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Developing a Triadic Implementation Framework for Adolescent HIV Status Disclosure in Resource-Limited Settings: A Mixed-Methods Study in Kenya

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ABSTRACT
HIV status disclosure to adolescents living with HIV (ALHIV) remains a critical yet inconsistently implemented component of paediatric HIV care in resource-limited settings. Despite policy guidance promoting developmentally appropriate disclosure, routine practice continues to lag. This study formulates an evidence-informed triadic implementation framework grounded in empirical data and aligned with global guidelines. A convergent parallel mixed-methods design was conducted in Western Kenya, involving 310 caregiver–adolescent dyads, eight focus group discussions (n=64), and ten key informant interviews with healthcare providers. Multivariable logistic regression identified independent predictors of disclosure using a quadratic age term for non-linear dynamics, while thematic analysis explored contextual drivers across existing policy frameworks. Overall disclosure prevalence was 74.5%, but dropped to 1.8% among early adolescents (10–12 years), demonstrating a threshold effect (aOR=0.70, 95% CI: 0.59–0.83, p<0.001). Primary predictors included caregiver training (aOR=15.61), confidence (aOR=2.42), peer support access (aOR=3.33), and perceived adolescent maturity (aOR=1.52), whereas fear of psychological harm reduced disclosure odds (aOR=0.27). Disclosure was associated with improved ART adherence (93.9%) and emotional well-being (92.6%), despite initial distress (34.6%). The resulting Triadic Model conceptualizes disclosure as the convergence of adolescent readiness, caregiver capacity, and health system support. It operationalizes normative guidelines into five actionable mechanisms: structured readiness assessment, anticipatory caregiver preparation, family-engaged planning, health system enabling, and post-disclosure follow-up. This framework provides a scalable model to bridge the policy-practice gap in resource-constrained health systems.

Keywords: Adolescents, HIV Disclosure, Implementation Framework, Kenya, Resource-Limited Settings, Service Delivery, Triadic Model

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1. INTRODUCTION

HIV status disclosure to adolescents living with HIV (ALHIV) represents a critical milestone in paediatric HIV care, encompassing complex clinical, psychosocial, and developmental processes that shape treatment adherence, engagement in care, and long-term health outcomes (Mugo, Njuguna, et al.,

2023; Sornillo et al., 2023; Toromo et al., 2022). When disclosure is undertaken in a timely, developmentally appropriate, and supportive manner, it is associated with improved antiretroviral therapy adherence, enhanced treatment literacy, better psychosocial well-being, stronger caregiver–adolescent communication, and sustained engagement in HIV care (C. Laurenzi et al., 2026; Lemma et al., 2022). These therapeutic gains foster adolescents' autonomy and readiness for independent HIV care, enabling them to transition from passive recipients of treatment to active, informed participants in healthcare decision-making (Barr et al., 2022; Njuguna et al., 2022). Conversely, delayed, unstructured, or inadvertent disclosure is associated with psychological distress, feelings of betrayal, weakened caregiver–adolescent communication, and disengagement from HIV care, underscoring the importance of structured and developmentally appropriate disclosure processes (Edun et al., 2022; Ramsammy et al., 2022; Toromo et al., 2022). Furthermore, effective disclosure promotes treatment literacy, retention in care, and sustained viral suppression, thereby contributing to improved long-term clinical and population-level HIV outcomes (C. A. Laurenzi et al., 2022; Sornillo et al., 2023).

The policy architecture governing HIV status disclosure has evolved substantially over recent decades, reflecting advances in scientific evidence and a progressive shift toward rights-based, developmentally appropriate, and adolescent-centred approaches to disclosure (Evangeli et al., 2026; C. Laurenzi et al., 2026; Ronan et al., 2026). Early global guidance, such as the 2011 World Health Organization recommendations, framed disclosure as a protective, caregiver-led process advocating full status disclosure by early adolescence (WHO, 2011). Subsequent frameworks attempted to operationalize these principles through staged communication pathways, including the Elizabeth Glaser Pediatric AIDS Foundation toolkit with structured readiness assessments (EGPAF, 2018), South Africa National Department of Health framework integrating disclosure into chronic disease paradigms (NDoH, 2016), and Kenya National AIDS and STI Control Programme guidelines aligning procedures with national health structures (NASCOP, 2024). Most recently, updated guidance from the World Health Organization has advanced a rights-based conceptualization that emphasizes evolving adolescent capacities and addresses onward disclosure to peers and partners (WHO, 2025), in direct alignment with the United Nations Convention on the Rights of the Child (UN, 1995).

Despite extensive policy development, substantial gaps remain between evidence-based HIV guidelines and their implementation in routine clinical practice, particularly in resource-constrained, high HIV-burden settings across sub-Saharan Africa (Eshun-Wilson et al., 2023; Goldstein et al., 2023; Maluleka et al., 2023). Empirical studies indicate that status disclosure is frequently delayed well beyond recommended ages, with fewer than 5% of adolescents aged 10 to 12 years aware of their HIV status during routine care in Western Kenya (Obiero et al., 2021; Toromo et al., 2022). This discrepancy is not merely a failure of policy adoption but reflects broader operational constraints, including inadequate organizational readiness assessment, insufficient caregiver preparation and support, and substantial variation in health system capacity across health facilities (Cockburn et al., 2023; Magill et al., 2023). As a result, HIV status disclosure often remains reactive rather than proactively planned, frequently occurring only after adolescents begin questioning their illness, experience treatment challenges, or other disclosure-triggering events, instead of following a structured healthcare-led disclosure process (Mugo, Njuguna, et al., 2023; Puffer et al., 2023). This ongoing implementation gap contributes to poor antiretroviral therapy adherence, increasing the likelihood of treatment failure, unsuppressed viral load, HIV drug resistance, and continued HIV transmission among adolescents and young people (Gill et al., 2022; Mengesha et al., 2023).

