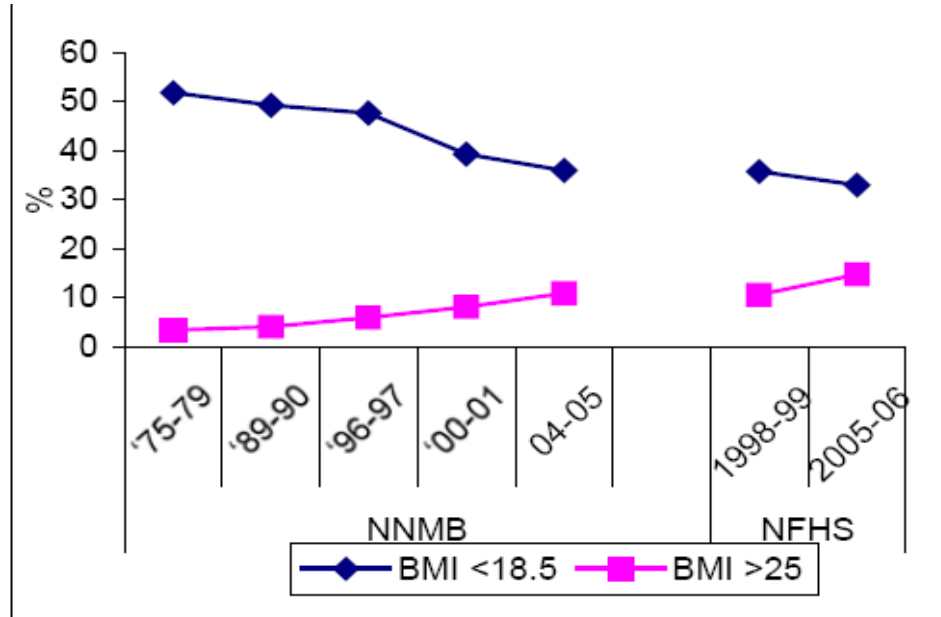
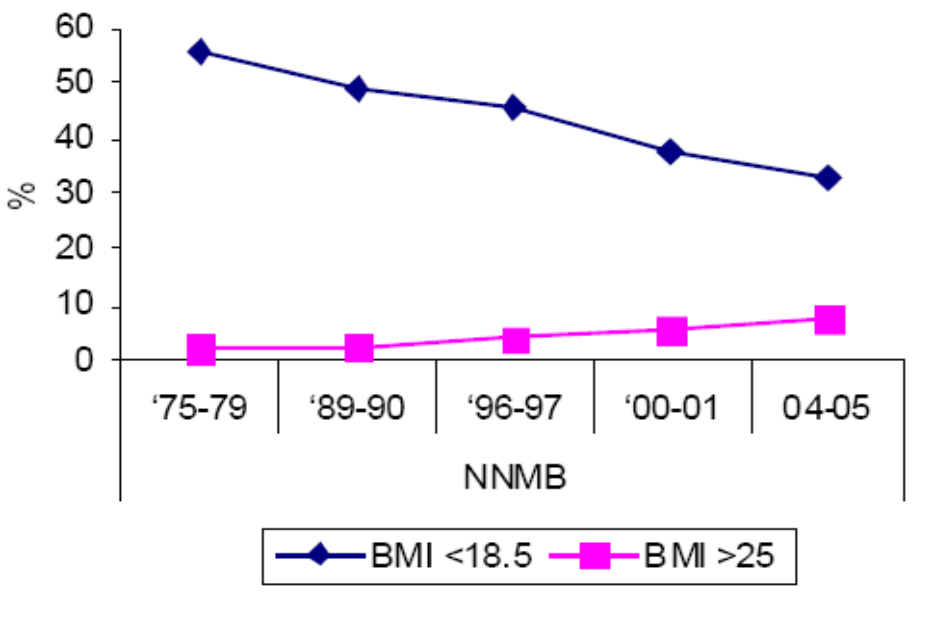
The rates of decline in under-nutrition in the pre- and post-HIV epidemic era are similar

TIME TRENDS IN PREVALENCE OF UNDER-NUTRITION IN INDIA



Despite the ongoing HIV epidemic there has been continued steady decline in stunting and under-weight rates in the last two decades.

