

HIV Epidemic in India –Way forward for elimination

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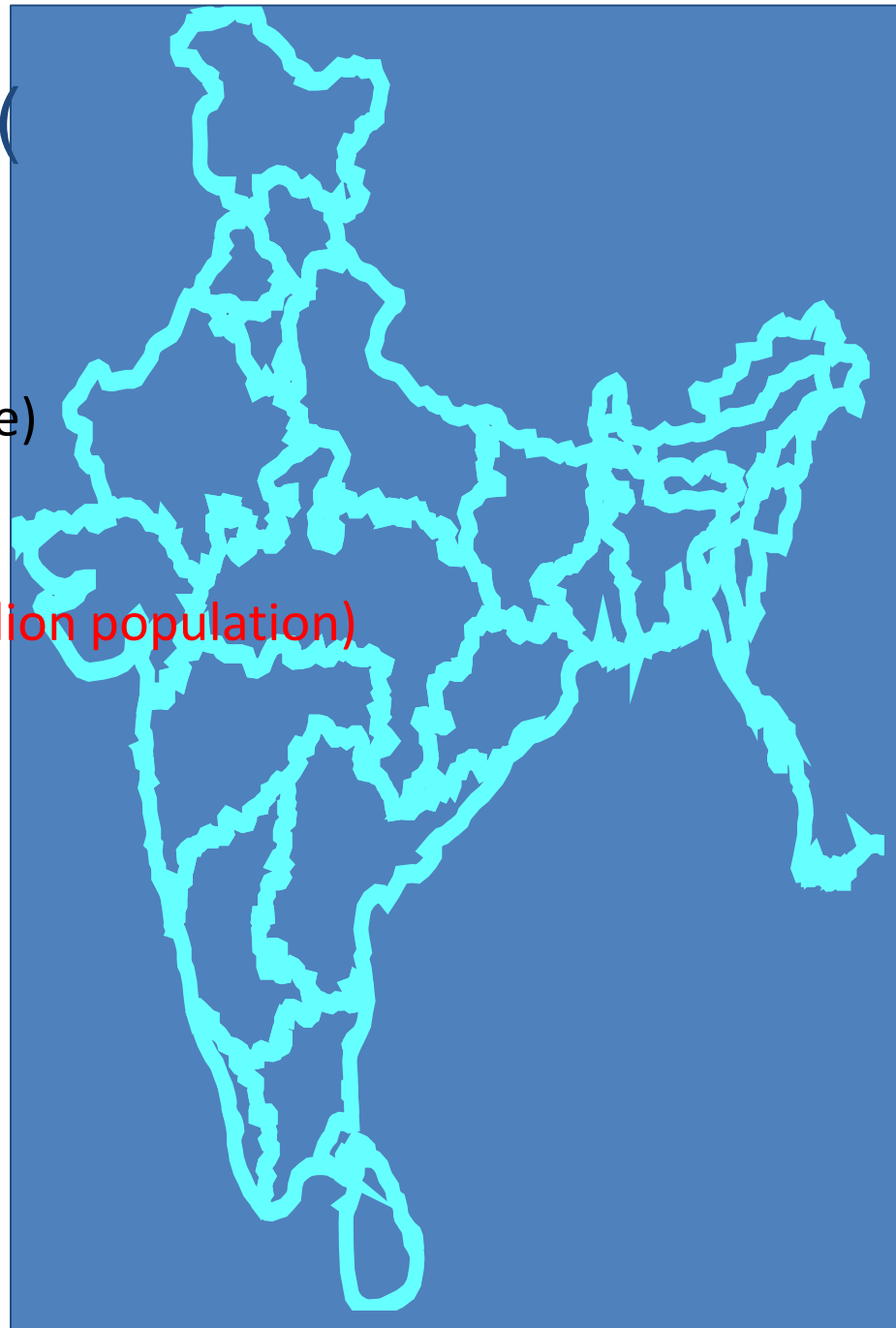
Voluntary Health Services

**Chief-Chennai Antiviral Research and
Treatment (CART) Clinical Research Site**

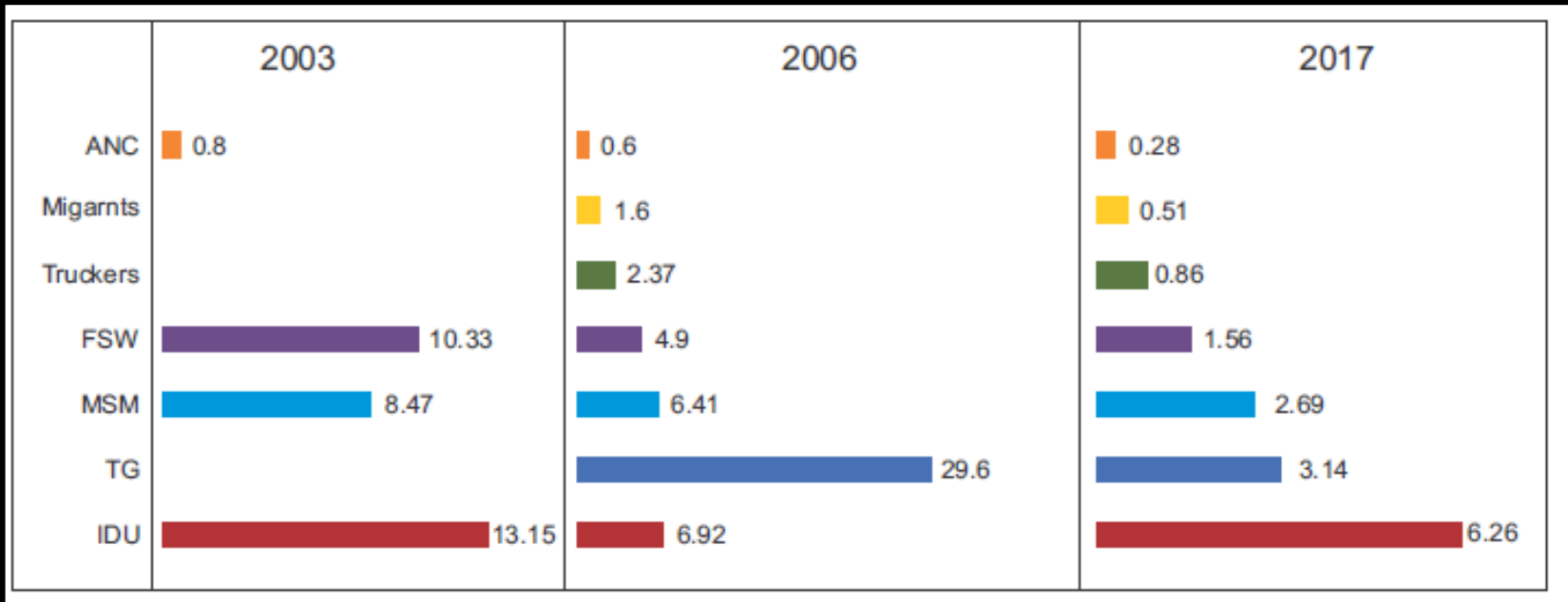
HIV Scenario in India (2017)