Recent evidence suggests that HIV disclosure should be conceptualized as a multilevel process rather than an isolated dyadic decision between caregivers and children, as disclosure outcomes are shaped by caregiver readiness, healthcare provider support, health facility practices, stigma, and broader health system contexts (Magill et al., 2023; Moraa et al., 2023; Mugo, Njuguna, et al., 2023). Established theoretical models such as the Disclosure Processes Model explain approach and avoidance motivations (Mpofu & Mbandlwa, 2026; Toromo et al., 2022), while Social Cognitive Theory (Islam et al., 2023) emphasizes caregiver self-efficacy (Huang et al., 2025). However, these individual-level theories fail to capture facility infrastructure, provider-caregiver coordination, and complex affective barriers such as unaddressed caregiver guilt (Cluver et al., 2022; Mpofu et al., 2025). Grounded in the Theory of Triadic Influence, disclosure must be reconceptualized as a multi-level service delivery process occurring at the intersection of adolescent readiness, caregiver capacity, and health system support (Garland et al., 2024; Kahn et al., 2024). A critical research gap remains in understanding how these three domains interact empirically and how existing policy frameworks can be translated into a practical implementation model for resource-constrained health facilities.

To directly address these empirical, theoretical, and operational gaps, this study integrates convergent parallel mixed-methods data from primary healthcare facilities in Western Kenya with a comparative analysis of major global and national disclosure guidelines (EGPAF, 2018; NASCOP, 2024; NDoH, 2016; WHO, 2011, 2025). Moving beyond descriptive analyses of implementation barriers, this research formulates, empirically grounds, and operationalizes a triadic implementation framework tailored to the structural realities of resource-limited settings. Specifically, this study investigates the

empirical prevalence, non-linear age dynamics, and multi-level determinants shaping adolescent disclosure across individual, interpersonal, and institutional levels. Furthermore, it evaluates the extent to which routine clinical practices align with or diverge from normative policy recommendations across key implementation domains. Ultimately, these empirical and contextual insights are synthesized to establish the essential operational mechanisms, clinical protocols, and post-disclosure support pathways required to construct a sustainable, integrated service delivery framework for routine adolescent HIV care.

2. METHOD

2.1 Study Design and Theoretical Orientation

This study employed a convergent parallel mixed-methods design grounded in a pragmatist epistemological paradigm to examine adolescent HIV status disclosure and formulate an evidence-informed implementation framework. Pragmatism was selected for its capacity to integrate methodological pluralism and prioritize problem-driven inquiry, combining quantitative and qualitative evidence to address complex, context-dependent health delivery phenomena. Disclosure was conceptualized both as a measurable clinical outcome and as a multi-level relational process shaped by interacting developmental, social, and health system factors. Quantitative and qualitative data were collected concurrently, analyzed independently, and integrated at the interpretive stage using a weaving approach to produce a comprehensive understanding of disclosure mechanisms. The study was theoretically informed by the Disclosure Processes Model (Mpofu & Mbandlwa, 2026; Toromo et al., 2022), Social Cognitive Theory (Islam et al., 2023; Wille et al., 2025), and the Theory of Triadic Influence (Garland et al., 2024; Kahn et al., 2024).

2.2. Study Setting

The study was conducted in Bondo Sub-County, Siaya County, Western Kenya, a high HIV prevalence region characterized by complex socio-cultural dynamics in caregiving and health communication. Data were gathered from three public health facilities providing comprehensive HIV care: Bondo County Hospital, Got Agulu Sub-County Hospital, and Usigu Sub-County Hospital. These facilities operate within a hub-and-spoke service delivery model serving rural and peri-urban populations, capturing health system variability in capacity, provider practices, and patient populations.

2.3. Participants and Sampling

The quantitative target population comprised primary caregivers of adolescents living with HIV (ALHIV) aged 10 to 19 years receiving antiretroviral therapy at the selected facilities. Primary caregivers served as key proxy informants regarding adolescent readiness, household communication dynamics, and clinical disclosure status. From an eligible population of 972 dyads, sample size determination was based on finite population sampling equations adjusted for potential non-response, yielding a final sample of 310 primary caregivers. Post-hoc power calculations confirmed that a sample size of n = 310 provided over 80% statistical power ($\beta = 0.20$, $\alpha = 0.05$) to detect adjusted odds ratios ($aOR \geq 1.5$) in multivariable logistic regression models. Proportional allocation ensured representation across facilities, followed by systematic random sampling with a sampling interval of 3.

Purposive maximum-variation sampling was used to select participants for focus group discussions (FGD) and key informant interviews (KII). Eight FGD were conducted with caregivers (n = 64), stratified by adolescent age group (10–12, 13–14, and 15–19 years) and disclosure status. In addition, ten KII were conducted with healthcare providers, including nurses, clinical officers, psychosocial counselors, and a clinical mentor. Sampling proceeded until thematic saturation was achieved, which was confirmed after six FGD and eight KII.

2.4. Data Collection

Quantitative data were gathered using a pre-tested, structured questionnaire administered via face-to-face interviews on KoboCollect using password-protected digital tablets. The instrument evaluated caregiver socio-demographic characteristics, adolescent clinical profiles, disclosure patterns, perceived barriers, enabling factors, and post-disclosure outcomes. The questionnaire was translated into Dholuo and back-translated into English to preserve conceptual equivalence.

Qualitative data were gathered through FGD (lasting 60 to 90 minutes) and KII (lasting 45 to 60 minutes) using semi-structured discussion guides. Audio recordings were transcribed verbatim, translated into English, and verified through independent cross-checking and member checking with selected participants.

2.5. Instrument Validity, Reliability, and Trustworthiness

Content validity was established through expert panel evaluation, yielding a Scale Content Validity Index (S-CVI) of 0.92. Construct validity for the newly developed 15-item Determinants of Disclosure

Scale was confirmed using Exploratory Factor Analysis, which demonstrated excellent sampling adequacy (Kaiser-Meyer-Olkin = 0.87; Bartlett test of sphericity $p < 0.001$) and robust item loadings ranging from 0.62 to 0.89. Internal consistency reliability was high across all subscales (Cronbach $\alpha > 0.80$), and test-retest reliability demonstrated temporal stability (Intraclass Correlation Coefficient = 0.76). Qualitative trustworthiness was ensured through data triangulation, member checking, audit trails, and intercoder agreement checks achieving over 85% consensus between independent coders.

2.6. Data Analysis

Quantitative data were analyzed using Stata version 18.0. Descriptive statistics summarized participant characteristics. Bivariate associations were tested using chi-square tests, Student t-tests, or Mann-Whitney U tests based on variable distribution. Multivariable logistic regression was executed to identify independent predictors of disclosure, incorporating a quadratic age term (Age^2) alongside the linear age variable to capture non-linear threshold dynamics. Model fit and discrimination were evaluated using the Hosmer-Lemeshow goodness-of-fit test, likelihood ratio tests, pseudo-R^2, and Receiver Operating Characteristic (ROC) curve analysis.

