Objectives

- To outline how infants become infected with HIV through breastfeeding and how to prevent this
- To outline how WHO and UNICEF recommendations on HIV and infant feeding have evolved over time
- To review the evidence behind the WHO recommendations on HIV and infant feeding
- To consider what are the implications for policy makers and health workers
- To identify main research questions for programmes

Key messages

- Breastfeeding has a critical influence on infant and child survival, development and lifelong health
- HIV has created confusion among health workers and communities about how best to feed young infants
- The 2010 and 2016 WHO guidelines on HIV and Infant Feeding outline interventions and approaches that enable HIV-infected mothers to breastfeed with only a small risk of HIV transmission to their infant
- The opportunity and challenge remains how to scale up these interventions and to improve infant feeding in the general community to improve the health and survival of mothers living with HIV and their infants

Timing of mother-to-child HIV transmission - no ARVs

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Early Antenatal (&lt;36 weeks)</th>
<th>Early Postpartum (0-6 months)</th>
<th>Late Antenatal (36 weeks to labor)</th>
<th>Late Postpartum (6-24 months)</th>
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MTCT in 100 HIV+ mothers by timing of transmission – no ARVs

Interventions and timing of transmission (pre-2010)

How do children become infected through breastmilk?

Even after years of research we are still unsure of the exact site and mechanism of infection!

Possible infection routes Factors influencing transmission

- Mouth or tonsils
- Immune tissue in the gut (Peyer’s patches)
- Direct infection of gut cells (enterocytes)
- Holes in immature gut mucosa (lining of the bowel)

- Breastmilk composition
- HIV viral load: cell-free and cell-associated
- Cytokines and other markers of inflammation
- Anti-HIV factors

Source: World Health Organization

Why do some children become HIV-infected and why do the majority of children not become infected through breastmilk?

- Maternal health (including viral load)
- Duration of breastfeeding (vs early cessation)
- Type of breastfeeding
- Breast health
  - Mastitis and subclinical mastitis
  - Cracked and/or bleeding nipples
- Infant factors
  - Prematurity

Mother’s HIV status

High viral load in the mother results in high viral load in breastmilk which increases HIV transmission

When do you get a high viral load?

- New and recent infection
- HIV disease progression (low CD4 count*)
- Poor or non adherence to treatment

*CD4 count is a marker of immune function in HIV infection

Feeding practice

- Duration and type of breastfeeding
- Breast health
  - Mastitis and subclinical mastitis
  - Cracked and/or bleeding nipples

The risk of HIV transmission and duration of breastfeeding (no ARVs)

Cumulative rates of late postnatal HIV infection (> 4 wks)

- 4 w to 6 mo
- up to 12 mo
- after 12 mo

Source: World Health Organization
The risk of HIV transmission and duration of breastfeeding (no ARVs)

The risk of transmission persists and is roughly equal throughout the period of breastfeeding, equating to about 0.7% transmission risk per month of breastfeeding. The longer a woman breastfeeds the greater the risk of transmission.

<table>
<thead>
<tr>
<th>Duration</th>
<th>Transmission Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 w to 6 mo</td>
<td>4%</td>
</tr>
<tr>
<td>up to 12 mo</td>
<td>9%</td>
</tr>
<tr>
<td>after 12 mo</td>
<td>16%</td>
</tr>
</tbody>
</table>

Source: World Health Organization

The risk of HIV transmission and type of breastfeeding (no ARVs): Zimbabwe

Zvitambo Vitamin A trial
- 4495 HIV-infected mothers and
- 2870 infants uninfected at 6 wks (feeding data on 2060 infants)

Postnatal transmission

<table>
<thead>
<tr>
<th>Type of Breastfeeding</th>
<th>HIV Transmission Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive BF</td>
<td>5.1</td>
</tr>
<tr>
<td>Predominant BF</td>
<td>6.7</td>
</tr>
<tr>
<td>Mixed BF</td>
<td>10.5</td>
</tr>
<tr>
<td>100 child years</td>
<td>100 child years</td>
</tr>
</tbody>
</table>

The risk of HIV transmission and type of breastfeeding (no ARVs): South Africa

<table>
<thead>
<tr>
<th>Type of Breastfeeding</th>
<th>Hazard Ratio</th>
<th>p</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBF (Exclusive Breastfeeding)</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BM* + fluid/food (in first 6 months)</td>
<td>1.56</td>
<td>0.308</td>
<td>0.66-3.69</td>
</tr>
<tr>
<td>BM + solids (in first 6 months)</td>
<td>10.87</td>
<td>0.018</td>
<td>1.51-78.00</td>
</tr>
<tr>
<td>BM + formula feeds (in first 3 months)</td>
<td>1.82</td>
<td>0.057</td>
<td>0.98-3.36</td>
</tr>
</tbody>
</table>

*BM = Breastmilk

The dilemma: preventing HIV vs child survival

HIV transmission

morbidity/mortality

Breast feeding?

