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Review

Evaluating Infant Feeding Strategies in Botswana: Insights into PMTCT Best Practices from 1998 to 2012

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In this review, the extent to which the Government of Botswana (GoB) applied international health recommendations and guidelines on infant feeding "best practices" within the context of the prevention of mother-to-child transmission (PMTCT) of human immunodeficiency virus (HIV), into its national infant feeding policies between 1998 and 2012 was assessed. The infant feeding guidelines of focus here are those endorsed by the World Health Organization (WHO) between 1998 and 2006, namely, involving the promotion of exclusive breastfeeding for infants in the first six months of life, irrespective of the HIV status of their mothers, under circumstances in which uninterrupted access to safe formula feeding cannot be ensured. This review identifies a significant delay in policy transfer from international guidelines to Botswana's national infant feeding policies, particularly between the years 1998 and 2006. The need for more effective policy coordination and more efficient research management are recommended to the Botswana government as a means of avoiding such occurrences in the near future. These recommendations are also relevant to other low and middle-income countries and particularly to many countries within sub-Saharan Africa, where HIV-endemicity and high rates of vertical transmission persist in many countries, and where improvements in health policy implementation mechanisms can afford many benefits.

Key words: Mother-to-child transmission (MTCT) of human immunodeficiency virus (HIV), prevention of mother-to-child transmission (PMTCT) of HIV, infant feeding policies, Government of Botswana (GoB), Ministry of Health of Botswana (GoB MoH), acceptable, feasible, affordable, sustainable and safe (AFASS).

INTRODUCTION

Integral to the 2011 political declaration on HIV and AIDS was the commitment made by member states of the United Nations (UN) General Assembly, to endeavor to eliminate all new cases of mother-to-child transmission (PMTCT) of HIV by 2015 (UNAIDS, 2011). This was largely a result of the exceedingly high numbers of individuals that have continued to be newly infected with HIV annually, and the fact that many infants continue to be born having already contracted the HIV virus. Notably, in 2009, an estimated 370,000 children globally contracted HIV during the prenatal and breastfeeding period (UNAIDS, 2010). In Botswana alone, with a population of only 1,952,000 persons (United Nations Population Division, 2012), it was estimated that 20,000 children, defined as persons under the age of 15, were thought to be living with HIV in 2009 (UNAIDS, 2010). An additional 886 new child infections also occurred within the country in the same year (GoB AIDS Response Report, 2012). Also, the risk of vertical transmission in the country still remains considerable as the HIV prevalence among adults

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aged 15 to 49 years in Botswana is 25% (GoB AIDS Response Report, 2012), while the estimated prevalence among pregnant women is 30.4% (MoH ANC Surveillance Report, 2011). In light of this national epidemic, concerns in Botswana have arisen regarding optimal infant feeding practices within the context of the prevention of mother-to-child transmission (PMTCT) of HIV [GoB AIDS Response Report, 2012; Botswana MDG Status Report, 2010]. This has especially been the case as the country has continued to experience higher than expected infant and under-five mortality rates due to non-HIV/AIDS-related causes, such as diarrheal diseases (GoB AIDS Response Report, 2012), which often resulting from the ingestion of foods and liquids derived from unsafe water sources that are given to infants as alternatives to breast milk.

Additionally, although the rate of new child infections experienced in Botswana in 2009, represent a drop of 78% from their 2001 estimates (Government of Botswana AIDS Response Report, 2012), these figures still remain considerably high when compared with many of the nation's developed country counterparts wherein new cases of HIV among children have virtually been eliminated (WHO, 2010a). These trends both elucidate and reaffirm the critical role that both the breastfeeding period and appropriate breastfeeding practices, continue to have on the trajectory of national HIV epidemics. This is particularly so with respect to the epidemiology of HIV transmission among pediatric populations in low and middle-income countries (LMICs), and namely in sub-Saharan Africa where more than 90% of the global newly acquired child HIV infections occurred in 2011 (UNAIDS, 2012) .

Within the same context, the identification of the presence of the HIV virus within the breast milk of HIV-infected mothers has been well documented, and breastfeeding has thus been established as a significant route of mother-to-child transmission (MTCT) of HIV (Ziegler et al., 1985; Vonesch et al., 1992; Nduati et al., 1994; BHITS, 2004). Noteworthy however, is that the nutritious and protective benefits that breastfeeding affords infants against the risk of deaths due to infectious diseases, such as diahrroea and pneumonia, as well as malnutrition, has also been well documented over the years (WHO, 2007; UNICEF, 2009; WHO, 2010b). These latter advantages have also resulted in breast milk being tagged as the ‘ideal’ food for infants and young children (Latham, 1997; WHO, 2010b).

Similar observations have also influenced endorsements such as those made by members of the international health community, such as WHO, who have endorsed breastfeeding when acceptable, feasible, affordable, sustainable and safe (AFASS), among mothers living with HIV/AIDS (WHO, 2010b).

Accordingly, the critical importance of evidence-based infant feeding policy and infant feeding policy transfer (and implementation), from international health guidelines and recommendations into the national policies of countries with high burdens of HIV/AIDS, cannot be understated. The need for greater progress among countries, and particularly those within sub-Saharan Africa, with the development of policy frameworks for preventing new child infections, as well as for more efficiently adapting existing systems and approaches for preventing new child infections as new evidence becomes available, has also been observed (UNAIDS, 2012).