Qualitative transcripts were analyzed using Braun and Clarke six-phase thematic analysis within NVivo 14. A hybrid inductive-deductive coding framework was applied, allowing emergent contextual themes to be interpreted alongside theoretical constructs.

Quantitative and qualitative findings were integrated at the interpretation stage using joint displays and weaving narratives. Furthermore, a structured comparative analysis mapped empirical findings against five major global and national HIV disclosure guidelines (EGPAF, 2018; NASCOP, 2024; NDoH, 2016; WHO, 2011, 2025) across six operational domains to identify policy-practice disconnects and construct the implementation framework.

2.7. Ethical Considerations

Ethical approval was granted by the Institutional Scientific Ethics Review Committee of the University of Eastern Africa, Baraton, and Africa Research University. Research permits were issued by the Kenya National Commission for Science, Technology and Innovation and the Siaya County Department of Health. Written informed consent was obtained from all caregivers. Participant anonymity was maintained through de-identification, and psychosocial support protocols were established for participants experiencing distress.

3. RESULTS

3.1. Socio-Demographic and Clinical Profile of Caregiver–Adolescent Dyads

A total of n = 310 caregiver–adolescent dyads were enrolled across three public health facilities providing comprehensive HIV care in Bondo Sub-County, Western Kenya. The majority of participants were recruited from Bondo County Hospital (72.9%, n = 226), with equal proportional representation from Got Agulu Sub-County Hospital (13.6%, n = 42) and Usigu Sub-County Hospital (13.6%, n = 42).

Caregivers ranged in age from 20 to 76 years, with an overall mean age of 45 years. The caregiving cohort was predominantly female (74.5%, n = 231). In terms of relationship to the adolescent, biological mothers constituted the largest caregiving group (62.9%, n = 195), followed by grandmothers (15.8%, n = 49) and biological fathers (12.3%, n = 38). Approximately half of the caregivers reported being married or cohabiting (49.7%, n = 154).

Adolescents living with HIV (ALHIV) were aged between 10 and 19 years, with a mean age of 15.4 years. The sample exhibited a balanced sex distribution, comprising 54.8% females (n = 170) and 45.2% males (n = 140). Disaggregation by developmental age categories revealed that older adolescents aged 15–19 years represented the largest proportion (69.4%, n = 215), while early adolescents aged 10–12 years and young adolescents aged 13–14 years accounted for 18.4% (n = 57) and 12.3% (n = 38) of the cohort, respectively. A comprehensive summary of baseline socio-demographic characteristics is presented in Table 1.

Table 1
Baseline Socio-Demographic Characteristics of Caregivers and Adolescents (N = 310)

Characteristic	Category / Metric	Frequency (n)	Percentage (%)
Health Facility Distribution	Bondo County Hospital	226	72.9
	Got Agulu Sub-County Hospital	42	13.6
	Usigu Sub-County Hospital	42	13.6
Caregiver Characteristics			
Sex	Female	231	74.5
	Male	79	25.5
Age (years)	Mean (Range)	45 (20–76)	
Relationship to Adolescent	Biological Mother	195	62.9

	Grandmother	49	15.8
	Biological Father	38	12.3
	Other Guardians / Relatives	28	9.0
Marital Status	Married / Cohabiting	154	49.7
	Widowed	71	22.9
	Single	49	15.8
	Separated	21	6.8
	Divorced	15	4.8
Adolescent Characteristics			
Sex	Female	170	54.8
	Male	140	45.2
	Mean (SD)	15.4 (2.1)	
Age Category	10–12 years	57	18.4
	13–14 years	38	12.3
	15–19 years	215	69.4
Education Level	Primary School	129	41.6
	Secondary School	177	57.1
	Out of School / Other	4	1.3

The baseline demographic distribution highlights critical structural and relational realities within the rural health delivery ecosystem. Caregiving responsibility was heavily skewed toward female family members, who accounted for nearly three-quarters of all primary guardians, reflecting traditional gender roles in household health management across Western Kenya (Table 1). Notably, non-biological guardians, particularly grandmothers and extended relatives, managed over one-quarter (24.8%) of the adolescents, reflecting familial restructuring often driven by parental loss or socio-economic migration (Table 1). Furthermore, while older adolescents aged 15 to 19 years constituted the majority of the clinical cohort, nearly one-third (30.7%) of the sample fell into the 10 to 14 age bracket, representing the precise developmental window where formal status disclosure should routinely occur according to global guidelines (Table 1). These baseline patterns underscore that implementation frameworks cannot assume a uniform mother-child caregiving unit; rather, disclosure mechanisms must be tailored to engage grandmothers, single caregivers, and diverse guardian structures across primary and secondary educational transitions.

3.2. Disclosure Prevalence, Timing, and Non-Linear Age Thresholds

Among the n = 310 caregiver–adolescent dyads evaluated, the overall prevalence of HIV status disclosure was 74.5% (n = 231), while 25.5% (n = 79) of adolescents remained completely unaware of their HIV status. However, status disclosure exhibited a pronounced non-linear distribution when stratified across developmental age categories. Among early adolescents aged 10 to 12 years, status disclosure was nearly absent, recorded at only 1.8% (n = 1). In contrast, disclosure prevalence rose sharply to 60.5% (n = 23) among adolescents aged 13 to 14 years and reached near-universal levels at 96.3% (n = 207) among older adolescents aged 15 to 19 years, demonstrating a statistically significant association between age group and disclosure status ($\chi^2 = 214.8$, $p < 0.001$).

Among the disclosed cohort (n = 231), the mean age at disclosure was 11.8 years. The largest proportion of disclosures occurred within the 10 to 12 age bracket (42.0%, n = 97), followed closely by the 13 to 15 age bracket (38.1%, n = 88). Disclosures occurring prior to age 10 accounted for 16.9% (n = 39), whereas late disclosures between ages 16 and 18 represented only 3.0% (n = 7). Primary caregivers served as the primary disclosers in 71.8% (n = 166) of cases, while healthcare providers led the disclosure process in 24.7% (n = 57) of instances. Direct self-disclosure by adolescents following accidental discovery occurred in 3.5% (n = 8) of cases. The structured breakdown of disclosure status by age category and the characteristics of age at disclosure are summarized in Table 2 and Table 3, respectively.