- 2 to 2.5 million infections (estimate)
- Heterosexual transmission
- ` 0.25% of adult population (1.2billion population)
- Growing number- MSM,PWIDs
- HIV-1; Subtype C
- 1.2 million on ART
- >50% decline in HIV incidence and mortality

Source : NACO

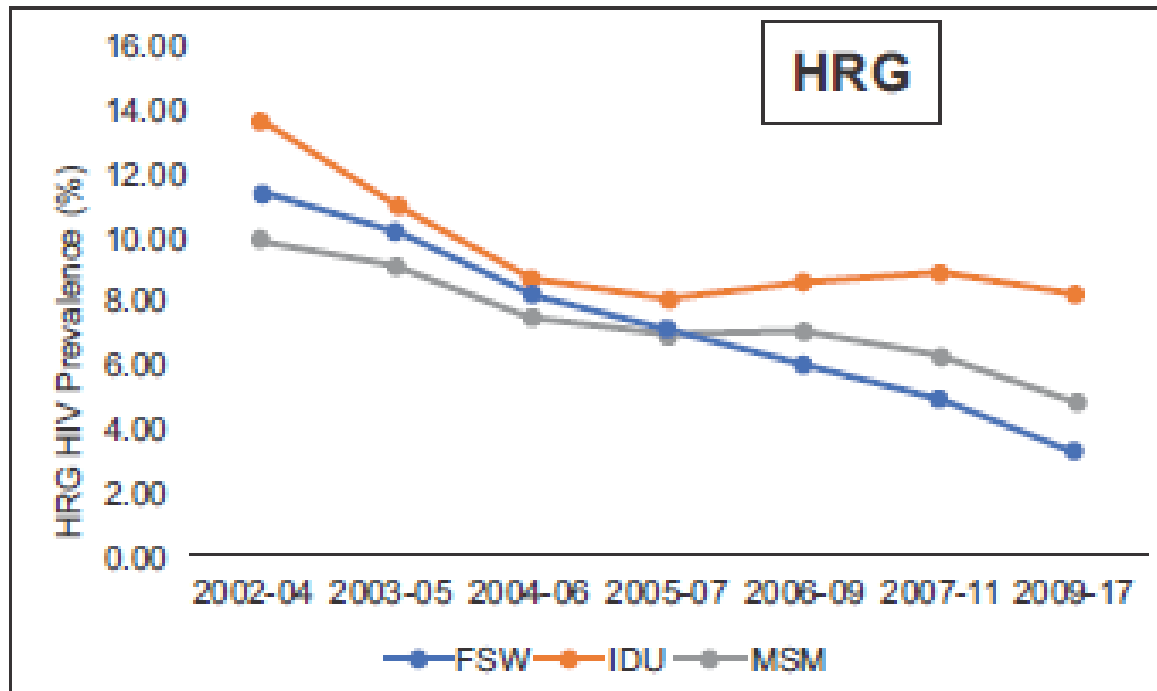


The trend today...