TIME TRENDS IN NUTRITIONAL STATUS OF MEN AND WOMEN

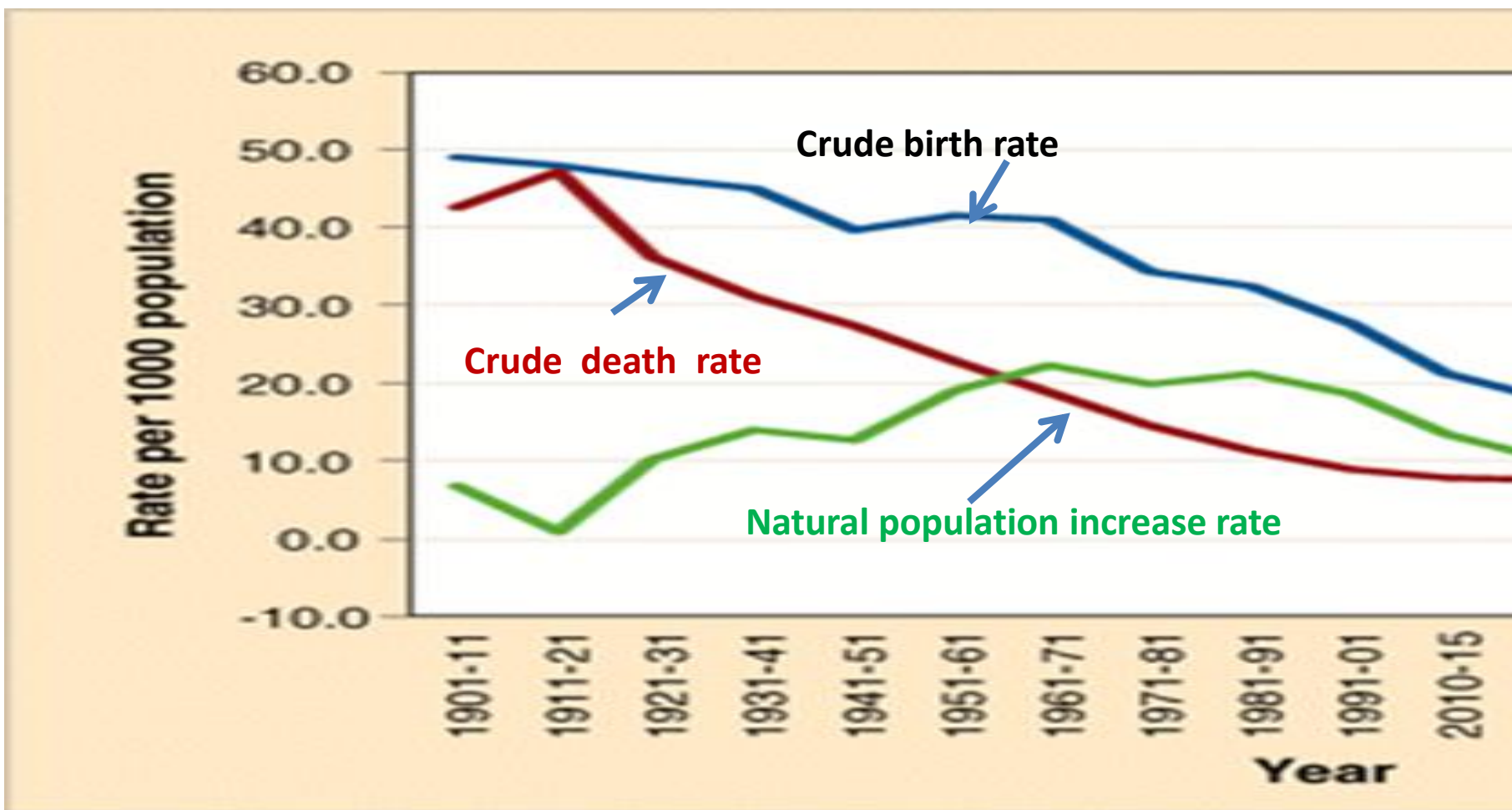


Data from NNMB surveys and NFHS indicate that:

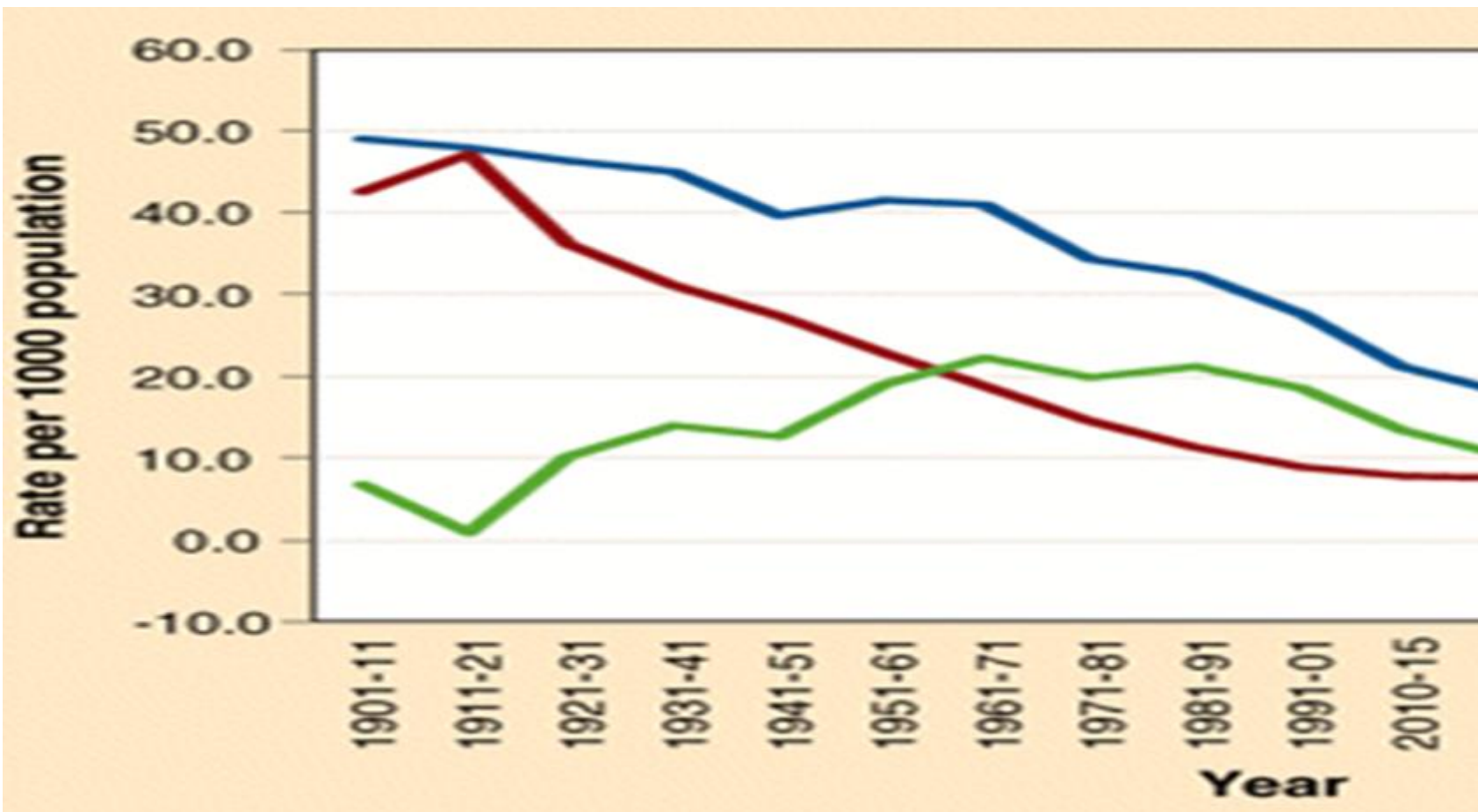
- In the last four decades there has been a slow but steady decline in the prevalence of under-nutrition in adults - perhaps due to lower physical activity and better health care,

- The rate of reduction in under-nutrition in men and women in the pre-HIV infection era is similar to the rate of reduction in the last two decades

TIME TRENDS IN CRUDE DEATH RATE IN INDIA



The rate of decline in CDR in the pre-HIV time period, continued during the HIV epidemic.



