Potential Impact and Cost-Effectiveness of the 2010 WHO PMTCT Guidelines — 15 Resource-Limited Countries, 2010

Presented by Andrew F. Auld MBChB

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Peri-natal HIV Transmission

- Globally, 420,000 infants become HIV-infected annually
- About 90% of infections occur in Africa
  - 60% during pregnancy/birth
  - 40% during breastfeeding
- Antiretroviral drugs (ARVs) known to significantly reduce HIV transmission during pregnancy and birth
  - In 2009 ARVs proven effective during breastfeeding
- Guidelines for the use of ARVs for prevention of mother-to-child transmission (PMTCT):
  - Last published in 2006
  - Revised in 2009

2006 vs. 2010 WHO PMTCT Guidelines - ART-Ineligible Women Choosing to Breastfeed

		2006 PMTCT Guidelines	2010 PMTCT Guidelines	
			Option A	**Option B**
Mother	**Pregnancy**	AZT from 28 weeks	AZT from 14 weeks	
	Delivery	SDN + AZT-3TC	SDN + AZT-3TC	Triple ARV 14 weeks –> end of Breastfeeding
	Post-Natal	AZT-3TC tail	AZT-3TC tail	
Infant	**Post-Natal**	SDN & AZT tail	Daily NVP during BF	NVP for 6 weeks

Earlier ART for HIV-Infected Pregnant Women

- 2006 WHO Guidelines:
  - CD4 < 200/µL
  - CD4 < 350/µL with WHO stage III
  - All WHO stage IV eligible
- 2010 WHO Guidelines: Earlier ART
  - CD4 < 350/µL
  - All WHO stage III/IV eligible

Rationale & Objectives for Research

- Rationale:
  - 2009 PMTCT guidelines, adopting options A or B for ART-ineligible women, equally effective for HIV prevention (WHO 2009)
  - Other criteria, e.g. cost-effectiveness, feasibility, are important

- Objectives:
  - To estimate in 15 resource-limited countries:
    - the potential cost-effectiveness
    - the potential costs saved, through reduced need to treat HIV-infected children,

  if countries choose option A or option B

Objectives for this Presentation

- Model overview
- Present assumptions of transmission risk
- Estimated numbers of HIV-infections in three countries: Botswana, Tanzania and Zambia for 2009
- Some results of cost-effectiveness research

Model Overview

- Deterministic model:
  - Follow cohorts of HIV-infected pregnant women and exposed infants born in each of the 15 focus countries during 2010
  - Three PMTCT scenarios:
    - Scenario “A”: 2010 Guidelines with option A for ART-ineligible women
    - Scenario “B”: 2010 Guidelines with option B for ART-ineligible women using the least expensive prophylactic regimen (AZT,3TC,EFV)
    - Scenario “2006”: 2006 WHO Guidelines

15 Focus Countries of the US President's Emergency Plan for AIDS Relief

Model Structure

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Mother-to-Child HIV-1Transmission Risk

Age	Infant Feeding	No PMTCT	sdNVP	Dual Therapy	ART	Option A	Option B
Birth	--	20%	11%	2.2%	1.8%	2.2%	1.8%
During Breast-feeding : all ages (risk/ month)	Exclusive	0.95%	0.95%	0.95%	0.48%	0.28%	0.48%
	Mixed	1.97%	1.97%	1.97%	0.81%	0.47%	0.81%

Cost-Effectiveness Analysis

- To estimate cost-effectiveness of scenarios “A” & “B”, estimate:
  - Incremental cost-effectiveness ratios (ICERs)
    - Additional cost per additional life-years gained (LYG) of implementing either scenario “A” or “B” instead of the 2006 Guidelines
- If ICER < Gross Domestic Product (GDP) / Capita:
  - Highly Cost-effective

Methods

- To estimate whether scenarios A & B are cost saving, estimate for each of the scenarios (“A”, “B”, and “2006”):
  - Total costs incurred by PMTCT program
  - Total lifetime treatment costs for infected children
- If total costs for scenario A or B < total costs for scenario 2006:
  - Cost-saving

Assumptions and Sensitivity Analysis

- Key input parameters:
  - PMTCT effectiveness data: Kesho-Bora and Ban
  - ARV costs and service fees: ARV procurement agencies & costing surveys
- Multivariate sensitivity analysis:
  - 10,000 trials of Monte Carlo simulation created 95% confidence intervals (CI)

Estimated Numbers of Infant HIV-Infections for 3 African Countries during 2003-2015 - Scenario “A”

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Potential Impact and Cost-Effectiveness of Scenarios "A" and "B" of the 2009 PMTCT Guidelines – 15 Focus Countries, 2010

Model Outcome	Scenario "2006" (95% CI)	Scenario "A" (95% CI)	Scenario "B" (95% CI)
Infant HIV Infections (thousands)	345 (328-361)	242 (231-252)	258 (247-270)
Infections Averted (thousands)	66 (50-82)	169 (159-180)	152 (141-163)
Life-Years Gained (LYG millions)	1.3 (0.7-2.0)	3.2 (2.7-3.6)	2.9 (2.4-3.4)
Additional LYG (millions)	-	1.9 (0.8-2.9)	1.6 (0.4-2.7)
Cost (US $ millions)	64 (55-73)	235 (223-247)	343 (325-362)
Additional Cost (millions)	-	171 (150-192)	288 (252-307)
ICER (US $/LYG)	-	92 (81-107)	Equally Effective More Expensive

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Average ICER of implementing Scenario “A” Instead of Scenario “2006” – 15 Focus Countries, 2010

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Country-Specific ICERs of Implementing Scenario “A” Instead of Scenario “2006” – 15 Focus Countries, 2010

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Potential Cost Savings of Implementing PMTCT Scenario "A" Instead of the 2006 PMTCT Guidelines

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Limitations

- In establishing 95% CIs, only those input parameters that affected the ICER were varied
- Costs of ARVs are continually changing

Public Health Implications

- In 2010, in 15 PEPFAR focus countries, we estimate:
  - Implementing 2010 WHO Guidelines could nearly triple infections averted
  - Option “B” is significantly more expensive than option “A”
  - The 2009 WHO Guidelines with option “A” are:
    - highly cost effective
    - possibly cost-saving in 9 of 15 PEPFAR focus countries

Public Health Implications

- These findings support:
  - Rapid implementation of the 2010 WHO PMTCT Guidelines
  - Option “A” the most cost-effective option

Acknowledgements

- Co-authors
  - Omotayo Bolu
  - Tracy Creek
  - Mary Lou Lindegren
  - Emilia Rivadeneira
  - Helen Dale
  - Nalinee Sangrujee
  - Tedd Ellerbrock
- Collaborators
  - Ray Shiraishi
  - Elliot Raizes
  - David Bell
  - Nick Menzies
  - Prahbu Vimanaland
  - John Blandford

Thank You!

The findings of this presentation are those of the authors and do not necessarily represent the views of the US Centers for Disease Control and Prevention

Mother-to-Child HIV-Infections among Exposed Children Born in 15 Focus Countries, 2010

Life-Time Treatment Costs for Infected Children Associated with PMTCT Strategy – 15 Focus Countries, 2010

Varying Costs and Effectiveness of PMTCT Scenario "A" to Assess Effect on ICER – Ethiopia, 2010

Potential Cost Savings of Implementing PMTCT Scenario "A" Instead of the 2006 PMTCT Guidelines

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