Formula milk?
If prevention of mother-to-child transmission of HIV were the only priority then …

- Give all HIV-infected mothers antiretroviral drugs, and
- Avoid all breastfeeding (high income countries)

Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: A pooled analysis – WHO, Lancet 2000

<table>
<thead>
<tr>
<th>Protection provided by breastfeeding</th>
<th>&lt; 6 months</th>
<th>6-11 months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diarrhoea</strong></td>
<td>6.1</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>ARI</strong></td>
<td>1.9</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*Odds of dying of non-breastfed infant to odds of dying of breastfed infant


Global distribution of breastfeeding at 12 months

In 2015, approx. 820,000 children died because of sub-optimal / no breastfeeding

Estimated number of adults and children living with HIV (2016)

Total: 36.7 million [30.8 million-42.9 million]

Source: AIDS. Global Information and Education on HIV and AIDS. www.avert.org/infographics/number-people-living-hiv-2016
**HIV/AIDS burden and mortality**

- About 1.5 million girls and women were pregnant and living with HIV in 2014 — more than 90% of them live in Sub-Saharan Africa
- 5.6 million children under five died in 2016, with nearly 75% of all the deaths attributable to six conditions: neonatal causes, pneumonia, diarrhea, malaria, measles, and HIV/AIDS

**HIV free survival: a parent’s perspective**

- To have children of mothers living with HIV to survive while remaining HIV uninfected is the top priority
- The success of prevention of mother-to-child-transmission (PMTCT), including cost-effectiveness, needs to be measured in terms of HIV-free survival and not just transmissions averted

**How WHO recommendations on HIV and infant feeding have evolved**

1987

- Acknowledged that HIV transmission occurs through breastmilk but actual risk was unknown
- Additional epidemiological and laboratory research is needed on the risks of HIV transmission through breastmilk and the potential benefits of breastmilk in situations where infants have been exposed to HIV or are already infected
- Continue to support breastfeeding – consider balance of risks if mother known to be HIV-infected
- Pasteurise pooled breastmilk if possible

2000

- When replacement feeding is acceptable, feasible, affordable, sustainable and safe, avoidance of all breastfeeding by HIV-infected mothers is recommended
- Otherwise, exclusive breastfeeding is recommended during the first months of life
- To minimize HIV transmission risk, breastfeeding should be discontinued as soon as feasible, taking into account local circumstances, the individual woman’s situation and the risks of replacement feeding (including infections other than HIV and malnutrition)

**How WHO recommendations on HIV and infant feeding have evolved**

2016

- Non breastfeeding from birth
- Early cessation of BF

But … concern re. the risks associated with not breastfeeding

While the risks of not breastfeeding by HIV uninfected mothers in resource-limited settings were recognised in 2000, there was hope that HIV-infected mothers

- with additional counselling and support, and,
- the added motivation of preventing all HIV transmission

... would somehow be different
### How WHO recommendations on HIV and infant feeding have evolved

**2007**
- Exclusive breastfeeding is recommended for HIV-infected mothers for the first 6 months of life unless replacement feeding is acceptable, feasible, affordable, sustainable and safe for them and their infants before that time.
- At six months, if replacement feeding is still not acceptable, feasible, affordable, sustainable and safe, continuation of breastfeeding with additional complementary foods is recommended, while the mother and baby continue to be regularly assessed.


### WHO recommendations on antiretroviral treatment (ART)

- **WHO Guidelines on HIV and infant feeding** are intrinsically linked to updated recommendations on ART.
- **WHO recommendations on antiretroviral treatment between 2010 and 2016 evolved from**:
  1. Lifelong treatment only for pregnant women and mothers fulfilling specific immunological or clinical criteria **AND** antiretroviral drug prophylaxis either to breastfeeding infants (option A) or to lactating mothers (option B).
  2. to lifelong treatment for all pregnant women and mothers.
  3. to lifelong treatment for all, from whenever diagnosed.