Therefore, in this review, we use the experiences of Botswana to demonstrate some of the implications that such policy transfer and implementation can have not only on PMTCT, but also on the overall status of infant health. The national situation in Botswana is also noteworthy, as the country's PMTCT program has seen a significant reduction in mother-to-child transmission of HIV from 20 to 40% in 2001 to around 4% in 2009, with an associated increase in PMTCT uptake from 27% in 2002, to 94% in 2011 (GoB AIDS Response Report, 2012). The former feat has also resulted in the country being heralded as a success story, due to its achieved declines in prevalence levels of vertical transmission of HIV (GoB AIDS Response Report, 2012).

Against this backdrop, this study reviews infant feeding policy in Botswana between the years 1998 and 2012. Despite the first case of HIV/AIDS documented in Botswana, having done so in 1985, which was also the year that the first case of HIV transmission through breastfeeding (globally) had been documented (NACA et al., 2008); the authors have nevertheless selected the year 1998 as our starting point for this review because it was the first year in which the Government of Botswana (GoB) took observably substantive measures to try and curtail the levels of MTCT in the country. The end point of 2012 for this review was selected as it represents the last year up to which the authors reviewed Botswana’s infant feeding policy.

In this process, this review examines the factors that precipitated both policy transfer, as well as a delay in policy transfer from international infant feeding guidelines and recommendations into the national infant feeding policies of the Government of Botswana. Additionally, the review assesses the impact of overall levels of infant feeding policy transfer on both the rates of mother-to-child transmission (MTCT) of HIV, as well as on the levels of overall HIV-free infant survival in Botswana. Lastly, this review aims to derive insights from the experiences of Botswana that can be applied to other HIV endemic countries that are similarly experiencing high rates of mother-to-child transmission of HIV, and particularly to the country's counterparts in sub-Saharan Africa.

METHODOLOGY

A systematic search was carried out by each of the authors, using the terms 'breastfeeding', 'infant health', breastmilk', 'infant formula', 'breastfeeding and HIV', 'Botswana and infant', and various combinations of these terms. A focused literature review of the topic ‘breastfeeding and HIV’ was also conducted. The medical and

scientific databases used were: PUBMED and EMBASE. The WHO's, Nutrition for Health and Development tool was also consulted. These sources were cumulatively used to retrieve relevant articles, reports, and commentaries that addressed: the benefits of breastfeeding for the growth, health and development of infants and young children; the health effects of other forms of infant feeding (including mixed feeding); and the risk of transmission of HIV from breastfeeding. Publications that did not address these factors were excluded, and no limits were placed on the publication date used for our search.

The identified databases and international health publications were reviewed to identify and map available international infant feeding guidelines. A list of the publications and guidelines that were referred to included: WHO's infant and young child feeding list of publications; UNICEF's HIV and infant feeding guidelines; University of California, San Francisco's Center for HIV Information PMTCT: Related Resources; Women, Children, and HIV: resources for prevention and treatment (Center for HIV Information); and the Emergency Nutrition Network: Infant and Young Child Feeding in Emergency Core Group.

Additionally, the infant feeding guidelines of the Botswana government, as well as data on the infant feeding practices performed at the local level within the country were derived from documents, reports and publications produced by the Government of Botswana's Ministry of Health; the Botswana's Department of HIV/AIDS Prevention and Care; Botswana's National AIDS Coordinating Agency; WHO/UNICEF/UNAIDS: Botswana country information; and the University of California, San Francisco Center for HIV Information Botswana.

RESULTS

Infant feeding guidelines espoused by international health organizations

International health organizations have a mandate to be objective and to formulate policies that are in line with the best available evidence base (WHO, 2010b). Available evidence reveals that the infant feeding policies of the WHO over the years, have been reflective and coherent with the available scientific evidence base on breastfeeding, infant health, and HIV (Ziegler et al., 1985; BHITS, 2004; Theiry et al., 1985; WHO, 1987; Bertolli et al., 1996; Ekpini et al., 1997; Humphrey, 2010; WHO, 2001; Iliff et al., 2005; WHO, 2007). Thus, within the context of infant feeding guidelines pertinent to PMTCT, WHO's guidelines acknowledged both the costs and benefits of formula and breast milk feeding among HIV+ mothers (that is, the potential risk of infant deaths if not breastfed, and the risks of HIV transmission if breastfed). Accordingly, dating back to 2001, WHO recommended that HIV+ women should avoid breastfeeding if they met the AFASS criteria for replacement feeding and if not, then they should exclusively breastfeed during the first 6 months of an infant's life (WHO, 2001).

Furthermore, an assessment of WHO's international infant feeding guidelines in 1998, 2001 and 2006 reveal that their guidelines were clearly consistent and coherent with one another. This was such that the 1998 guidelines stated that 'when children born to women living with HIV can be ensured uninterrupted access to nutritionally safe and adequate breast milk substitutes, then they are at less risk of illness and death' (Humphrey, 2010). The 2001 and 2006 guidelines recommended that "When replacement feeding is AFASS, then avoidance of breastfeeding is recommended; otherwise, exclusive breastfeeding is recommended during the first six months of life (WHO, 2001, 2007).