IMPACT OF NATIONAL AIDS CONTROL PROGRAMME

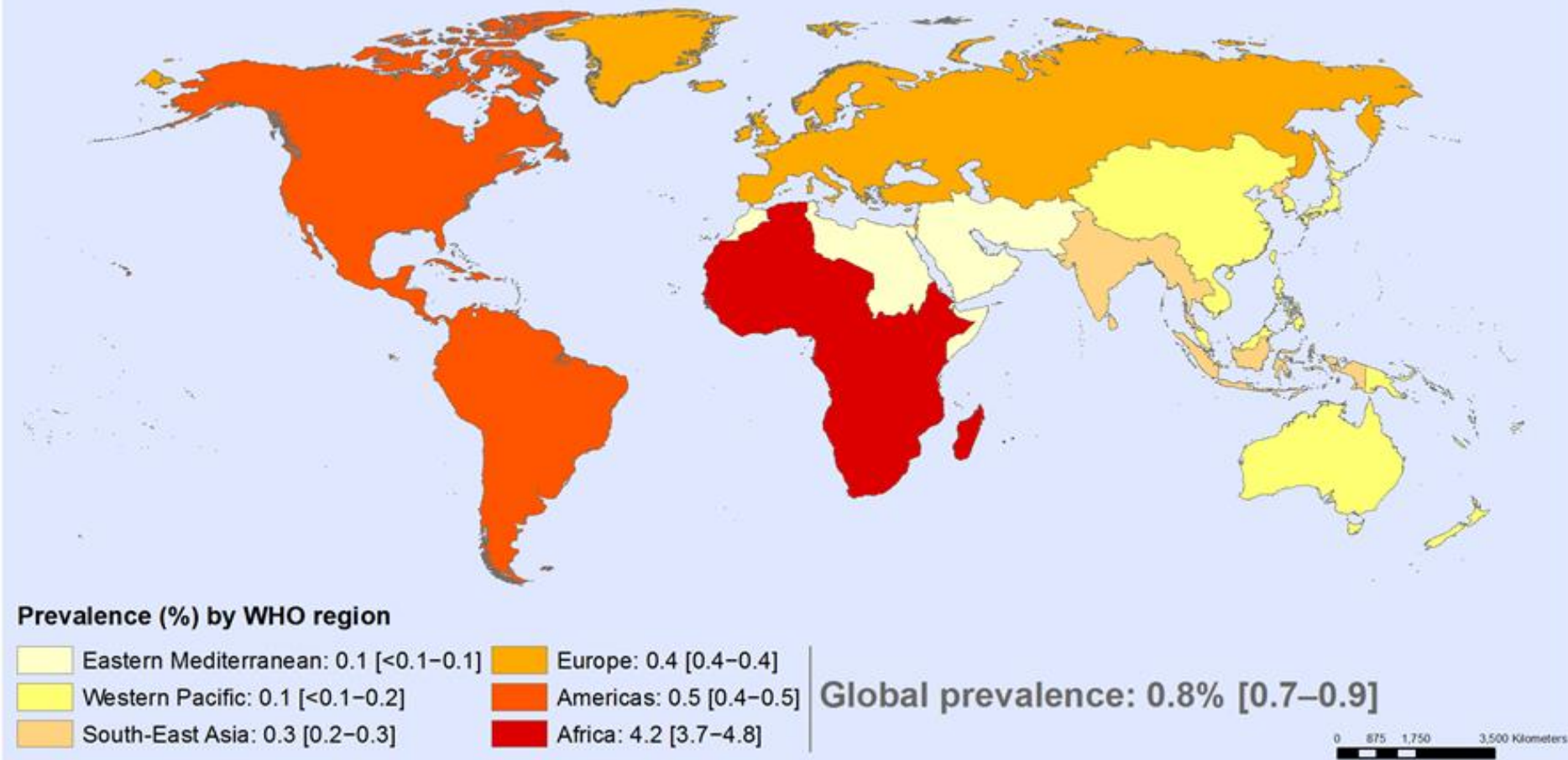
HIV new infection rates showed decline within a decade after initiation of National AIDS control programme

Rate of reduction in the mortality and under-nutrition rates in children and adults in post-HIV era was similar to the pre-HIV era

This is the best testimony for success of the National AIDS control programme strategies, coverage under services, core competence of health and nutrition personnel and peoples' participation.