Source : NACO

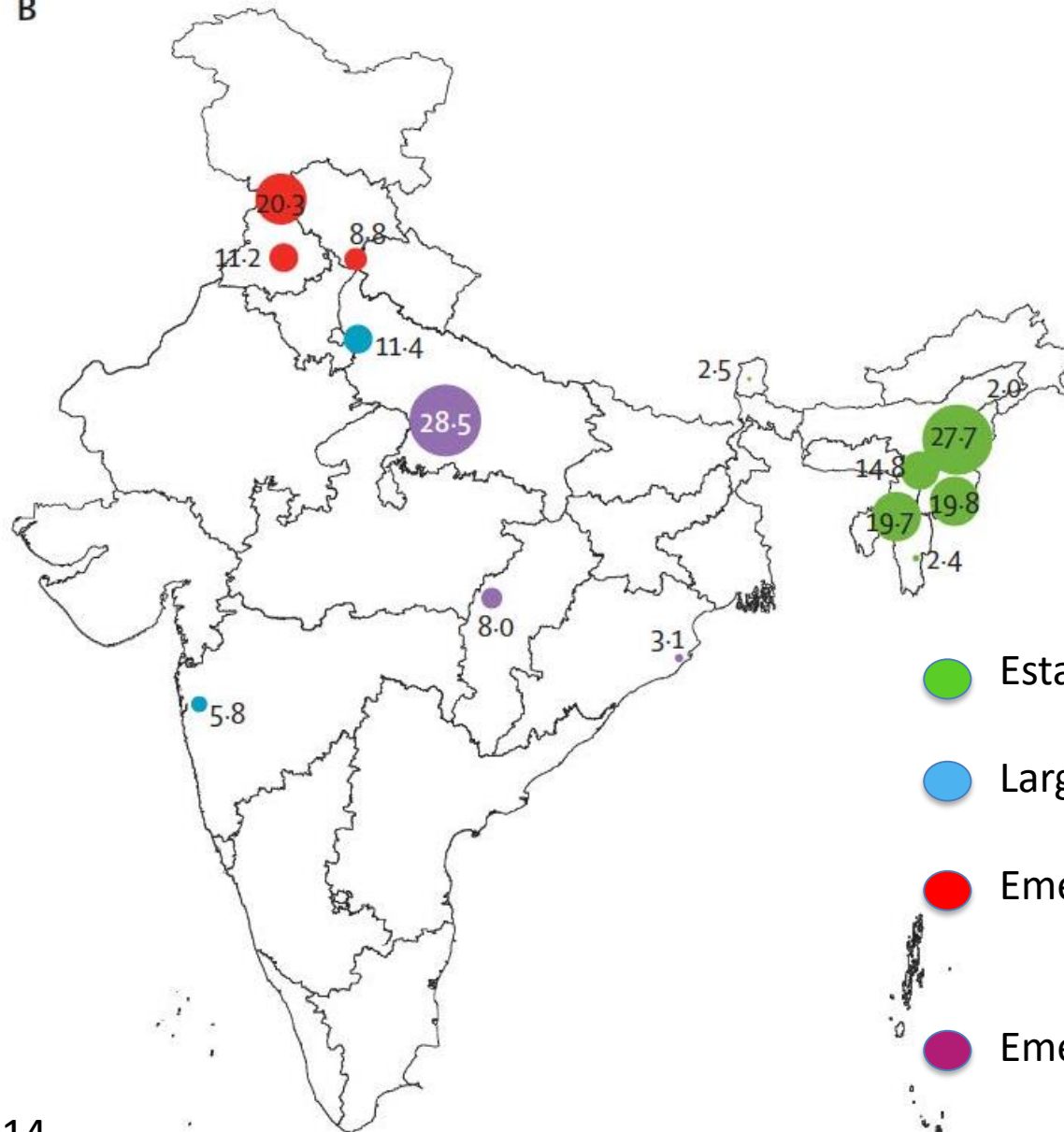
Overall trend among Key populations: 2002-2017



Source : NACO

HIV/HCV Prevalence in India PWIDU

B



- Established Epidemics
- Large Cities
- Emerging Epidemics (documented)
- Emerging Epidemics (anecdotal)

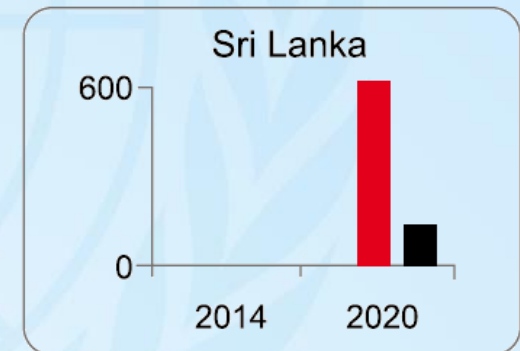
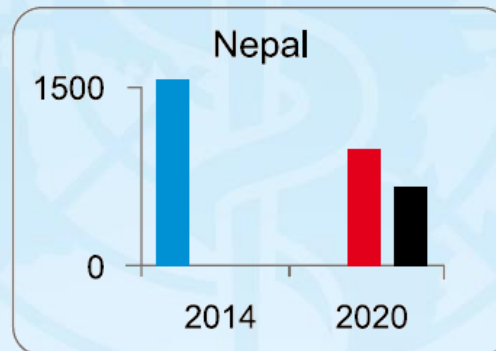
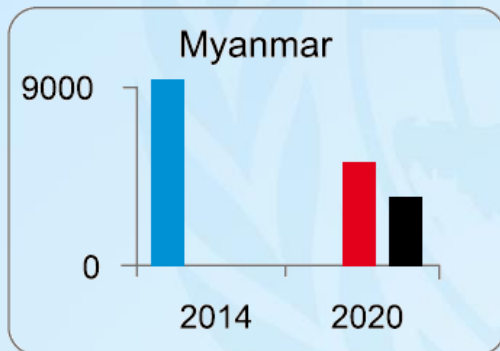
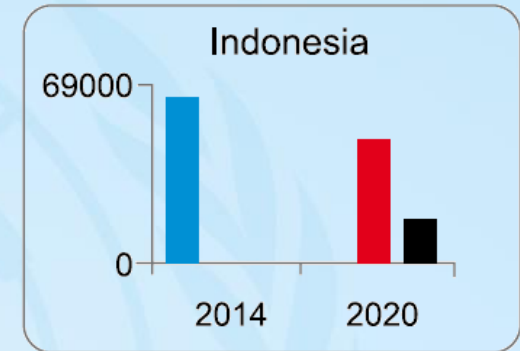
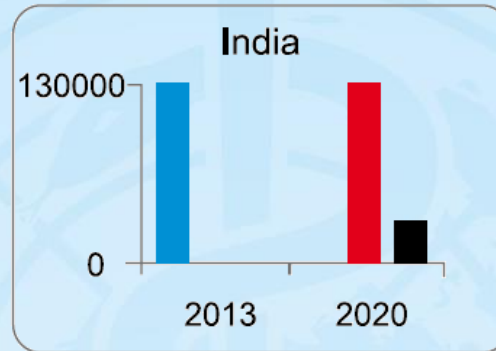
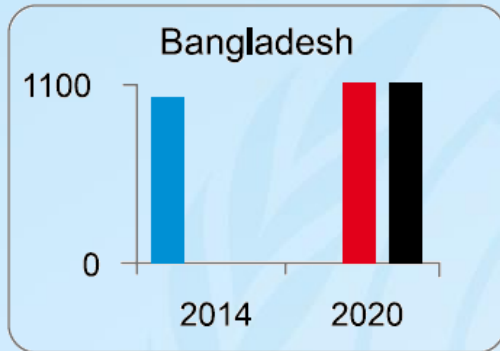
Clinical Impact and Cost-Effectiveness of Expanded Voluntary HIV Testing in India