Efforts made by the government of Botswana in the area of PMTCT

From 1998 onwards, the GoB took several measures to address the issue of PMTCT within the country. These initial efforts were partly reflected by the country's formulation of its infant and young child feeding policy around the same time that UNICEF started to support PMTCT programs in many low-income countries (LICs), in 1998 (UNICEF, 2003). In 1998, the GoB also formed a technical advisory committee (TAC) comprised of staff from Botswana's ministries, including the food and nutrition units, as well as staff from WHO and UNICEF. This committee, tasked with documenting the implementtation of a PMTCT pilot program in the country, would in the process also define a package for the PMTCT program, develop protocols, guidelines, an implementation plan, and submit a budget to the ministry of health for assessment (UNICEF, 2003).

In conjunction with these efforts, in 1999, the GoB would take arguably the most concrete measure until that point in its aim of tackling MTCT of HIV. This would involve the initiation of its widespread establishment of PMTCT facilities across the country (NACA et al., 2008). After establishing the first PMTCT site in 1999 in two districts, Gaborone and Francis Town, the GoB went on to make such sites available nationwide by the end of 2002 (NACA et al., 2008).

Over the years, the GoB had also demonstrated a strong commitment to reducing MTCT of HIV through breastfeeding. In June 2001, at the United Nations General Assembly Special Session on HIV/AIDS (UNGASS), the GoB would be one of the nations that would jointly declare its commitment to reducing the proportion of infants being infected with HIV by 20% by 2005, and by 50% by 2010 (United Nations, 2001). It asserted that it would achieve this feat through ensuring that HIV+ women had access to effective treatment, particularly ART, in order to reduce MTCT of HIV; and that where appropriate, the provision of breast milk substi-tutes and a continuum of care would also be provided (United Nations, 2001). Similarly, and in more recent years, estimates in changes in the GoB's spending on HIV/AIDS also reveal that spending has increased.

This has been such that the government has disbursed a greater amount of its domestic national funds, 165.1 million USD in 2005, 130.9 million USD in 2006, 203.8 million USD in 2007, 228.7 million USD in 2008, to cover its HIV/AIDS-related costs (UNAIDS, 2008, 2010). As

shown, domestic spending by the GoB represented over 65% of the total funds spent on HIV/AIDS for each of the respective years between 2005 and 2008 (UNAIDS, 2008, 2010).

Infant feeding policies and nationally observed infant feeding practices between 1998 and 2006

Although commendable in many respects, the efforts made by the GoB between 1998 and 2006 to reduce national levels of MTCT, unfortunately did not go far enough, and were not consolidated by tangible policy changes that could have been taken to meet this end. This was partly reflected by the way in which the GoB failed to substantiate and clarify in accordance with one of the earlier cited recommendations; the grounds on which breast milk substitutes could be provided to HIV+ mothers, and only indicated that it would offer these substitutes to relevant mothers where appropriate, in addition to offering them access to effective treatment, namely ART (United Nations, 2001). Indeed, the lack of vigour with which this recommendation was enforced, and evidence that this important contingency within the guidelines was not rigorously clarified and executed on the ground, was reflected by a number of memorandum and initiatives that were released by the GoB around the same time. An example includes the 1998 document, the "Prevention of Mother to infant transmission of HIV and the establishment of a national HIV/AIDS fund", in which policy recommendations were made for the introduction of essential drugs such as Zidovudene (AZT) in PMTCT health facilities (Latham and Kisanga, 2000). Noteworthy here, was that while these recommendations did not explicitly state that infants born to HIV positive mothers who were given AZT should be formula fed, the document contained an annual national budget for the provision of free infant formula or "bottle feeding" to all HIV+ mothers, which corresponded with an annual estimated stated cost of "5,301,100 Pula" (691,400 USD) (Latham and Kisanga, 2000).

In another government document titled "Mother to Child Transmission of HIV Infant Feeding Guidelines for the Health Worker", one of the intervention strategies endorsed, which the GoB felt had proven to contribute significantly to the reduction of MTCT, included the "avoidance of breastfeeding" (Latham and Kisanga, 2000). These findings support the assertion that by the time PMTCT pilot programs were established in Botswana in 1999 (NACA et al., 2008), the country's national infant feeding policy supported the 'avoidance of breastfeeding', as well as the provision of free infant formula to HIV positive mothers. This was corroborated by Tlou et al. (2000) who argued that Botswana's pilot PMTCT strategy involved 'purchasing and distributing AZT and breast milk substitutes'. UNICEF (2004) further substantiated these findings through its observation that during the period at which the first PMTCT sites were established in Botswana, that the GoB used government funding sources to procure and distribute infant formula to HIV positive mothers.

Furthermore, in a 2001 study that evaluated infant feeding practices in Botswana among HIV infected and uninfected women at PMTCT sites, and women of unknown HIV status at non PMTCT sites (Table 1).

Notably, approximately 90% of all HIV positive mothers interviewed reported feeding their babies with infant formula, whereas only 3% reported exclusive breast-feeding. These infant feeding practices could be seen as consistent with recommendations made in Botswana's "mother-to-child transmission of HIV feeding guidelines" report, which espoused the "avoidance of breastfeeding" as a way to curb the spread of the epidemic (MoH, 2001). This study also found that while most HIV+ women chose to formula feed, in contrast to uninfected mothers and mothers of unknown HIV status who preferred to breast-feed, that the rate of exclusive breastfeeding among the latter was very low, which was mainly because of the early introduction of infant formula. For example, 77 and 60% of HIV-uninfected mothers and mothers of unknown status, respectively, mixed fed their babies before they were 6 months of age (MoH, 2001).