Table 2
HIV Status Disclosure Prevalence Stratified by Adolescent Age Category (N = 310)

Age Category	Disclosed (n,%)	Not Disclosed (n,%)	Total Cohort (N)	p-value
10–12 years	1 (1.8)	56 (98.2)	57	<0.001
13–14 years	23 (60.5)	15 (39.5)	38	
15–19 years	207 (96.3)	8 (3.7)	215	
Total	231 (74.5)	79 (25.5)	310	

The empirical patterns demonstrate that HIV status disclosure does not progress as a smooth linear continuum across adolescent age; rather, it operates as a rigid threshold phenomenon triggered after age

12. Prior to age 13, non-disclosure is overwhelmingly dominant at 98.2%, reflecting an operational delay during middle childhood. Once adolescents cross the 12-year developmental boundary, disclosure prevalence jumps exponentially by 58.7 percentage points in the 13 to 14 age group and reaches 96.3% in late adolescence. This abrupt escalation indicates that healthcare providers and caregivers defer disclosure until physical maturation or persistent adolescent inquiry forces action, rather than initiating gradual, developmentally staged communication during early childhood.

Table 3
Distribution of Age at Disclosure and Disclosure Characteristics Among Disclosed Adolescents (n = 231)

Characteristic / Variable	Metric / Category	Frequency (n)	Percentage (%)
Age at Disclosure	<10 years	39	16.9
	10–12 years	97	42.0
	13–15 years	88	38.1
	16–18 years	7	3.0
	Mean Age (SD)	11.8 years (1.9)	
Primary Discloser	Primary Caregiver	166	71.8
	Healthcare Provider	57	24.7
	Adolescent Self-Discovery	8	3.5
Disclosure Setting / Format	One-on-One Caregiver Session	161	69.7
	One-on-One Provider Session	48	20.8
	Facility Group Counselling	19	8.2
	Unplanned / Accidental	3	1.3

Analysis of non-disclosing caregivers (n = 79) further clarifies the psychosocial drivers perpetuating this delay. The primary rationale cited by caregivers for withholding disclosure was the belief that the adolescent was too young or cognitively immature to comprehend the diagnosis (50.6%, n = 40). Secondary barriers included severe fear of community stigma and familial gossip (22.8%, n = 18), fear of triggering acute psychological harm or emotional collapse (12.7%, n = 10), and a self-reported lack of communication skills or knowledge regarding how to conduct disclosure (12.7%, n = 10), and other secondary reasons (1.3%, n = 1). These findings highlight a critical misalignment: while caregivers perceive young adolescents as too fragile for status disclosure, the mean age of actual disclosure (11.8 years) indicates that when disclosure is finally executed, it is often compressed into a brief, high-anxiety window. This structural inertia reinforces the necessity for objective readiness assessment protocols that decouple disclosure timing from subjective caregiver age estimate.

3.3. Multivariable Determinants, Enablers, and System-Level Predictors

Multivariable logistic regression was executed to isolate the independent determinants, relational enablers, and system-level predictors of adolescent HIV status disclosure. The regression model adjusted for potential socio-demographic confounders, including caregiver age, marital status, relationship to the adolescent, and adolescent educational attainment. To account for the non-linear threshold effect observed across developmental age groups, a quadratic age term (Age^2) was incorporated alongside linear age variables.

The adjusted multivariable analysis identified six primary factors across individual, interpersonal, and health system domains that significantly determined disclosure likelihood. Among modifiable relational factors, caregiver disclosure training emerged as the single strongest independent predictor of status disclosure. Caregivers who received formal disclosure training had over fifteen times higher odds of disclosing status compared to untrained caregivers (aOR = 15.61, 95% CI: 3.71-65.76, $p < 0.001$). System-level enabling conditions also exerted a powerful influence: adolescent access to facility-based peer support groups increased the likelihood of disclosure more than threefold (aOR = 3.33, 95% CI: 1.24-8.96, $p = 0.017$), while significant health facility-level variations underscored the impact of organizational implementation capacity (aOR = 2.96, 95% CI: 1.16-7.53, $p = 0.023$).

At the individual caregiver and adolescent level, caregiver communication confidence (aOR = 2.42, 95% CI: 1.31-4.47, $p = 0.005$) and perceived adolescent emotional maturity (aOR = 1.52, 95% CI: 1.00-2.29, $p = 0.048$) were positively associated with increased odds of disclosure. Conversely, caregiver fear of causing acute adolescent psychological distress operated as the dominant inhibitor, reducing the likelihood of disclosure by 73% (aOR = 0.27, 95% CI: 0.10-0.74, $p = 0.011$). The multivariable logistic regression parameters and model diagnostics are detailed in Table 4.

To ensure statistical rigor and verify model assumptions for high-impact publication standards, comprehensive diagnostic evaluations were performed on the final multivariable regression model. The Hosmer–Lemeshow goodness-of-fit test yielded a chi-square statistic of $\chi 2 = 6.48$ ($df = 8$, $p = 0.593$), failing to reject the null hypothesis and confirming that observed disclosure outcomes did not significantly differ from model-predicted probabilities. This demonstrates optimal model calibration across risk deciles.

Table 4
Multivariable Logistic Regression of Independent Determinants, Enablers, and Barriers to HIV Status Disclosure

Variable Category	Predictor Variable	Adjusted Odds Ratio (aOR)	95% CI	p-value
Caregiver Capacity	Caregiver Disclosure Training	15.61	3.71–65.76	<0.001
	Caregiver Communication Confidence	2.42	1.31–4.47	0.005
Health System Support	Access to Adolescent Peer Support Groups	3.33	1.24–8.96	0.017
	Health Facility Implementation Capacity	2.96	1.16–7.53	0.023
Adolescent Readiness	Perceived Emotional Maturity	1.52	1.00–2.29	0.048
	Adolescent Age (Quadratic Term, Age^2)	0.70	0.59–0.83	<0.001
Primary Barrier	Fear of Adolescent Psychological Distress	0.27	0.10–0.74	0.011

Note. Model adjusted for caregiver age, relationship to adolescent, marital status, and adolescent education

The overall explanatory power was exceptionally high for epidemiological field data, achieving a McFadden Pseudo-R^2 of 0.482, which indicates that nearly half of the total variance in adolescent HIV disclosure status was accounted for by the specified multivariable predictors. Furthermore, discrimination capacity was evaluated using Receiver Operating Characteristic (ROC) curve analysis. The model demonstrated an Area Under the Curve (AUC) of 0.914 (95% CI: 0.878-0.950), indicating excellent diagnostic accuracy and predictive power in distinguishing between disclosed and non-disclosed adolescent cohorts.