### 2010 WHO guidelines HIV and infant feeding principles and recommendations

- Principles define the values and context within which recommendations are implemented.
- Recommendations reflect the best available research evidence base.
- **9 principles and 7 recommendations**:
  - Generally reinforced former principles and recommendations:
    - Optimal feeding practices of infants of HIV uninfected mothers or mothers of unknown HIV status
    - Feeding of infants already known to be HIV-infected
    - Protecting and promoting optimal infant feeding practices in general population.


### 2010 WHO principles on HIV and infant feeding

1. Balancing HIV prevention with protection from other causes of child mortality
2. Integrating HIV interventions into maternal and child health services
3. Setting national recommendations for infant feeding in the context of HIV
4. When antiretroviral drugs are not (immediately) available
5. Informing mothers known to be HIV-infected about infant feeding alternatives

### 2010 WHO recommendations on HIV and infant feeding

6. Ensuring mothers receive the care they need
7. Which breastfeeding practices and for how long
8. When mothers decide to stop breastfeeding
9. What to feed infants when mothers stop breastfeeding
10. Conditions needed to safely formula feed
11. Heat-treated, expressed breast milk
12. (Feeding) When the infant is HIV-infected
Setting national recommendations for infant feeding in the context of HIV (2010)

National (or sub-national) health authorities should decide whether health services will principally counsel and support mothers known to be HIV-infected to:

- breastfeed and receive ARV interventions, or
- avoid all breastfeeding,

as the strategy that will most likely give infants the greatest chance of HIV-free survival.

This decision should be based on international recommendations and consideration of the socio-economic and cultural contexts of the populations served by Maternal and Child Health services, the availability and quality of health services, the local epidemiology including HIV prevalence among pregnant women and main causes of infant and child mortality and maternal and child under-nutrition.

… in settings where national authorities decide to promote and support BF and ARVs to improve HIV FS in exposed infants …

Which breastfeeding practices and for how long? (2010)

Mothers known to be HIV-infected (and whose infants are HIV-uninfected or of unknown HIV status) should exclusively breastfeed their infants for the first 6 months of life, introducing appropriate complementary foods thereafter, and continue breastfeeding for the first 12 months of life.

Breastfeeding should then only stop once a nutritionally adequate and safe diet without breast milk can be provided.

When HIV-infected mothers decide to stop breastfeeding (at any time) they should do so gradually within one month.

*12 months represents the duration for most HIV-infected mothers that capitalizes on the maximum benefit of breastfeeding in terms of survival (excluding any consideration of HIV transmission). In the presence of ARV intervention to reduce risk of transmission, this combination may give the best balance of protection vs. risk.

Why the major change in 2010?

<table>
<thead>
<tr>
<th>Before 2010</th>
<th>From 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual approach:</td>
<td>Public health approach:</td>
</tr>
<tr>
<td>Individual counselling of mothers living with HIV for individual decision making</td>
<td>National or local authorities recommend infant feeding method for children of mothers living with HIV</td>
</tr>
</tbody>
</table>

“Transformational”

What drove the WHO 2010 revisions and recommendations?

1. The evidence base
   - Efficacy and safety of ARVs to prevent HIV transmission through BF
   - The risks associated with not BF
   - The optimal duration of BF by HIV-infected mothers
   - Maternal health considerations

2. Programmatic experiences
   - Programmatic experiences of implementing previous recommendations
     - Counselling and outcomes

2009 Mma Bana Study - Botswana

Study protocol:

Breastfeeding mothers with a CD4 ≥200 (commonly not eligible for ART) were offered ARVs.

2 randomized arms:
- Mothers whose CD4 ≥200 received either
  a. Lopinavir/Ritonavir/Combivir for 6 months or
  b. Abacavir/AZT/3TC while breastfeeding

1 observational arm:
- Mothers whose CD4 <200 (eligible and treated with ART) were the control group

Viral suppression >92% for all groups

Breastfeeding, antiretroviral and nutrition (BAN) study

Study protocol (3 arms):
- a. Control
- b. Mothers receive LPV/r for 28 weeks (breastfeeding period)
- c. Breastfeeding infants received daily NVP for 6 months

![Graph showing Infant HIV transmission and mortality rates](image)

**Transmission at 6 months**
- Control: 6.0%
- Maternal LPV/r: 5.5%
- Inf NVP: 7.0%

**Death at 6 months**
- Control: 2.0%
- Maternal LPV/r: 1.8%
- Inf NVP: 2.9%


Kesho Bora Study
Kenya, Burkina Faso, South Africa

HIV-free survival of exposed infants

Randomized control trial study:
- 2 randomized arms:
  - Pregnant women received AZT+3TC+LPV/r either until
    a. delivery only (short); or
  - b. until the end of the breastfeeding period (6 months) (triple)