Kartik K. Venkatesh¹, Jessica E. Becker², Nagalingeswaran Kumarasamy³, Yoriko M. Nakamura^{9,10}, Kenneth H. Mayer^{4,5,13}, Elena Losina^{12,13,16}, Soumya Swaminathan^{6,7}, Timothy P. Flanigan¹, Rochelle P. Walensky^{8,9,10,11,13}, Kenneth A. Freedberg^{8,9,10,13,14,15*}

- Simulation model of HIV testing and treatment
 - Prevalence and Incidence in different groups
 - Cost of testing

Conclusion: Voluntary HIV screening among National population every 5 yrs offers substantial clinical benefit and cost effective. Annual screening is cost effective among high risk population and in high prevalent districts

India misses the new infection targets



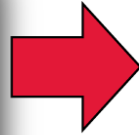
■ New HIV infections in 2014

■ With current trend in 2020

■ Fast-Track target 2020

Source: UNAIDS 2016 estimates; Global AIDS Response Reporting 2016.

**HPTN 052:
Treatment as
Prevention**

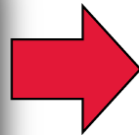


**Public
Health
Benefit**



**Begin treatment
at any CD4⁺
T-cell count**

**START and
Temprano Studies:
Early Treatment**



**Individual
Health
Benefit**



SPECIAL ARTICLE

Cost-Effectiveness of HIV Treatment as Prevention in Serodiscordant Couples

Rochelle P. Walensky, M.D., M.P.H., Eric L. Ross, B.A.,
Nagalingeswaran Kumarasamy, M.B., B.S., Ph.D., Robin Wood, D.Sc.,
Farzad Noubary, Ph.D., A. David Paltiel, Ph.D., M.B.A., Yoriko M. Nakamura, B.A.,
Sheela V. Godbole, M.D., Ravindre Panchia, M.B., B.Ch.,
Ian Sanne, M.B., B.Ch., D.T.M.&H., Milton C. Weinstein, Ph.D., Elena Losina, Ph.D.,
Kenneth H. Mayer, M.D., Ying Q. Chen, Ph.D., Lei Wang, Ph.D.,
Marybeth McCauley, M.P.H., Theresa Gamble, Ph.D.,
George R. Seage III, D.Sc., M.P.H., Myron S. Cohen, M.D.,
and Kenneth A. Freedberg, M.D.

- In South Africa, early ART was cost-saving over a 5-year period.
- In both South Africa and India, early ART was projected to be very cost-effective over a lifetime.
- With individual, public health, and economic benefits, there is a compelling case for early ART for serodiscordant couples in resource-limited settings.

WHO Treatment Guidelines :

What to Start in Adults

FIRST-LINE REGIMENS ARV REGIMENS)

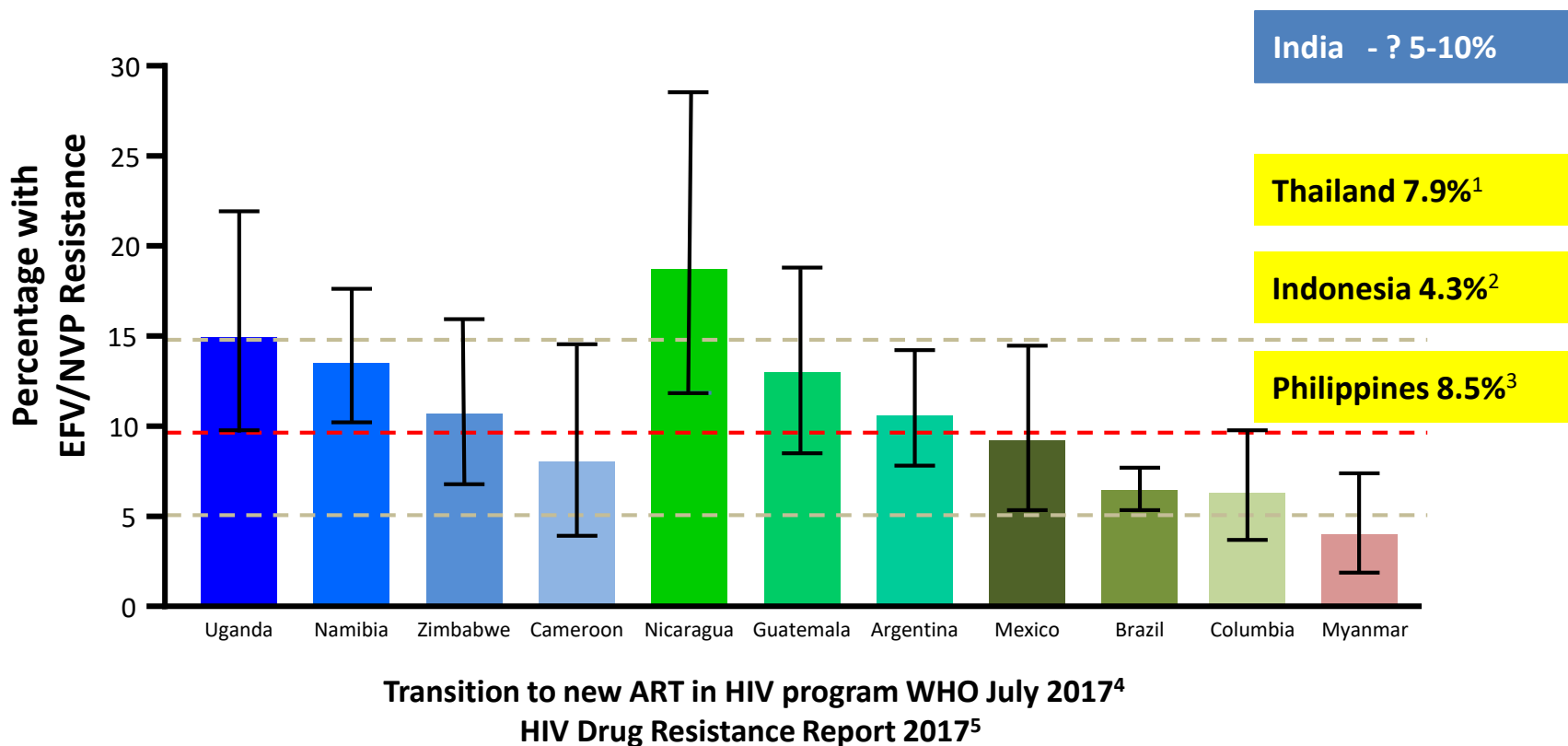
TARGET POPULATION	2010 ART GUIDELINES	2013 ART GUIDELINES	2016 ART GUIDELINES
HIV+ ADULTS	AZT or TDF + 3TC (or FTC) + EFV or NVP	TDF + 3TC (or FTC) + EFV (as fixed dose combination)	Preferred: TDF + 3TC (or FTC) + EFV (as fixed dose combination) Alternate: TDF + 3TC (or FTC) + DTG* TDF+3TC (or FTC) + NEW EFV400mgs
HIV+ PREGNANT WOMEN	AZT + 3TC + NVP or EFV		
HIV/TB CO-INFECTION	AZT or TDF + 3TC (or FTC) + EFV		
HIV/HBV CO-INFECTION	TDF + 3TC (or FTC) + EFV		