In 2001, Botswana's Ministry of Health also documented that the government's practice of promoting formula feeding for HIV+ mothers had a considerable "spill-over effect", as it had influenced the infant feeding practices of uninfected women and those of unknown HIV status (UNICEF, 2004). They asserted that this likely influenced the significant number of these women (77 and 60%, respectively) who reported mixed feeding. These factors may have likely enticed many of these women to adopt mixed feeding as normal breastfeeding practice (MoH, 2001). However, this practice of mixed feeding was and remains inconsistent with WHO's guidelines, which had, and have continued to recommend exclusive breastfeeding for the first six months of life to uninfected mothers and those of unknown HIV status (WHO, 2001, 2010b).

Similar findings, which reflect the endorsement of formula feeding by the GoB, and which also demonstrate that international infant feeding guidelines were likely not adopted on a wide-scale at the local and community levels, arise from studies which documented the widespread practice of infant formula feeding and the technical incapacities of health workers to undertake appropriate infant feeding counseling sessions (MoH, 2001; Creek et al., 2010; Chopra et al., 2008). In the Botswana Ministry of Health's 2001 study assessing the infant feeding patterns of HIV infected and uninfected women at Botswana PMTCT clinics, they found that of the 158 HIV+ mothers assessed, 87% reported practicing exclusive replacement feeding, 10% reported mixed feeding, and only 3% reported exclusive breastfeeding within the first 6 months of an infant's life (MoH, 2001).

Table 1. Reported infant feeding practices in Botswana from 2001 to 2002 following the introduction of PMTCT programs (among infants 0 to 6 months old, based on 24 h recall).

Infant feeding practice	HIV Status		
	HIV +	HIV -	Unknown
Botswana (infants 0 to 6 months old, based on 24 h recall)			
Exclusive breastfeeding (%)	3	17	32
Exclusive replacement feeding (%)	87	6	8
Mixed feeding (%)	10	77	60
Number of women	158	157	186

Botswana MoH (2001) [32]

Furthermore, and as delineated by the study described earlier, it is highly questionable whether the 87% of HIV+ mothers who reported exclusive replacement feeding, had actually all met the 'AFASS' criteria recommended by WHO. Indeed, and as observed by Shapiro et al. (2003), the acceptability and safety of this infant feeding practice in a context where breastfeeding was perceived as normal, and where the availability of clean water was lacking, brings about doubts as to whether the 'AFASS' criteria could realistically be met for any but a small proportion of HIV+ mothers. Additionally, Shapiro et al. (2003), also documented very low adherence to infant feeding strategies among rural Botswana HIV+ mothers who were either assigned to, or who personally chose exclusively formula feed.

2006 Flooding and subsequent diarrhea outbreak

Between November 2005 and February 2006, heavy rains and flooding occurred in Botswana, causing approximately 24,000 cases of diarrhea, and approximately 486 deaths in children under 5 years of age (Creek et al., 2010; Timberg, 2007). Mach et al. (2009) reported that the mortality rate among children affected by the outbreak was above the international threshold for emergency action, with an estimated 547 excess deaths. This was in comparison to the only 9,166 diarrhea-cases and 21 diarrhea-related deaths that occurred across the entire country in the first quarter of 2005 (Creek et al., 2010).

The Botswana Ministry of Health (MoH) in collaboration with the United States Center for Disease Control and Prevention (CDC) investigated the outbreak and found that the public water supply was contaminated in 26 villages tested, within which 63% of infants born to HIV+ women were formula fed from birth, and 20% of infants born to HIV- mothers were weaned from breast milk before the age of six months (Creek et al., 2010). Overall, they estimated that 35% of infants under 6 months of age were not breastfeeding. Additionally, upon conducting a closer examination of 154 children hospitalized for diarrhea, the CDC found that the majority (93%) were not breastfeeding. In one village visited, 30% of formula fed babies (and no other babies) died during the outbreak.

Thus, the CDC concluded that the severest morbidity and mortality that resulted from the outbreak occurred in children who were HIV negative, and who were not breastfed. On the strength of these findings, the CDC also recommended that the GoB review its infant and young child feeding policies (Creek et al., 2010). The premise for this recommendation also echoed the widespread international criticisms of the country's infant and young child feeding policies that the event had triggered. This was such that the GoB's national infant feeding policies had been identified as being incoherent with the scientific research evidence-base, as well as with international guidelines on infant feeding best practice (Creek et al., 2010; Timberg, 2007).

Subsequently, and as a result of this outbreak, the government then changed its national infant feeding guidelines in July 2006 to make them consistent with those of the WHO's. These revised national guidelines recommended exclusive formula feeding to HIV+ mothers for whom formula feeding is 'AFASS', and exclusive breastfeeding to HIV+ mothers for whom formula feeding is not 'AFASS'. Also, in July 2006, the Department of HIV/AIDS Prevention and Care in Botswana created a PMTCT training package for health workers with infant feeding guidelines that were more in line with WHO's 2001/2006 recommendations ([WHO, 2001, 2007). These guidelines were again reiterated in the 'Botswana National HIV/AIDS Treatment Guidelines: 2008 version", as elaborated in Table 2.

DISCUSSION

Challenges with implementing infant feeding policy shifts

Although available evidence on stated infant feeding policy shifts have been made by the government of Botswana since 2006, less than optimal changes with respect to policy implementation on the ground, and at the level of the community, have been observed during the same time period. For instance, in 2007, the GoB in collaboration with UNICEF published a progress report entitled "A World Fit For Children; Mid Decade Review",

Table 2. Botswana's 2006 to 2010 infant feeding guidelines.