**INDIA AND MDG 6 TARGET:
HALT SPREAD OF HIV INFECTION**

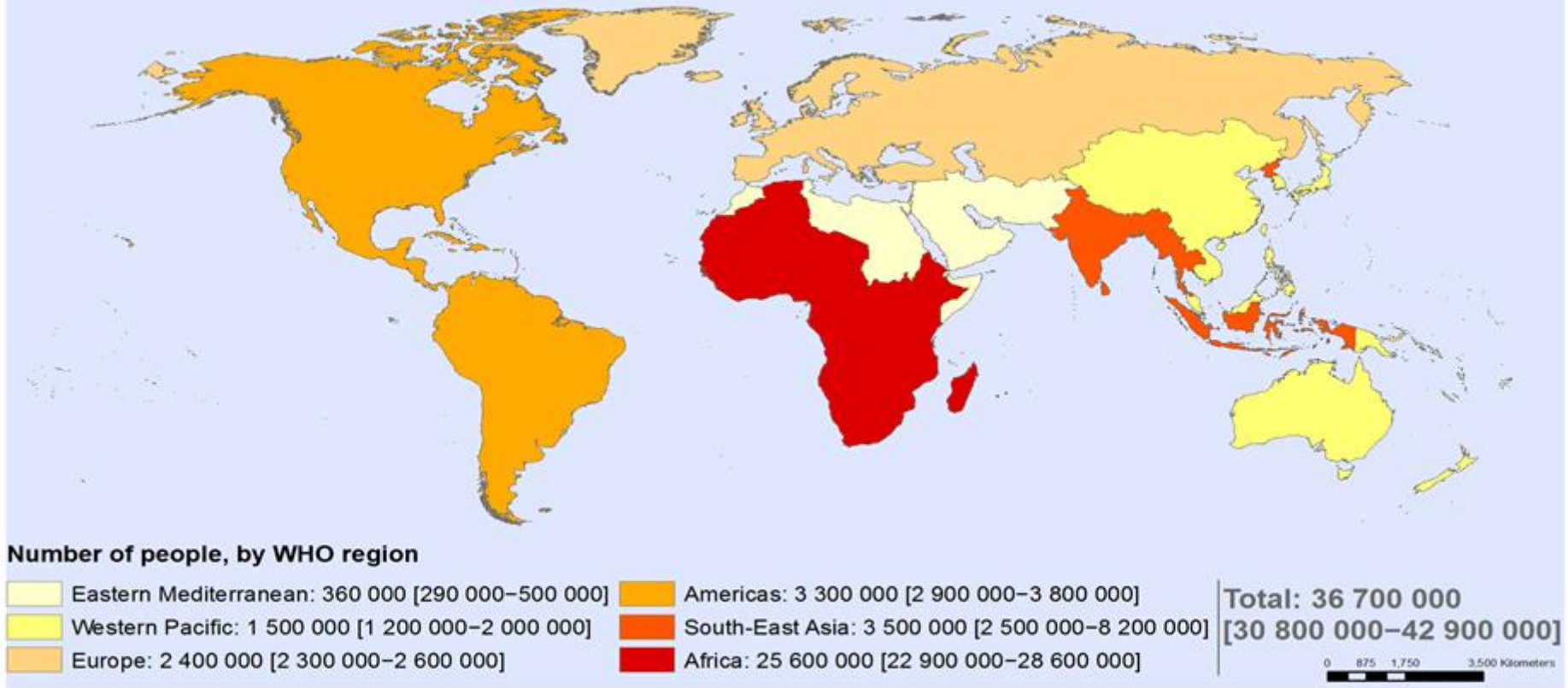
PREVALENCE OF HIV AMONG ADULTS AGED 15-49 2016 BY WHO REGION



Global prevalence of HIV infection in reproductive age group persons is estimated to be 0.8 (CI 0.7 to 0.9).

Prevalence of infection in SE Asia is far lower 0.3 (CI 0.2 to 0.3)