WHO Guidelines 2010: http://apps.who.int/iris/bitstream/10665/44379/1/9789241599764_eng.pdf. Accessed may 2016.

WHO Guidelines 2013: http://apps.who.int/iris/bitstream/10665/85321/1/9789241505727_eng.pdf. Accessed May 2016.

WHO Guidelines 2015: http://apps.who.int/iris/bitstream/10665/198064/1/9789241509893_eng.pdf?ua=1. Accessed May 2016.

Pretreatment HIV drug resistance to EFV or NVP among first-line ART initiators in selected countries



1. Kiertiburanakul S et al., 2016 Feb 1;11(2):e0147945. Kotaki T et al., *AIDS Research and Therapy* 2015;12:5
DOI 10.1186/s12981-015-0046-y 3. Salvana E et al., *Open Forum Infectious Diseases* 2017; 4(suppl 1): S423 4. WHO Guidelines 2017:
Transition to new ART in HIV program, WHO July 2017. Available at: <http://www.who.int/hiv/pub/toolkits/transition-to-new-arv-technical-update/en/>.
Accessed Jan 2018 5. HIV Drug Resistance Report 2017. Available at: <http://www.who.int/hiv/pub/drugresistance/hivdr-report-2017/en/> Accessed Jan 2018

What about India?

Zheng A et al. *Journal of the International AIDS Society* 2018, **21**:e25085
<http://onlinelibrary.wiley.com/doi/10.1002/jia2.25085/full> | <https://doi.org/10.1002/jia2.25085>



RESEARCH ARTICLE

The cost-effectiveness and budgetary impact of a dolutegravir-based regimen as first-line treatment of HIV infection in India

Amy Zheng¹, Nagalingeswaran Kumarasamy², Mingshu Huang¹, A David Paltiel³, Kenneth H Mayer^{4,5,6}, Bharat B Rewari⁷, Rochelle P Walensky^{1,8,9,4,10} and Kenneth A Freedberg^{1,8,9,4,11}

- A generic DTG-based regimen is likely to be cost-effective and should be recommended for initial therapy of HIV infection in India

The Clinical and Economic Impact of Dolutegravir-based First-line ART in India

Conclusions:

- A generic DTG regimen for 1st-line ART in India will increase survival and decrease the proportion of patients switching to more costly 2nd-line ART.
- At \$102 (INR 6,834) per patient per year, a DTG regimen is very cost-effective and its implementation would be at no additional cost for the national HIV program in 5 years in India.
- DTG-based first-line ART should become the standard of care for ART initiation in India.