Patient situation	Feeding recommended from 0 to 6 months	Feeding recommended from 6 to 24 months
HIV-negative women	Exclusive breastfeeding (no added foods or liquids, including plain water)	Breastfeeding until at least 2 years, plus complementary foods
HIV-positive women for whom formula feeding is AFASS*	Exclusive formula feeding (no added foods or liquids, including plain water)	Formula until 1 year, plus complementary foods
HIV-positive women for whom formula feeding is not AFASS*	Exclusive breastfeeding (no added foods or liquids, including plain water)	Early cessation of breastfeeding at six months with transition to formula feeding, plus complementary foods
Women of unknown HIV status (should be strongly encouraged to be tested.)	Exclusive breastfeeding (no added foods or liquids, including plain water)	Breastfeeding until at least 2 years, plus complementary foods

Botswana Department of HIV/AIDS Prevention and Care (2008).

in which it reported that by the end of 2006, 1,653 infants had been given ART from the PMTCT program, and of this number, 1,595 infants had been given infant formula (UNICEF, 2007). This implied that in the year 2006, 96% of infants born to HIV infected mothers who visited PMTCT sites, and who were receiving ART, were also being formula fed. Whether the mothers of these infants all met the 'AFASS' criteria is again unknown, but questionable.

Additionally, in the 2010 Botswana Assessment Report, in which the GoB's Ministry of Health (Nutrition and Food Control Division) carried out a national assessment of the status of the country's implementation of the Global *S*trategy for Infant and Young Child Feeding *(IYCF)* [1] , some of the noteworthy findings of the report identified that spill-over of infant formula feeding from PMTCT mothers to non-PMTCT mothers remained a challenge within the country (MoH GoB, 2010). The assessment also noted that health workers' skills in infant feeding counseling and support in HIV were sub-optimal, and that the support provided to mothers to better implement their infant feeding choices were inadequate (MoH GoB, 2010). Also, in assessing the extent to which national policies and programs were in place to ensure that HIV+ mothers were being informed about the risks and benefits of different infant feeding options, as well as on the extent to which they were being supported in carrying out their infant feeding decisions, the assessors provided very low ratings on the related criteria corresponding with these indicators (MoH GoB, 2010). For instance, some of the low scoring indicators included those on assessments pertinent to national efforts that had been made until that point to counter misinformation made on HIV and infant feeding, as well as on efforts made for the promotion, protection and support of 6 months of exclusive breastfeeding and continued breastfeeding in the general population (MoH GoB, 2010).

In light of these observations, a plausible explanation for the limited levels of infant feeding policy implementation undertaken in Botswana since 2006, could be due to the turn over time often experienced by countries that are in the process of translating policy from the level of government to the ground or community level. Also, other related and specific factors which may have impacted the limited levels of policy implementation in Botswana include: the lengthy and bureaucratic processes often involved with promulgating new information across health ministries and sectors; and the time required for retraining and upgrading the information supplied to health workers, designed to enable them carry out changes in health care practices. Also, with respect to the latter, and in the context of PMTCT in Botswana, such changes would also entail health workers having to modify their attitudes, behaviours and perceptions about the benefits of breastfeeding when consulting women living with HIV/AIDS on optimal practices for PMTCT and overall infant survival.

In addition to these findings, other data suggest that the country's infant feeding policy shift may have begun to be associated with a reduction in MTCT levels after 2006. For instance, in Botswana's 2008 and 2010 country progress reports, the government estimated that only 4.8 and 3.8% of infants born to HIV infected mothers were infected in 2007 and 2009, respectively. This represents a significant reduction from the 20.7% of infants infected in 2003, and the 11.5% of infants infected in 2005 (NACA, 2008). Namely, these findings can largely be explained by the improved increases in PMTCT coverage levels that the government had made for women living with HIV/AIDS

[1] *The Global S*trategy for Infant and Young Child Feeding *(IYCF)*, adopted at the World Health Assembly in 2002 was done so using the WBT*i* World Breastfeeding Trends Initiative tool in order to document the existing gaps in feeding practices, policy and programs (GoB MoH, 2010).

over this time period, which rose from 19% in 2003 to greater than 95% in 2009 (UNAIDS, 2006, 2010). Similarly, significant increases in ART coverage levels among children in Botswana have also been made over the past decade, such that in 2009, among the 25 countries with the greatest number of people living with HIV, Botswana was the only country that reported antiretroviral coverage of greater than 80% among children (UNAIDS, 2010). Also in the same year, only Botswana and South Africa achieved higher levels of antiretroviral therapy coverage among children than adults (UNAIDS, 2010). These findings are particularly notable when comparing Botswana's progress to that of the vast majority of its sub-Saharan African counterparts wherein ART coverage among children remained much lower (UNAIDS, 2010).

This evidence demonstrates that despite the limited levels of implementation of HIV infant feeding policy that has occurred in Botswana, there have nevertheless been observable declines in vertical transmission of HIV in the country. Also noteworthy is that in the period between 2005 and 2010, infant mortality dropped from 43 to 36 child deaths per 1000 live births; and that under-5 mortality dropped from 61 to 48 child deaths in the same respect (WHO, 2011). Furthermore, when compared with other countries in the sub-Saharan African region, Botswana's under-five mortality rate of 48 child deaths per 1000 live births is considerably lower than the regional average of 119 child deaths per 1000 live births (WHO, 2012). Thus providing evidence to support the fact that if Botswana were to better implement its infant feeding policy, it would be able to achieve even more marked declines in its overall infant and child mortality rates. This is also especially the case as HIV/AIDS continues to be the third leading cause of death among children under the age of five in the country (WHO, 2012).