The multivariable findings demonstrate that adolescent status disclosure is driven primarily by modifiable capacity-building factors rather than static demographic traits. The massive effect size associated with caregiver training (aOR = 15.61) establishes that structured educational preparation provides caregivers with the essential communication strategies and emotional regulation tools necessary to overcome disclosure hesitancy. When combined with caregiver confidence (aOR = 2.42), these findings confirm that informational readiness alone is insufficient; caregivers require practical rehearsal and skill building to transition from avoidance to active disclosure execution.

System-level determinants also highlight that disclosure cannot be sustained solely as a domestic responsibility. The strong association with adolescent peer support access (aOR = 3.33) indicates that health facilities offering structured peer environments create a supportive ecosystem that eases post-disclosure adjustment, making caregivers significantly more comfortable initiating the process. Similarly, the nearly threefold increase in disclosure odds associated with facility-level variation (aOR = 2.96) reflects structural heterogeneity in provider engagement, private counselling spaces, and facility leadership across healthcare sites.

Finally, the strong inhibitory effect of psychological fear (aOR = 0.27) identifies the critical affective bottleneck in routine care. Caregivers who anticipate that disclosure will emotionally harm their child are 73% less likely to disclose, maintaining secrecy even when the adolescent reaches physical maturity. Because perceived adolescent emotional maturity moderately increases disclosure likelihood (aOR = 1.52), interventions must focus on recalibrating caregiver risk perceptions, providing objective readiness tools to demonstrate that adolescents possess greater psychological resilience than their guardians assume.

3.4. Qualitative Synthesis: Reactive Disclosure, Caregiver Guilt, and Misalignment

To contextualize the quantitative findings and elucidate the relational mechanisms shaping disclosure, qualitative data from eight focus group discussions (n = 64 caregivers) and ten key informant interviews with healthcare providers were synthesized. Thematic analysis yielded five interconnected qualitative dimensions reflecting the structural, emotional, and interpersonal realities of status disclosure within routine clinical care.

First, qualitative narratives revealed that HIV status disclosure rarely followed a structured, proactive clinical care pathway, operating instead as a predominantly reactive event. Disclosure was frequently precipitated by adolescent illness crises, persistent questioning regarding daily ART regimen adherence, or accidental self-discovery. When healthcare providers and caregivers failed to establish a planned schedule for gradual disclosure, the process devolved into a crisis-driven event, often leaving adolescents to piecemeal their diagnosis together independently. A key informant clinical officer highlighted the risks of this unstructured pattern, noting that "*when the appropriate time for full*

disclosure is missed, many adolescents end up discovering their HIV status on their own" (KII, Clinical Officer).

Second, participants strongly emphasized the primacy of emotional readiness over chronological age. Caregivers and healthcare providers concurred that chronological age served as an inadequate standalone proxy for determining disclosure timing, noting that developmental readiness is a complex, multidimensional construct encompassing cognitive comprehension of chronic illness, emotional regulation capacity, and health curiosity. While normative guidelines suggest age benchmarks, frontline providers noted that rigid age cut-offs fail to capture individual maturity levels. A psychosocial counselor articulated this developmental perspective, stating that "*readiness for disclosure is not determined purely by age, but more by the adolescent's level of emotional maturity, curiosity about their health, and ability to understand illness and treatment*" (KII, Psychosocial Counselor).

Third, a critical qualitative finding was the pervasive presence of unaddressed caregiver guilt, particularly among biological mothers who experienced profound remorse regarding vertical HIV transmission. Caregivers internalized severe self-blame, fearing that revealing the diagnosis would provoke adolescent anger, resentment, or permanent relational rupture. This emotional burden created an avoidance loop in which caregivers deferred disclosure to protect themselves from emotional rejection, a psychological barrier rarely addressed in routine clinical counseling. A biological mother expressed this deep emotional strain, reflecting: "*Every time I look at her, I see my mistake... she will hate me forever*" (FGD, Biological Mother, Non-Disclosed Cohort).

Fourth, the qualitative synthesis uncovered a stark miscalibration between caregivers' anticipated catastrophic fears and the actual long-term psychological responses of disclosed adolescents. Caregivers persistently cited the fear of triggering severe emotional collapse, depression, or self-harm as their primary justification for withholding status information. A caregiver described this paralyzing dread: "*The hardest part is knowing what to say... we fear breaking the child's heart*" (FGD, Caregiver, Non-Disclosed Cohort). However, empirical narratives from disclosed dyads demonstrated that while transient emotional distress occurred in 34.6% of cases, disclosure ultimately fostered long-term psychological relief, enhanced treatment literacy, and improved ART adherence (93.9%), showing that caregiver anxiety was sustained primarily by uncertainty and lack of experiential preparation rather than actual post-disclosure clinical trajectories.

Fifth, a pronounced operational divergence emerged between primary caregivers and healthcare providers regarding adolescent capacity and disclosure responsibility. Caregivers consistently perceived early adolescents as emotionally fragile and cognitively unprepared, leading 50.6% to defer disclosure on the grounds that the child was "too young". Conversely, healthcare providers viewed young adolescents as increasingly capable of comprehending illness concepts and advocated for earlier disclosure, creating a pattern of mutual deferral where caregivers waited for providers to initiate the process while providers hesitated to intervene without explicit caregiver consent. A clinical officer reflected on adolescent resilience and provider frustration with delayed timing, stating: "*By 10 or 11, they need to know... my son understood more than I thought*" (KII, Clinical Officer).

Taken together, these qualitative findings demonstrate that the implementation gap in adolescent HIV disclosure is fundamentally a relational and structural problem. Unaddressed caregiver guilt and risk miscalibration generate severe emotional hesitation, causing caregivers to perceive their children as overly fragile. When combined with provider-caregiver misalignment and the lack of a structured clinical protocol, healthcare systems default to reactive disclosure triggered by crises. To overcome these affective and institutional barriers, implementation models must explicitly incorporate guilt-focused counseling for caregivers, bridge provider-caregiver expectations, and establish objective developmental readiness metrics to transition disclosure from a reactive event into a planned continuum of care.