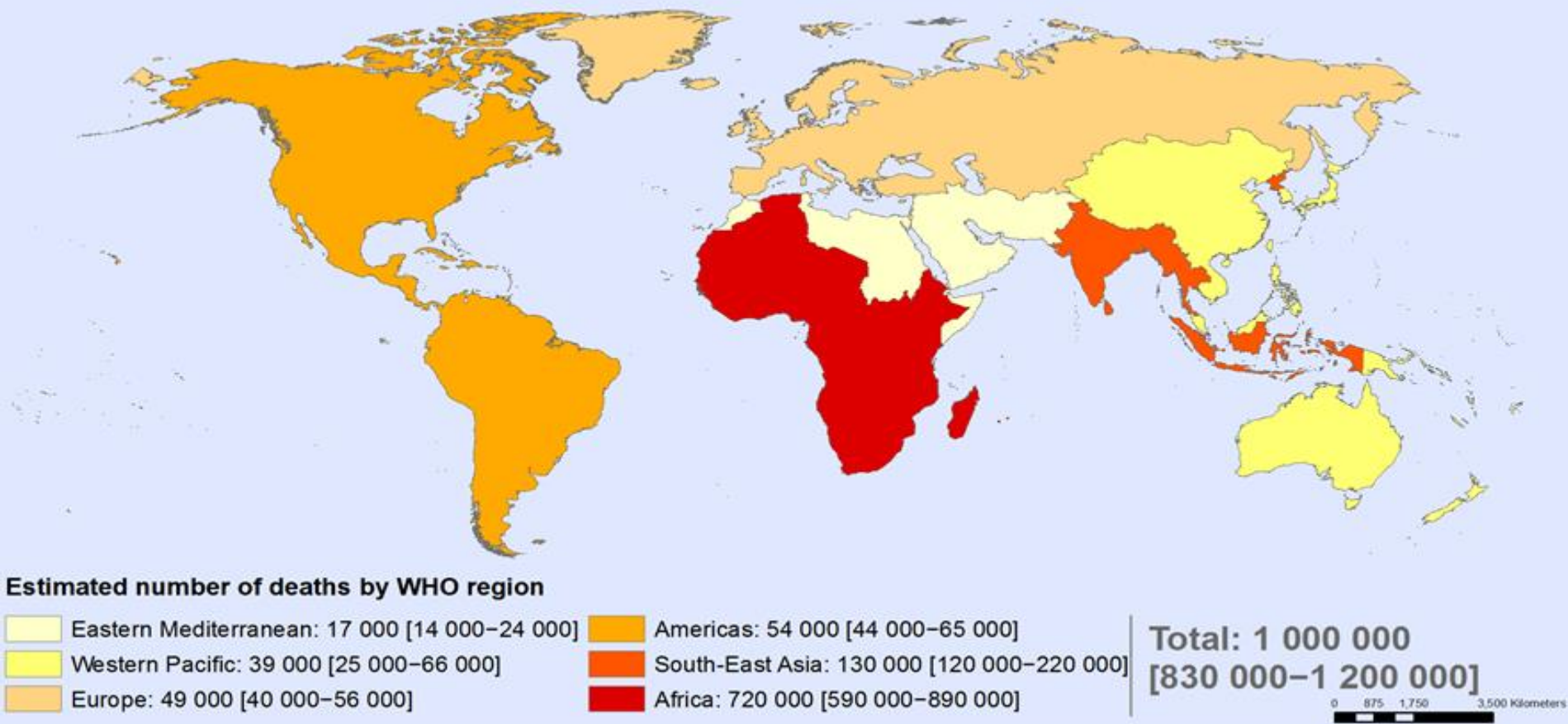
ESTIMATED NUMBER OF PEOPLE LIVING WITH HIV, 2016 BY WHO REGION



There were approximately 36.7 million PLHA (people living with HIV/AIDS) worldwide at the end of 2016

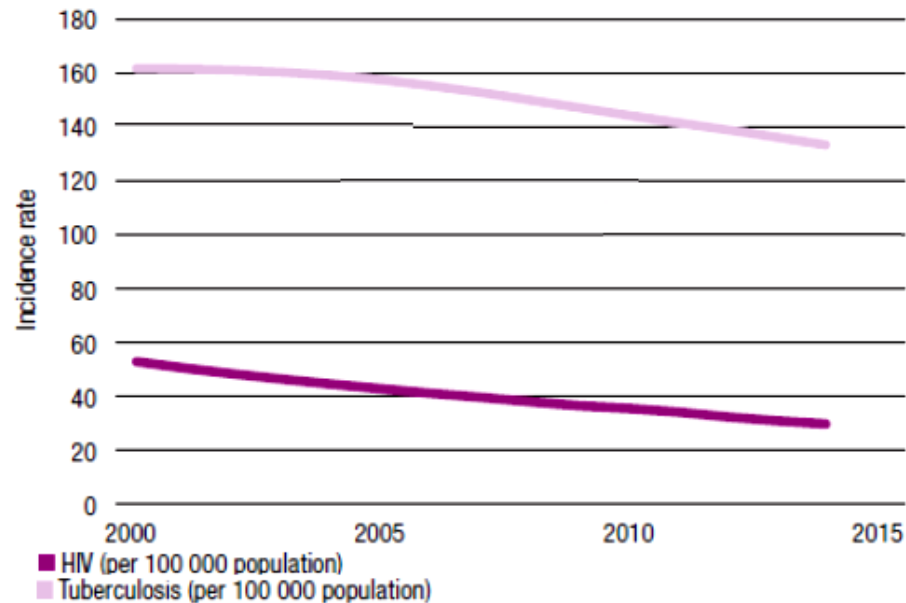
Even though the prevalence rate of HIV infection is low (0.3 %) in SE Asia, 3.5 million of HIV infected persons live in this highly populous region