These findings are also significant as some of the challenges that were being experienced by the GoB with implementing its infant feeding policies will likely also mirror challenges that other countries in the region experience when trying to achieve the same measures. Thus, taking Botswana as an example raises the issue of the need for better and more fortified policy implementtation mechanisms and frameworks in the region that can better ensure that there is a continuum between health policy formulation and implementation.

Reasons for delay in policy transfer

One of the explanations for the delay in infant feeding policy transfer undertaken by the GoB could be seen as due to the government's strong focus on trying to reduce the overall burden of HIV in the country. This was such that the GoB had tended to place a disproportionate focus on reducing HIV transmission and prevalence levels within the country, thereby limiting cumulative efforts that could have been directed towards improving the overall health and survival of the country's infants. This was demonstrated through the GoB's initial position, which supported infant formula feeding as the primary feeding method for women living with HIV/AIDS, as it was felt that this was an intervention, which could directly result in averting new child infections. In comparison, whereas the WHO's endorsed approach to infant feeding among mothers living with HIV/AIDS also aimed to reduce MTCT, the WHO however also gave consideration to the overall health of children when formulating their guidelines. This was conveyed through WHO's strong adherence to the AFASS criteria, which inherently emphasized the role that poor water and sanitation systems could have on undermining the overall health and development of infants, under circumstances in which infant formula was employed as a primary feeding method for mothers, vis-a-vis the option of breastfeeding. This was advocated even to HIV+ mothers who might be pursuing the infant formula feeding option, in order to avoid exposing their children to the risk of vertical transmission of HIV. Furthermore, despite the fact that this remained the position of the WHO, the GoB did not clearly incorporate these considerations into their national guidelines until at least 2006. Conversely also, and in principle, the GoB's policies were stipulated in such a way that it was obliged to provide free infant formula to HIV+ mothers at PMTCT clinics (Shapiro et al, 2003). This would occur regardless of whether any of the prerequisites for encouraging the use of infant formula, notably ensuring its acceptability, feasibility and sustainability, could be assured.

Corporate commercial interests within the baby food industry may have also enticed the GoB to endorse infant formula feeding. This is demonstrated by the fact that between 1999 and 2002, the GoB had procured infant formula from the local market (UNICEF, 2004), which could have possibly been at subsidized rates. The GoB had also opted to purchase this formula through the local market as opposed to receiving it at no cost from UNICEF (UNICEF, 2004). Similarly, the Botswana MoH (2001) and Chopra and Rollins (2008) reported that health workers in Botswana received free samples of infant formula outside of the health system's institutions, and that HIV+ mothers received branded formula, instead of generic ones, demonstrating clear violations of articles 5, 6 and 7 of the ICMBMS [2] (International Code of Marketing of Breastmilk Substitutes) (WHO, 1981). This also suggests that the baby food industry could have also had some influence over the provision of these free samples of formula. This conjecture is further substan-

[2]The International Code of Marketing of Breastmilk Substitutes was endorsed as a set of recommendations, collectively agreed upon by United Nation's Member States, at the World Health Assembly in 1981. The stated aim of this code was to 'contribute to the provision of safe and adequate nutrition for infants, by the protection and promotion of breast-feeding, and by ensuring the proper use of breast milk substitutes, when these are necessary, on thebasis of adequate information and through appropriate marketing and distribution' (WHO,1981).

tiated by the fact that immediately after the 2006 diarrhea outbreak, Botswana's Minister of Health launched the regulations on the marketing of foods for infants and children (UNICEF, 2006), and later during the same year, the ICMBMS was enacted as legislation within the country (IBFAN, 2006).

Similarly, and as observed more recently within the Botswana Assessment Report 2010 (on the *IYCF),* the GoB noted that some of the challenges they had been experiencing with the implementation and application of the International Code of Marketing of Breastmilk Substitutes, were the resistance by some baby food manufacturers for complying with all of the provisions of the GoB's regulations (MoH GoB, 2010). They also noted repeated violations of the government's regulations by baby food manufacturers (MoH GoB, 2010).

Conclusion

The findings of this review are noteworthy for other low and middle-income countries, and particularly for other countries in sub-Saharan Africa, where more than 90% of the new globally acquired child infections occurred in 2011. And yet despite demonstrated reductions in child infections having been observed between 2009 and 2011 in sub-Saharan Africa, which have largely been a result of scale-ups in the provision of infant feeding based prevention services (UNAIDS, 2012), much remains to be done in the domain of averting new child infections. Furthermore, in addition to breastfeeding, additional future improvements in child health survival will be contingent upon additional increases in ART coverage among pregnant women in sub-Saharan Africa. For instance, unlike in Botswana, who by 2009 had already achieved 92% coverage of ARV's among pregnant women living with HIV/AIDS, the overall average coverage levels for sub-Saharan African women receiving antiretroviral therapy or prophylaxis, remained a less satisfactory 59% (53 to 66%) in 2011 (UNAIDS, 2012).