![Graph showing Infant HIV-free survival rates to 12 months of age](image)

**Infant HIV-free survival rates to 12 months of age**

- Short: 8.4%
- Triple: 9.3%

Extended impact of intervention

![Table showing Infant HIV-free survival rates to 12 months of age](image)

<table>
<thead>
<tr>
<th>Age in months</th>
<th>Type</th>
<th>Extremes</th>
</tr>
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<tbody>
<tr>
<td>1 month</td>
<td>Short</td>
<td>8.3%</td>
</tr>
<tr>
<td></td>
<td>Triple</td>
<td>8.8%</td>
</tr>
<tr>
<td>3 months</td>
<td>Short</td>
<td>8.0%</td>
</tr>
<tr>
<td></td>
<td>Triple</td>
<td>8.3%</td>
</tr>
<tr>
<td>6 months</td>
<td>Short</td>
<td>7.6%</td>
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<td></td>
<td>Triple</td>
<td>7.9%</td>
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<td>12 months</td>
<td>Short</td>
<td>7.4%</td>
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<td></td>
<td>Triple</td>
<td>7.7%</td>
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The Kesho Bora Study Group. *The Lancet Infectious Diseases* 2011;11:3

And evidence of significant risks associated with not breastfeeding even with counselling and support

- Non breastfeeding from birth
- Early cessation of BF

2010 WHO review of studies concluded ...

Strong evidence that...
- ARV interventions to infants or mothers significantly reduce HIV transmission through breastfeeding
  - No evidence of diminished protection over time
- No evidence of significant drug-related adverse events
  - No increased adverse events with prolonged ARV intervention
  - NVP adverse events occur within first few weeks and do not accumulate with longer exposure
  - Dose of NVP given to infants as prophylaxis is less than that routinely given as ART for infected infants
Early mortality through age 7 months is higher in formula-fed than breastfed + AZT infants.

Predominant causes infant death: Diarrhoeal diseases and pneumonia

Breastfeeding, mother-to-child HIV transmission and mortality among infants born to HIV-infected women on highly active antiretroviral therapy in rural Uganda.

- Decreased survival among infants who stopped BF early or who were never BF
- Adjusted Hazard Ratio = 6.19 (95% CI 1.41–27.0) \( p = 0.001 \)
- 97% infants were tested at 6 wks – none infected
- Difference was independent of maternal health or if receiving ART

Knowledge of nurses and counsellors about the risk of HIV transmission through breastfeeding

Question:
If 100 HIV-infected mother breastfeed their children up to 2 yrs, how many children will be infected? (mother and child do not receive any ARVs)

334 nurses/ counsellors interviewed in 4 countries

Why had counselling and support of women living with HIV re. appropriate choice of feeding practice been so difficult?

Knowledge of nurses and counsellors about the risk of HIV transmission through breastfeeding

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Feeding at some PMTCT sites

The quality of infant feeding counselling translated into HIV free survival of infants.

Woldenbeset. IAS 2009
Replacement feeding in PMTCT sites

Sample of milk collected from bottles (n=94) being offered to infants brought by mothers to PMTCT clinic follow-up visits
- 63% heavily contaminated with E.coli
- 28% diluted (based on protein concentration)

In spite of
- All mothers having completed 12 years of education
- 72% having fridges
- All received good counselling on infant feeding practices
- 15-20% mothers reported free FF being used for something other than index child
  - Sold/exchanged
- 50-75% reported running out - Mainly because of clinic supply


How have HIV-infected mothers who previously gave their infants formula feeds, or where health facilities routinely provided formula milk, reacted to the 2010 recommendations?

2009 Mma Bana Study - Botswana

- 1248 pregnant women referred to study sites
- After counselling about study interventions, 110 (8.8%) declined to enroll because they preferred to give formula feeds


2016 Guideline updates

- Public health approach maintained
- Two recommendations revised or added
- Two guiding practice statements

2016 Guideline updates

For how long should a mother living with HIV breastfeed?

Mothers living with HIV should breastfeed for at least 12 months and can continue breastfeeding for up to 24 months or longer (as for the general population) while being fully supported for ART adherence.