ESTIMATED NUMBER OF PEOPLE DYING FROM HIV RELATED CAUSES 2016 BY WHO REGION



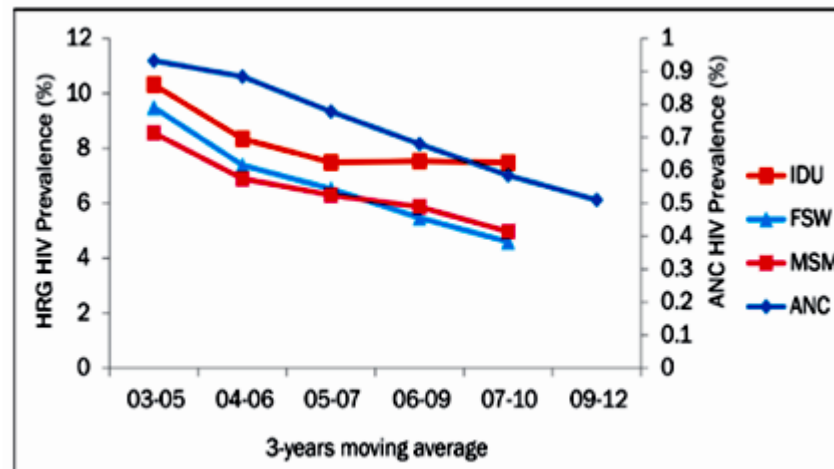
World wide there were 1million deaths due to HIV related causes
Of these 130,000 occurred in SE Asia

Global trends in HIV and TB incidence rates, 2000–2015

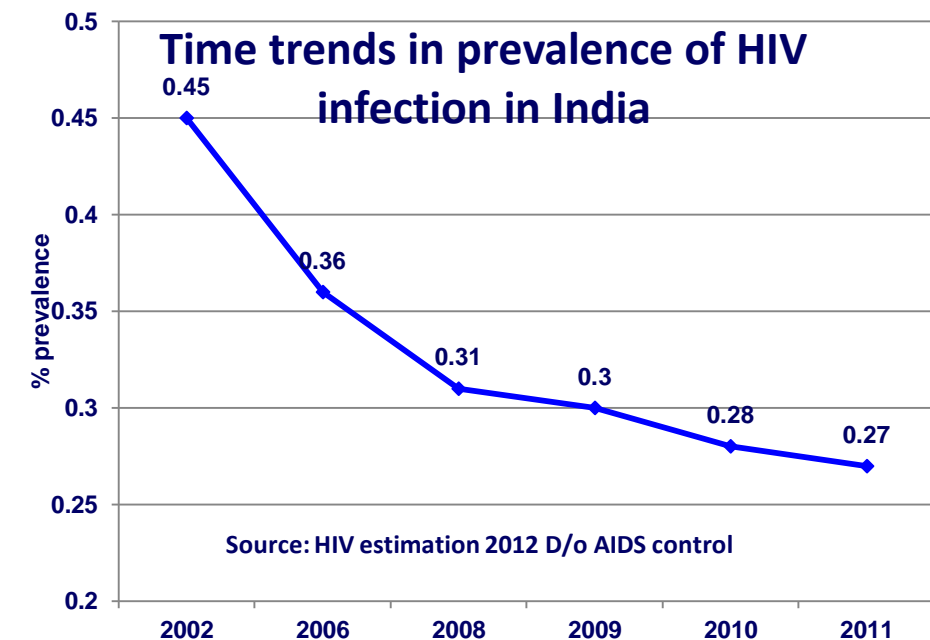


Global

Between 2000 and 2013, globally new HIV infections fell by **40%** from 3.5 to 2.1 million.