Lastly, this review supports the need for assertive steps to be taken in low and middle-income countries and particularly those in sub-Saharan Africa, to encourage increased policy transfer and implementation when involving effective and evidence-based recommendations, such as those outlined by the WHO. Improving the uptake of such policies could be achieved through the development of commissions within countries, which identify best mechanisms for achieving national health objectives and goals. The establishment of coordinating systems and bodies, or policy reviewing units at different levels within health ministries, who encourage the application and implementation of evidence-based and best practice policies formulated at the international level, can also bolster such efforts. Corporate bodies, donors, and other external funding actors, may also play a role in enhancing policy transfer by demonstrating their social responsibility through encouraging the implementation of evidence-based policies within countries such as Botswana. Taken together, such cumulative and multi-faceted efforts will certainly also enhance the likelihood of countries in the region achieving the UN Political Declaration on HIV and AIDS' global goal of eliminating new child infections by 2015.

REFERENCES

Bertolli J, Louis ME, Simonds RJ, Nieburg P, Kamenga M, Brown C, Tarande M, Quinn T, Ou CY (1996). Estimating the timing of mother to child transmission of human immunodeficiency virus in a breast-feeding population in Kinshasa, Zaire. Journal of Infectious Diseases; 174, p. 722–726.

BFAN (2006). The International Baby Food Action Network. State of the code by country. The State of the Code by Country 2006 is a special edition published on the occasion of the Code's 25th anniversary.

Botswana Department of HIV/AIDS Prevention and Care (2010). Infant feeding guidelines, 2008.

Botswana. Millennium Development Goals. Status Report 2010 (2010). The Government of Botswana - Ministry of Finance and Development Planning. The United Nations in Botswana - Office of the Resident Coordinator.

Chopra M, Rollins N (2008). Infant feeding in the time of HIV: rapid assessment of infant feeding policy and programmes in four African countries scaling up prevention of mother to child transmission programmes. Archives of disease in childhood; 93, p. 288-291.

Creek T, Kim A, Lu L, Bowen A, Masunge J, Arvelo W, Smit M, Mach O, Legwaila K, Motswere C, Zaks L, Finkbeiner T, Povinelli L, Maruping M, Ngwaru G, Tebele G, Bopp C, Puhr N, Johnston SP, Dasilva AJ, Bern C, Beard RS, Davis MK (2010). Hospitalization and Mortality Among Primarily Nonbreastfed Children During a Large Outbreak of Diarrhea and Malnutrition in Botswana, 2006. Journal of Acquired Immune Deficiency Syndrome; 53(1).

Ekpini ER, Wiktor SZ, Satten GA, Adjorlolo-Johnson GT, Sibailly TS,Chin-Yih Ou, Karon JM, Brattegaard K, Whitaker JP, Gnaore E, De Cock KM, Greenberg AE (1997). Late postnatal mother-to-child transmission of HIV-1 in Abidjan, Cote d'Ivoire. Lancet; 349:1054–1059.

Humphrey J (2010). The Risks of Not Breastfeeding. Journal of Acquired Immune Deficiency Syndrome; 53 (1).

Iliff P, Piwozb E, Tavengwaa NV, Zunguza CD, Marinda ET, Nathoo KJ, Moulton LH, Ward BJ, Humphrey JH (2005). Early exclusive breastfeeding reduces the risk of postnatal HIV-1 transmission and increases HIV-free survival. AIDS; 19, p.699–708.

Latham M (1997). Human nutrition in the developing world. Food and Agricultural Organization (FAO) of the United Nations. Food and Nutrition Series No.29.

Latham M, Kisanga P (2000). Current status of protection, support and promotion of breastfeeding in four African countries. Actions to Protect, Support and Promote Breastfeeding in Kenya, Namibia, Botswana, and Uganda. Prepared for UNICEF ESARO. 2 October to 3 November, 2000.

Mach O, Lu L, Creek T, Bowen A, Arvelo W, Smit M, Masunge J, Brennan M, Handzel T (2009). Population-Based Study of a Wide-spread Outbreak of Diarrhea Associated with Increased Mortality and Malnutrition in Botswana, January– March, 2006. The American Society of Tropical Medicine and Hygiene; 80 (5), p. 812-818.

Ministry of Health, Botswana (2001). Evaluation of infant feeding practices by mothers at PMTCT and non-PMTCT sites in Botswana.

Ministry of Health: Republic of Botswana (2012). 2011 Botswana Second Generation HIV/AIDS Antenatal Sentinal Surveillance Technical Report.

NACA, ACHAP (2008). National AIDS Coordinating Agency & African Comprehensive HIV/AIDS Partnership. National Operational Plan for Scaling Up HIV Prevention in Botswana: 2008-2010. Developed by John Hopkins University and Family Health International for Botswana Government.

Nduati R, John G, Kreiss J (1994). Postnatal transmission of HIV-1 through pooled breast milk. Lancet; 344(8934), p.1432.

Republic Of Botswana (2012). Botswana 2012 Global Aids Response Report. Progress Report Of The National Response To The 2011 Declaration Of Commitments On HIV and Aids Reporting Period: 2010-2011 National Aids Coordinating Agency 3/31/2012. Government of Botswana (GoB).

Shapiro R, Lockman S, Thior I Stocking L, Kebaabetswe P, Wester C, Peter T, Marlink R, Essex M, Heymann SJ (2003). Low adherence to recommended infant feeding strategies among HIV-infected women: results from the pilot phase of a randomized trial to prevent mother-to-child transmission in Botswana. AIDS Educ Prev. 2003 Jun; 15(3):221-30.