3.5. Comparative Guideline Analysis vs. Empirical Implementation Gaps

To evaluate the operational alignment between normative policy frameworks and frontline healthcare realities, a comparative matrix analysis was conducted across five major global and national HIV status disclosure guidelines: the World Health Organization guidelines (WHO, 2011, 2025), the Elizabeth Glaser Pediatric AIDS Foundation toolkit (EGPAF, 2018), the South Africa National Department of Health framework (NDoH, 2016), and the Kenya National AIDS and STI Control Programme guidelines (NASCOP, 2024). These frameworks were systematically mapped against empirical field data across six primary operational domains: conceptualization, age thresholds, readiness assessment, caregiver preparation, health system role, and post-disclosure follow-up. The comparative joint display is presented in Table 5.

The comparative analysis reveals a substantial disconnect between normative guidance and frontline clinical implementation across resource-limited health facilities. While global and national policy frameworks have achieved strong conceptual convergence, shifting away from rigid age cut-offs toward developmental, rights-based, and multidisciplinary care paradigms; they consistently fail to provide the operational mechanisms required for routine service delivery.

A primary implementation gap lies in the domain of adolescent readiness assessment. Although recent guidelines such as WHO (2025) and EGPAF (2018) emphasize developmental assessment, frontline facilities in Western Kenya lack standardized, objective assessment tools integrated into electronic medical records or clinical workflows. As a result, healthcare providers and caregivers rely almost entirely on subjective estimates of emotional maturity. This subjective reliance directly perpetuates delayed disclosure, as evidenced by the extremely low disclosure prevalence among adolescents aged 10 to 12 years (1.8%) despite guideline recommendations advocating full disclosure during early adolescence.

Table 5

Comparative Matrix Analysis of Global and National HIV Disclosure Guidelines versus Empirical Field Findings

Operational Domain	WHO (2011)	WHO (2025)	EGPAF (2018)	NDoH (2016) / NASCOP (2024)	Empirical Field Findings
Conceptualization	Caregiver-led, protective process	Rights-based, adolescent empowerment	Staged, developmental pathway	Adolescent-friendly, multidisciplinary chronic care approach	Triadic model integrating adolescent readiness, caregiver capacity, and system support
Age Thresholds	Full disclosure recommended by ~12 years	Developmental approach without rigid cut-offs	Partial disclosure at 6–9 years; full disclosure at 10–12 years	Developmental guidance; early adolescence emphasis without rigid cut-offs	Chronological age operates as a threshold proxy rather than a linear trigger
Readiness Assessment	Implied within routine clinical care	Strongly emphasized as a longitudinal requirement	Structured checklist included in clinical toolkit	Developmental assessment referenced within service delivery guidelines	Absence of standardized tools leads to reliance on subjective caregiver judgment and severe delays
Caregiver Preparation	Recommended as a general principle	Strongly emphasized through ongoing support	Structured 3-session caregiver preparation model	Counseling and provider training recommended within routine services	Caregiver training is the primary determinant of disclosure (aOR = 15.61), yet inadequately operationalized
Health System Role	Provider facilitation and supportive role	Longitudinal support embedded in care systems	Standardized facility protocols and workflow guides	Integrated adolescent-friendly services within multidisciplinary care systems	Peer support (aOR = 3.33) and facility capacity (aOR = 2.96) are key system determinants
Post-Disclosure Follow-Up	Recommended as standard good practice	Structured continuum of care and onward disclosure	Structured phone and clinic follow-up schedules	Psychosocial support integrated within chronic care models	Follow-up remains fragmented and highly inconsistent despite 34.6% immediate

adolescent distress

Similarly, a critical gap exists between recommended caregiver preparation and actual health system capacity. Empirical findings establish that caregiver disclosure training is the single most powerful predictor of successful status disclosure (aOR = 15.61, $p < 0.001$). However, routine clinical care pathways rarely offer structured, multi-session caregiver training programs or dedicated counseling to address affective bottlenecks such as maternal guilt and fear of psychological harm (aOR = 0.27). Furthermore, while guidelines emphasize integrated health system roles, the empirical data demonstrate that facility-level structural variation (aOR = 2.96) and access to peer support groups (aOR = 3.33) strongly dictate disclosure outcomes, highlighting that institutional readiness remains uneven across primary care settings.

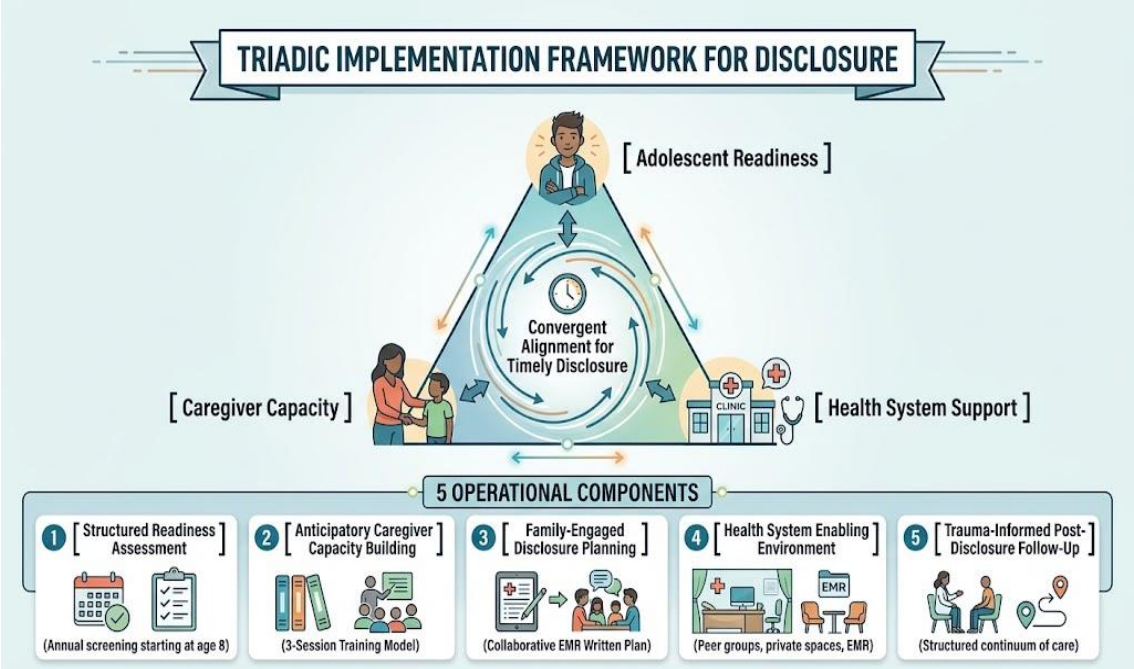
Finally, the most alarming operational gap occurs in post-disclosure follow-up. Although frameworks like EGPAF (2018) and WHO (2025) outline structured follow-up continuums, empirical field data show that post-disclosure tracking remains highly fragmented, unmonitored, and inconsistently documented in routine care. Given that 34.6% of disclosed adolescents experience immediate post-disclosure distress (including crying, withdrawal, and acute anxiety), the absence of standardized, trauma-informed follow-up protocols leaves families without essential clinical and psychosocial support during the critical post-disclosure transition period. These findings demonstrate that bridging the policy-to-practice gap requires translating normative principles into standardized clinical toolkits, objective assessment metrics, and institutionalized post-disclosure care pathways.