Time trends in prevalence of HIV infection in India



India

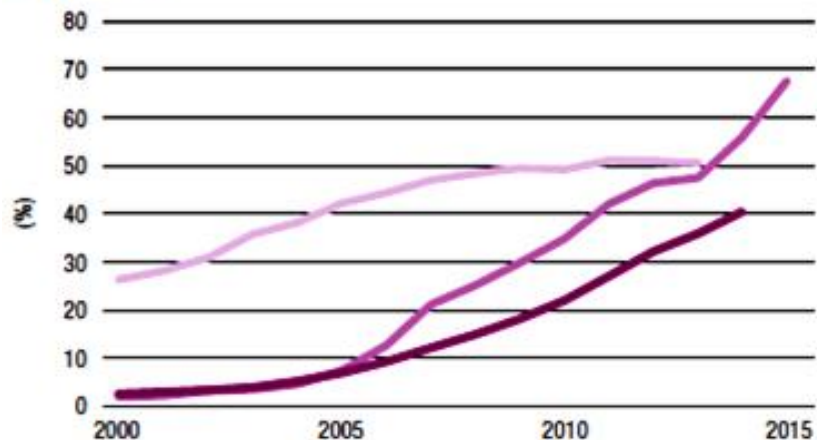
There has been a steep reduction in prevalence of HIV infection in all groups.

There has been a **57%** reduction of in annual new HIV infections (from 2.74 lakhs in 2000 to 1.16 lakhs in 2011).

Global coverage of interventions: ART among people living with HIV, ITN use among children under five and successful treatment for TB cases, 2000–2015

■ ART among people living with HIV
 ■ ITN use among children under five
 ■ TB treatment

Source:WHO Health in 2015



World

In 2014, 14.9 million people living with HIV were receiving ART, (up from 690,000 in 2000).

ART averted 7.6 million deaths from AIDS between 1995 and 2013.

MDG target of halting HIV epidemic has been achieved.

India

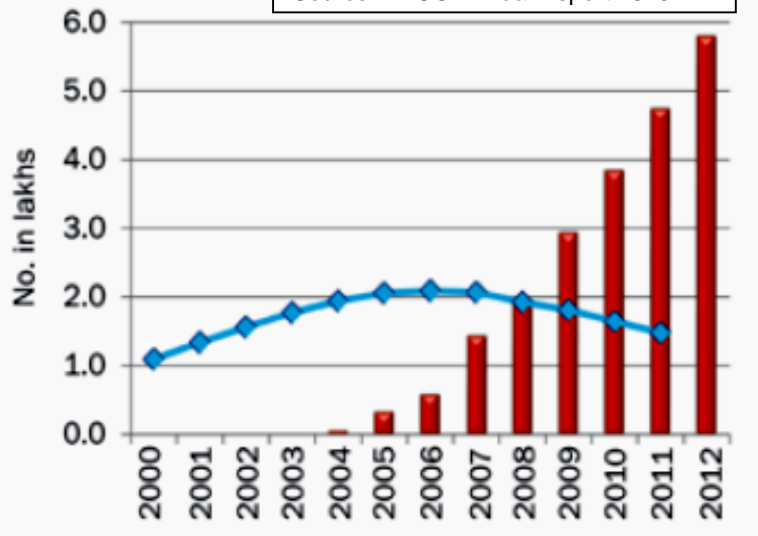
1.48 lakh people died of AIDS related causes in 2011 in India.

Deaths among HIV infected children account for 7% of all AIDS-related deaths. In India ART is totally free of cost; there has been a massive increase in PLHA who are on ART; in 2014, over 8 lakh PLHA have been on ART.

MDG target of halting HIV epidemic has been achieved.

■ Patients on ART ◆ Annual AIDS-related Deaths

Source NACO Annual Report 2013-14



WAY FORWARD

India was fortunate because HIV infection reached the country late and sero-surveillance for HIV infection led to the detection of infection even before the first case of AIDS was reported

As the dimensions of the epidemic unfolded, rational evidence based interventions which could be implemented within the existing health system, were initiated.

National AIDS Control Programme (NACP) continued and upscaled all these interventions.

Effective implementation of a multi-pronged, rational strategy for HIV infection dedicated work done by committed professionals belonging to government and voluntary sectors resulted in containment and control of infection right from the initial stages

Cultural ethos of the country and responsible behaviour of the population also played a major role in ensuring rapid decline in new infection and in steep reduction prevalence of infection within a quarter of a century after the initial detection of HIV.

However health system and the people will have to gear up to respond to newer challenges

Three decades ago AIDS was perceived as a rapidly fatal disease in young men and women.

Today we know that HIV infection is a chronic disease requiring life long treatment.

Health care system has to gear up to ensure that HIV infected persons adhere to long term ART and life style changes;

Emerging drug resistance to first line ART is another major threat;

The lessons learnt from management of other chronic diseases will help the health system and the population to cope with this second phase of combating HIV infection.

Thank You