The Breastfeeding and HIV International Transmission Study Group (BHITS) (2004). Late postnatal transmission of HIV in breast-fed children: an individual patient data meta-analysis. Journal of Infectious Diseases; 189(12), p. 2154-2166.

Theiry L, Sprecher-Goldberger S, Jonckheer T, Levy J, Van de Perre P, Henrivaux P, Cogniaux-LeClerc J, Clumeck N (1985). Isolation of AIDS virus from cell-free breast milk of three healthy virus carriers. The Lancet; 326(8460), p. 891-892.

Timberg C (2007). In Botswana, steps to cut AIDS proves a formula for disaster. The Washington Post, [online] 8 December.

Tlou S, Nyblade L, Kidd R (2000). Working report on community responses to initiatives to prevent mother-to-child transmission of HIV in Botswana.

UN (2001). United Nations. Declaration of commitment on HIV/AIDS. United Nations General Assembly Special Session on HIV/AIDS 25-27 June 2001.

UN Population Division (2012). United Nations Population Division. United Nations Department of Economic and Social Affairs. Population Division, Population Estimates and Projections Section. World Population Prospects, the 2012 Revision.

UNAIDS (2006). Joint United Nations Programme on HIV/AIDS. 2006 Report on the global AIDS epidemic. A UNAIDS 10th anniversary special edition.

UNAIDS (2008). Joint United Nations Programme on HIV/AIDS. 2008 Report on the global AIDS epidemic.

UNAIDS (2010). Joint United Nations Programme on HIV/AIDS. Global Report. UNAIDS Report on the Global AIDS Epidemic 2010.

UNAIDS (2011). Joint United Nations Programme on HIV/AIDS. Political Declaration on HIV and AIDS: Intensifying Our Efforts to Eliminate HIV and AIDS. Geneva, UNAIDS.

UNAIDS (2012). Joint United Nations Programme on HIV/AIDS. Global Report. UNAIDS Report on the Global AIDS Epidemic .

UNICEF (2003). United Nations Children's Fund. Evaluation of United Nations-supported pilot projects for the prevention of mother-to-child transmission of HIV. HIV/AIDS Working Paper. Overview of Findings. UNICEF New York, USA; August, 2003.

UNICEF (2004). United Nations Children's Fund. UNICEF's support to free infant formula for infants of HIV-infected mothers in Africa: a review of UNICEF experience. Washington, DC; April 14th, 2004.

UNICEF (2006). United Nations Children's Fund. Botswana child monitor: A bulletin of recent events, statistics and acquisitions about children. November to December 2005.

UNICEF (2007). United Nations Children's Fund. A world fit for children mid decade review. Botswana progress report. August, 2007. Republic of Botswana; August, 2007.

UNICEF (2009). United Nations Children's Fund. Tracking Progress on Child and Maternal Nutrition: A survival and development priority. Novermber 2009. New York, USA.

Vonesch N, Sturchio E, Humani AC, Cordiali Fei P, Cosenza D, Caprilli F, Pezzella M (1992). Detection of HIV-1 genome in leucocytes of human colostrum from anti-HIV-1 seropositive mothers. AIDS Research and Human Retroviruses; 8(7):1283-1287.

WBTi (2010). The World Breastfeeding Trends Initiative. Botswana Assessment Report 2010. Republic of Botswana. Nutrition and Food Control Division. Department of Public Health. Ministry of Health. Government of Botswana.

WHO (1981). World Health Organization. International code of marketing of breast milk substitutes. Geneva, Switzerland.

WHO (1987). World Health Organization. Summary statement on breastfeeding/breast milk and Human Immunodeficiency Virus (HIV). Geneva, Switzerland.

WHO (2001). World Health Organization. Infant formula and related trade issues in the context of the international code of marketing of breast-milk substitutes. Adapted from the official records of the Forty-seventh World Health Assembly, document WHA47/1994/REC/1/, Annex 1, paragraphs 133–139.

WHO (2007). World Health Organization. HIV and Infant Feeding. New evidence and programmatic experience. Report of a Technical Consultation held on behalf of the Inter-agency Task Team (IATT) on Prevention of HIV Infections in Pregnant Women, Mothers and their Infants. Geneva, Switzerland, 25-27 October 2006.

WHO (2010a). World Health Organization. PMTCT Strategic Vision 2010-2015. Preventing mother-to-child transmission of HIV to reach the UNGASS and Millennium Development Goals. Moving Towards the Elimination of Paediatric HIV; February 2010.

WHO (2010b). World Health Organization. Guidelines on HIV and infant feeding. Principles and recommendations for infant feeding in the context of HIV and a summary of evidence. Geneva, Switzerland.

WHO (2011). World Health Organization. Global Health Observatory Data Repository. Country Statistics. Botswana.

WHO (2012). World Health Organization. Botswana: health profile.

WHO/UNICEF/UNAIDS (2003). World Health Organization, United Nations Children's Fund, and The Joint United Nations Programme on HIV/AIDS. HIV and Infant Feeding: Guidelines for Decision-makers. Geneva, Switzerland: WHO/UNAIDS; 1998.

Ziegler JB, Cooper DA, Johnson RO, Gold J (1985). Postnatal transmission of AIDS associated retrovirus from mother to infant. Lancet; 1 (8434):896-898.