3.6. Operationalization of the Triadic Implementation Framework

To directly translate empirical findings into an actionable service delivery strategy, the study operationalizes the Triadic Implementation Framework. This model posits that successful, timely, and safe HIV status disclosure cannot occur as an isolated dyadic decision; rather, it requires the convergent alignment of three core pillars: adolescent emotional and cognitive readiness, caregiver capacity and confidence, and health system structural support. The first pillar, adolescent readiness, redefines preparedness as a dynamic developmental construct encompassing cognitive understanding of chronic illness, emotional self-regulation, health curiosity, and confidentiality management, rather than relying on rigid chronological age cut-offs. The second pillar, caregiver capacity, targets the primary modifiable driver of disclosure (aOR = 15.61), focusing on enhancing communication confidence (aOR = 2.42), developing practical delivery skills, and explicitly resolving affective bottlenecks such as maternal guilt and risk miscalibration (aOR = 0.27). The third pillar, health system support, establishes the institutional enabling environment through facility implementation capacity (aOR = 2.96), adolescent peer support networks (aOR = 3.33), provider competence, and structured clinical documentation. To operationalize these three pillars within routine primary care, the framework establishes five interconnected operational components (Figure 1).

Figure 1

Triadic Implementation Framework for Disclosure



First, to replace subjective age estimates and eliminate the operational delay observed among early adolescents (1.8% disclosure at 10–12 years), facilities must institutionalize annual structured readiness assessments beginning at age 8. Using a standardized clinical assessment tool integrated into the electronic medical record (EMR), healthcare providers evaluate five developmental domains: basic comprehension of illness and daily medication, emotional regulation and coping capacity, active curiosity regarding health care, ability to process stressful news, and understanding of privacy and confidentiality. Assessment scores are documented in the EMR with age-triggered prompts, repeating every 6 to 12 months to track developmental progression and guide planned disclosure timing rather than acting as a rigid pass/fail barrier. Second, given that caregiver disclosure training demonstrated the single strongest positive association with status disclosure (aOR = 15.61), anticipatory caregiver capacity building is operationalized through a structured Three-Session Preparation Model. Session 1 focuses on education and emotional regulation, providing clear information on disclosure benefits, addressing caregiver fears of psychological harm, and incorporating dedicated counseling to normalize and resolve maternal guilt surrounding vertical transmission. Session 2 delivers practical skills training, utilizing role-playing exercises, age-appropriate communication scripts, peer caregiver testimonies, and guided rehearsal to handle difficult adolescent questions. Session 3 integrates joint caregiver-provider planning, finalizing a tailored disclosure plan and connecting caregivers to psychosocial support networks prior to status disclosure.

Third, to resolve provider-caregiver misalignment and prevent crisis-driven reactive disclosures, family-engaged disclosure planning requires a written, collaborative disclosure plan documented within the EMR. Formulated jointly by primary caregivers and designated healthcare providers, the plan explicitly designates the primary discloser (caregiver, provider, or joint team), establishes a target timeframe based on readiness scores, defines the physical setting, specifies whether disclosure will follow a staged or single-session format, and outlines contingency protocols for accidental or crisis-triggered disclosure. Fourth, to establish health system support and an enabling environment that addresses facility-level variations (aOR = 2.96), health systems must embed disclosure support within routine service delivery structures. Facilities are required to establish adolescent peer support groups (aOR = 3.33), institutionalize peer-led caregiver support circles, train all pediatric HIV clinical staff in adolescent-friendly communication, and guarantee access to private, confidential counseling spaces. Age-appropriate educational materials in local languages must be maintained, and standardized disclosure indicators must be integrated into routine EMR reporting to ensure institutional accountability.

Fifth, recognizing that 34.6% of adolescents experience immediate post-disclosure distress, the framework establishes trauma-informed post-disclosure follow-up as a mandatory, multi-contact continuum of care rather than an isolated event. Post-disclosure care combines immediate emotional stabilization, adherence monitoring, peer support linkage, and onward disclosure counseling for older youth. Minimum clinical standards for post-disclosure tracking across six designated time points, ranging from 48 hours to 12 months post-disclosure are detailed in Table 6.