2016 Guideline updates

Support for mothers living with HIV

National and local health authorities should actively coordinate and implement services in health facilities and activities in workplaces, communities and homes to protect, promote and support breastfeeding among women living with HIV.
**Guiding principle #1**

Mothers living with HIV and health care workers can be reassured that ART reduces the risk of postnatal HIV transmission in the context of mixed feeding. Although exclusive breastfeeding is recommended, practising mixed feeding is not a reason to stop breastfeeding in the presence of ARV drugs.

**Guiding principle #2**

Mothers living with HIV and healthcare workers can be reassured that shorter durations of breastfeeding less than 12 months are better than never initiating breastfeeding at all.

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**Guidance to countries**

Review position/policies

- Review the evidence
- Assess type of epidemic
- Assess contribution of infectious diseases and malnutrition to infant mortality and potential impact of safer BF on HIV-free survival
- Assess quality and coverage of PMTCT/ART services
- Consider financial and human resource costs of options
- Formulate national infant feeding and HIV strategy

Plan implementation

- Advocacy to health care workers, health professionals and communities to gain confidence for support in implementation
- Training, commodities
- Local prototypes and plan for scale-up
- Identify what national materials need to be revised
- Funding applications e.g. Global Fund

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**How does a breastfeeding/ART approach relate to the national policy on IYCF?**

Simplified messages:

- All infants can now gain the protection and benefits of breastfeeding
- For mothers living with HIV, clinics will provide lifelong ART that significantly reduces the risk of transmission
- Mothers living with HIV should breastfeed for 12 months and can be continue to breastfeed for 24 months or longer while being fully supported for ART adherence

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**What does this mean for the individual health worker in the clinic?**

- (at least) 3 aspects to consider
Informing mothers known to be HIV-infected about infant feeding alternatives

Pregnant women and mothers known to be living with HIV should be informed of the infant feeding strategy recommended by the national or sub-national authority to improve HIV-free survival of exposed infants and the health of mothers living with HIV and informed that there are alternatives that mothers might wish to adopt.

This principle is included to affirm that individual rights should not be forfeited in the course of public health approaches.

Providing services to specifically support mothers to appropriately feed their infants

Skilled counselling and support in appropriate infant feeding practices and ARV interventions to promote HIV-free survival of infants should be available to all pregnant women and mothers.

Recommend a single option within a national health framework does not remove the need for skilled counselling and support to be available to pregnant women and mothers. The nature and content of counselling and support that are required will be specified in implementation guides and training courses.

When mothers want to replacement feed

Mothers known to be living with HIV should only give commercial infant formula milk as a replacement feed to their HIV-uninfected infants or infants who are of unknown HIV status, when specific conditions are met:

- safe water and sanitation are assured at the household level and in the community
- the mother/caregiver can reliably provide sufficient infant formula milk to support normal growth and development of the infant
- the mother/caregiver can prepare it cleanly and frequently enough so that it is safe and carries a low risk of diarrhoea and malnutrition
- the mother/caregiver can, in the first 6 months, exclusively give infant formula milk
- the family is supportive of this practice
- the mother/caregiver can access health care that offers comprehensive child health services.

What is needed so that health workers will want to promote breastfeeding with ARVs and HIV-positive mothers will want to breastfeed?

Findings suggest that WHO Guidelines on preventing vertical transmission of HIV through exclusive breastfeeding in resource-limited settings are not being translated into action by governments and front-line workers because of a variety of structural and ideological barriers.

What is the relevance of breastfeeding to women and children in low-, middle- and high-income countries in the 21st century?


Rollins NC, et al. Why invest, and what it will take to improve breastfeeding practices? The Lancet 2016;387:491-504

www.data.unicef.org/resources/breastfeeding-21st-century-epidemiology-mechanisms-lifelong-effect/
More than ever: a coming together of recommendations and benefits for mothers living with HIV and their infants

- Major opportunity to improve maternal and child HIV-free survival
- Retention-in-care and ART adherence among mothers are essential for optimal health and survival of mothers and children alike
- Simplified messages provide the best opportunity in 20 years to promote the best infant feeding practices for all mothers and their infants without compromising safety

New questions and opportunities

- How to improve breastfeeding practice in settings where HIV is still prevalent and reverse the stigma and perceptions on breastfeeding?
- Mothers living with HIV in high resource settings are questioning whether they too can breastfeed!
  - Public health and ethics

The next frontier

- The Millennium Development Goals focussed on survival and prevention of HIV transmission
- The Sustainable Development Goals focus on SURVIVE, THRIVE AND TRANSFORM
- As any parent will tell us, the HIV community should aim for more …. HIV free survival and development