Amy Zheng, N Kumarasamy, Mingshu Huang....,K Freedberg ; CROI 2017; JIAS 2018

Monitoring- WHO 2016 Guidelines

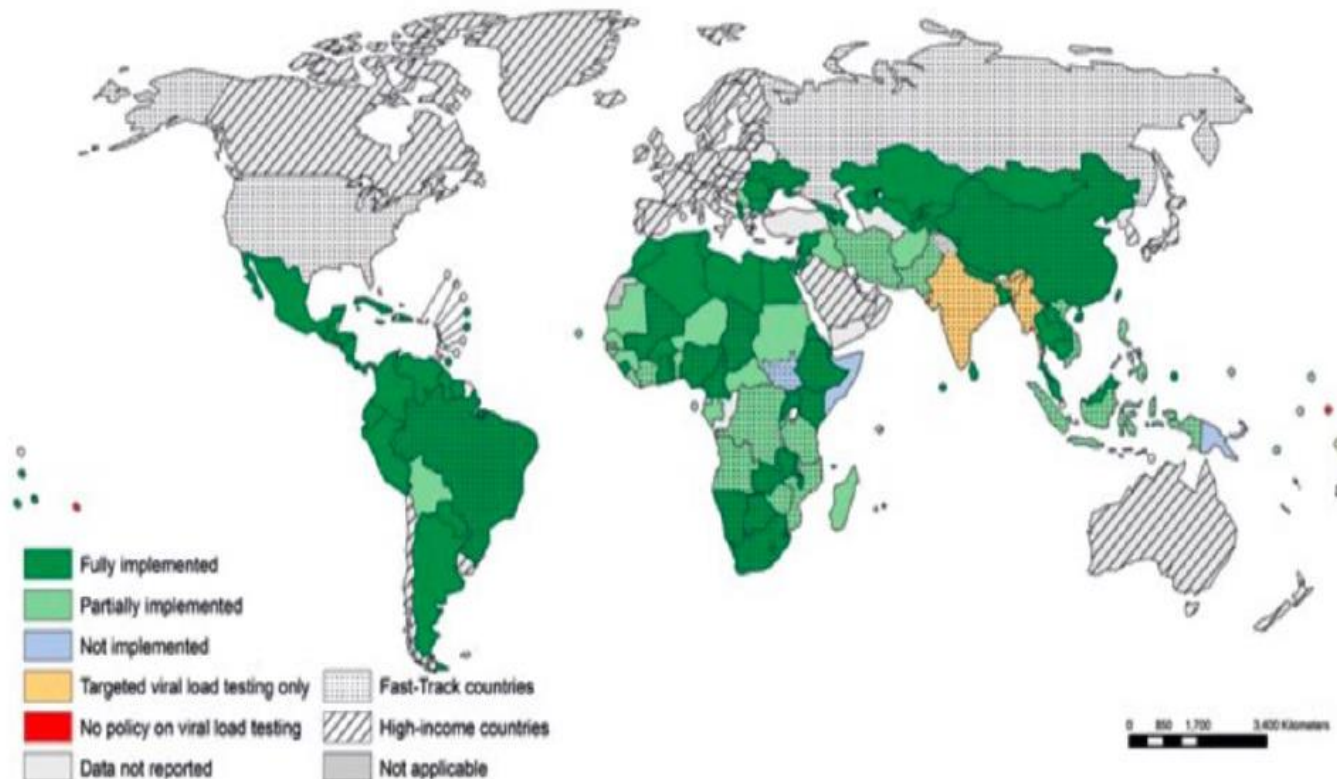
Recommendations for routine monitoring

Routine viral load monitoring can be carried out at 6 months, at 12 months and then every 12 months thereafter if the patient is stable on ART to synchronize with routine monitoring and evaluation reporting^a (conditional recommendation, very low-quality evidence).

In settings where routine viral load monitoring is available, CD4 cell count monitoring can be stopped in individuals who are stable on ART and virally suppressed^b (conditional recommendation, low-quality evidence).

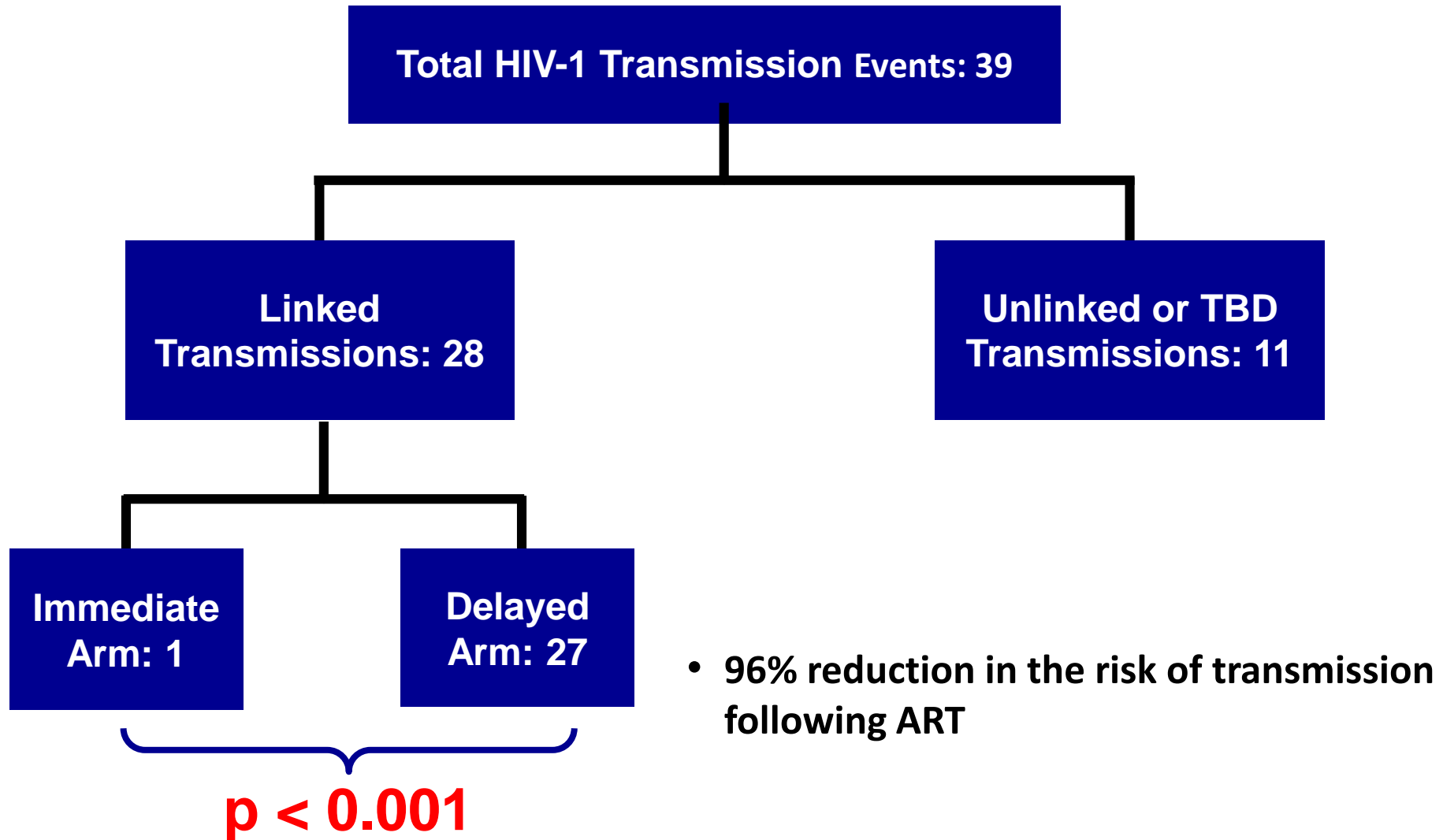
2016 WHO ARV Guidelines Uptake

National policy on routine viral load testing for monitoring ART and level of implementation for adults and adolescents in low- and middle-income countries (situation as of November 2017)



HPTN 052: HIV-1 Transmission

Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, Kumarasamy N et al, NEJM, 2011



Cost Effectiveness of Viral Load in India

- Compare 11 alternative lab monitoring protocols using CD4 count and viral load
- Simulation followed a cohort of patients from initiation on first-line ART

Examples of lab monitoring options

Bi-annual CD4

Annual CD4 + HVL confirmation

Bi-annual CD4 + HVL confirm (NACO)

Annual CD4 and HVL tests

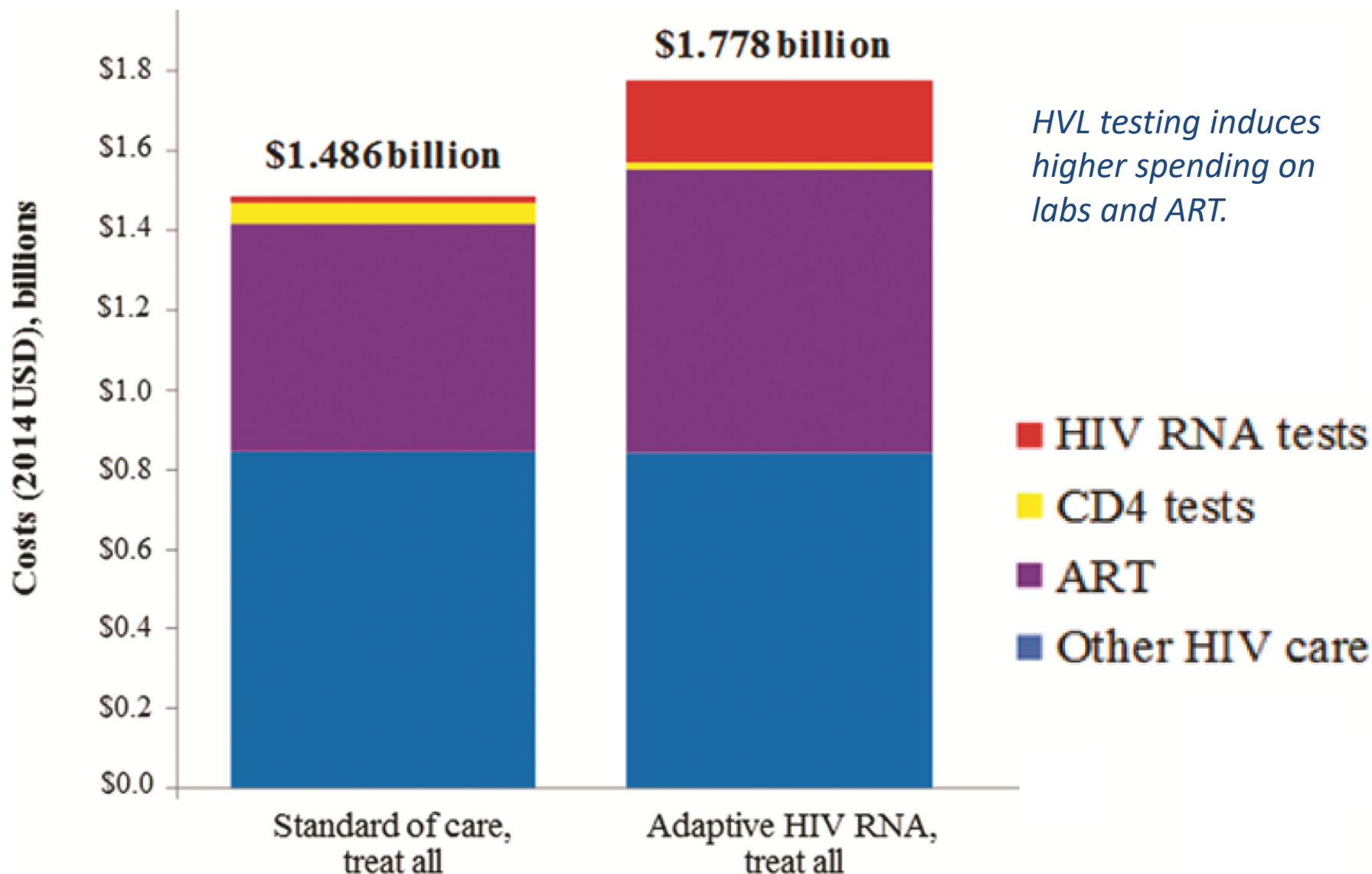
Adaptive CD4 + HVL testing

Adaptive HVL testing

Bi-annual CD4 + adaptive HVL (WHO)

Freedberg, Kumarasamy, et al., AIDS Research and Human Retroviruses. 2017.

5 year Budget Impact



Generic ARVs from India

NRTIs	NNRTIs	PIs
zidovudine (AZT) didanosine (ddI) stavudine (d4T) lamivudine (3TC) abacavir (ABC) emtricitabine (FTC)	Nevirapine (NVP) Efavirenz (EFV) Rilvriprine (RLP) Etravirine (ETV)	saquinavir (SQV) indinavir (IDV) ritonavir (RTV) nelfinavir (NFV) lopinavir/ritonavir (LPV/r) atazanavir (ATV) Darunavir(DRV)
	Nucleotide RTIs	Post Attachment Inhibitor
	Tenofovir DF (TDF) TAF	Ibalizumab
	Entry Inhibitors	
	Maraviroc (CCR5) enfuvirtide (ENF, T20)	
	Integrase Inhibitors Raltegravir (RAL) Elvitegravir(ELV),Bictegravir(BIC) Dolutegravir(DTG)	

WHO Guidelines

POPULATION	1 ST LINE REGIMEN	2 ND LINE REGIMENS	3 RD LINE REGIMENS
Adults	2 NRTIs + EFV	2 NRTIs + ATV/r or LPV/r	DRV/r ¹ + DTG (or RAL) ± 1–2 NRTIs
		2 NRTIs + DRV/r or LPV/r + RAL	
	2 NRTIs + DTG	2 NRTIs + ATV/r or LPV/r	DRV/r + 2 NRTIs ± NNRTI
		2 NRTIs + DRV/r	Optimize regimen using genotype profile
Pregnant/breastfeeding women	2 NRTIs + EFV	2 NRTIs + ATV/r or LPV/r	DRV/r + DTG (or RAL) ± 1–2 NRTIs
		2 NRTIs + DRV/r	
Children	2 NRTIs + LPV/r	If less than 3 years: 2 NRTIs + RAL ²	DTG ⁴ + 2 NRTIs DRV/r ³ + 2 NRTIs DRV/r ³ + DTG ⁴ ± 1–2 NRTIs
		If older than 3 years: 2 NRTIs + EFV or RAL	
	2 NRTIs + EFV	2 NRTIs + ATV/r ⁵ or LPV/r	

CART-Cohort study: Non AIDS causes of mortality (NCDs)

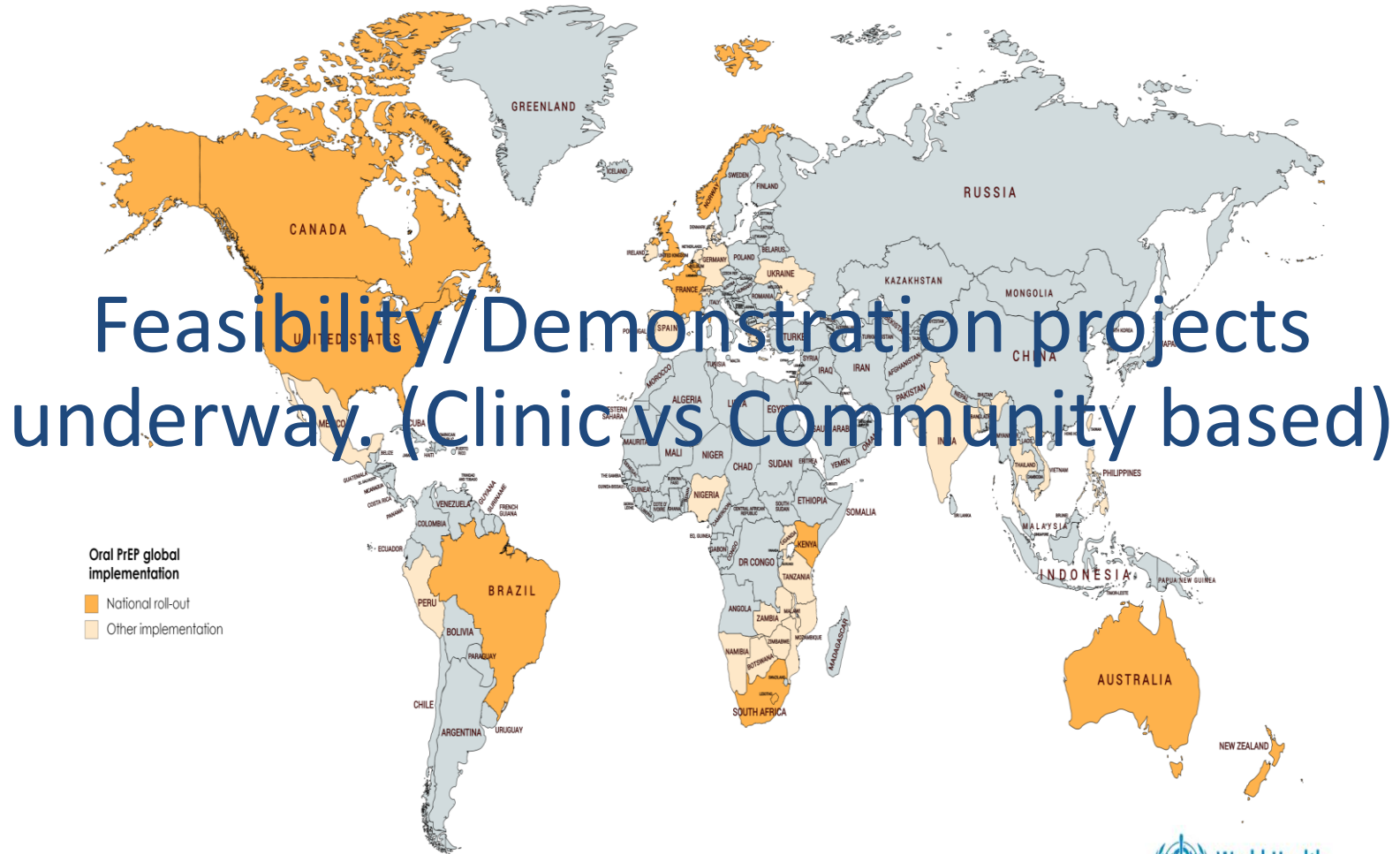
- Cardiovascular- **drugs, inflammation**
- Renal- **drugs, HIV**
- Diabetes- **drugs, HIV**
- Liver- **NASH**
- Cancers- **HPV**
- Neurocognitive effects- **drugs, HIV**

Kumarasamy N, et al. CART Cohort study. Cell-The Lancet Translational Medicine Conf. San Francisco, Nov 3-5, 2013

Oral PrEP global roll-out, 2018

National roll-out- Australia, Belgium, Brazil, Canada, Kenya, New Zealand, Norway, Scotland NHS, South Africa (?US)

Other implementation (e.g. demonstration projects, pharmacy access, DREAMS)



Feasibility/Demonstration projects underway. (Clinic vs Community based)

Oral PrEP global implementation

- National roll-out
- Other implementation

Conclusions

- Progress on scale-up of ART in India has been extraordinary- >1.2 millions on ART out of 2.1 million estimated
- Decrease in morbidity and mortality
- Declining incidence of HIV
- Sustainability of ARVs- Stock outs had happened. This will require forward-looking policies, more effective and innovative approaches, together with further investments
- Prevention of transmission of resistance strains
- Prevention and management of NCDs
- PrEP need to be implemented in India soon.