Table 6
Minimum Standard Protocol for Trauma-Informed Post-Disclosure Follow-Up

Time Point	Primary Follow-Up Activity	Responsible Personnel	EMR Documentation / System Tracking
Within 48 Hours	Remote or phone-based check-in to evaluate immediate adolescent emotional response, offer caregiver reassurance, and address acute distress	Designated Nurse or Psychosocial Counselor	EMR Outreach Log & Safety Assessment
Within 7 Days	In-person clinic review combining clinical health evaluation, psychosocial counseling, family communication review, and adherence verification	Healthcare Provider and Counselor	Structured Post-Disclosure Clinical Note
Within 1 Month	Formal orientation and structured linkage to facility-based adolescent peer support groups and caregiver support circles	Peer Support Leader / Adolescent Champion	Peer Group Attendance Record
At 3 Months	Comprehensive quarterly review assessing ART adherence trends, emotional well-being, school functioning, stigma coping, and family dynamics	Multidisciplinary Clinical Team	Quarterly Psychosocial Review Form

At 6 Months	Specialized session for older adolescents (aged ≥ 14 years) addressing onward disclosure to trusted peers, romantic partners, or family members	Psychosocial Counselor	Onward Disclosure Safety & Action Plan
At 12 Months	Annual comprehensive evaluation, reassessment of long-term treatment literacy, transition planning to youth services, and overall care summary	Primary Care Provider	Annual Adolescent Care Summary

The operationalized Triadic Implementation Framework directly bridges the policy-to-practice gap by converting normative guidelines into concrete, measurable clinical workflows. By replacing subjective caregiver estimates with structured annual readiness screening starting at age 8, the framework eliminates unnecessary disclosure deferral during early adolescence. The three-session caregiver training model directly addresses the primary affective bottlenecks identified in empirical models, equipping guardians with practical communication tools while actively relieving vertical transmission guilt. Furthermore, documenting written disclosure plans within EMR systems forces proactive caregiver-provider coordination, shifting health facility culture away from crisis-driven reactive disclosures. Embedded within an enabling health system environment supported by peer networks, private counseling spaces, and standardized post-disclosure follow-up protocols, this framework ensures that status disclosure functions not as a traumatic household event, but as a safe, developmentally responsive, and sustained healthcare continuum.

4. DISCUSSION

4.1. Principal Findings and Re-Conceptualizing Age: From Chronological Triggers to Developmental Thresholds

The principal finding of this study establishes that adolescent HIV status disclosure does not unfold as a simple linear function of aging, but rather emerges from the convergent alignment of three multi-level domains: adolescent emotional and cognitive readiness, caregiver capacity and confidence, and health system structural support. While overall disclosure prevalence reached 74.5%, disaggregation by developmental age categories revealed a stark non-linear threshold effect, demonstrated mathematically by the significant quadratic age term in multivariable modeling (aOR = 0.70, 95% CI: 0.59-0.83, $p < 0.001$). In standard linear models, each additional year of age is assumed to incrementally increase the probability of status disclosure; however, the quadratic term captures a distinct inflection point. During early adolescence (ages 10 to 12), disclosure prevalence remains virtually non-existent at 1.8%, reflecting an operational plateau where status information is systematically withheld. Once adolescents cross this developmental boundary into middle (ages 13 to 14 at 60.5%) and late adolescence (ages 15 to 19 at 96.3%), disclosure probability accelerates rapidly. Clinically, this demonstrates that chronological age functions not as a smooth, proactive prompt for communication, but as a rigid structural barrier that holds disclosure in abeyance until physical maturation or treatment crises force action.

This observed pattern of delayed and threshold-driven disclosure aligns closely with empirical literature across sub-Saharan Africa, reinforcing the pervasive nature of the policy-to-practice disconnect. Studies conducted in Western Kenya by Toromo et al. (2022) and Obiero et al. (2021) similarly reported that fewer than 5% of early adolescents living with HIV were aware of their diagnosis during routine care, highlighting a widespread regional inertia during middle childhood. Furthermore, prospective cohort evidence from South Africa by Edun et al. (2022) and prospective research in Zimbabwe by Puffer et al. (2023) confirm that when status communication is deferred past early adolescence, disclosure frequently transitions from a planned, supportive continuum into a reactive, crisis-driven event. In these settings, disclosure is commonly precipitated by unexplained health deterioration, treatment failure, or persistent adolescent inquiry regarding daily medication adherence, rather than deliberate clinical preparation. The empirical non-linear trajectory observed in Bondo Sub-County confirms that without structured implementation mechanisms, health systems default to reactive disclosure patterns regardless of high overall prevalence rates.

These findings offer a critical perspective on early normative policy frameworks that relied heavily on fixed chronological age cut-offs. Historical guidelines, such as the WHO (2011) recommendations, established prescriptive age targets advocating full status disclosure by age 12. However, the empirical reality that 98.2% of 10 to 12-year-olds in this cohort remained uninformed illustrates the operational failure of rigid age targets in resource-constrained primary care settings. Chronological age is a crude and unreliable proxy for an adolescent's true developmental readiness, as it fails to account for individual variations in cognitive comprehension, emotional self-regulation, health curiosity, and psychological resilience. When global and national policies prescribe age benchmarks without equipping frontline health workers with standardized readiness assessment tools, caregivers and healthcare providers default

to protective avoidance, perceiving young adolescents as inherently too fragile to process a chronic illness diagnosis. Re-conceptualizing age from a rigid chronological trigger into a flexible developmental threshold, as endorsed in updated frameworks such as WHO (2025) and EGPAF (2018), is therefore essential. Chronological age should serve merely as an administrative prompt to initiate structured, longitudinal readiness evaluations starting in middle childhood, shifting the clinical focus from "how old is the child" to "how ready is the triadic ecosystem".

4.2. Caregiver Capacity as the Primary Leverage Point: Self-Efficacy, Skill Rehearsal, and Resolving Guilt

The massive adjusted odds ratio associated with caregiver disclosure training (aOR = 15.61, 95% CI: 3.71-65.76, $p < 0.001$) identifies caregiver capacity as the single most powerful leverage point within the adolescent disclosure ecosystem. This gigantic effect size underscores that passive exposure to general HIV education or clinical literacy is fundamentally inadequate to initiate status communication. Grounded in Social Cognitive Theory, behavioral enactment requires not merely cognitive knowledge, but the development of robust self-efficacy, emotional self-regulation, and observational mastery (Islam et al., 2023; Wille et al., 2025). Caregivers who undergo structured training gain practical communication confidence (aOR = 2.42) through role-playing, behavioral rehearsal, and guided feedback, which directly transforms passive intention into active execution. Similar intervention trials in Western Kenya by Magill et al. (2023), McGray et al. (2023), and Toromo et al. (2022) demonstrated that structured caregiver preparation significantly enhances disclosure compliance and subsequent adolescent mental health outcomes, reinforcing that caregiver self-efficacy mediates the translation of clinical guidelines into routine household communication.

Beyond informational and skill deficits, the qualitative findings illuminate a profound affective barrier that has been largely overlooked in existing clinical guidelines, namely unaddressed caregiver guilt. Biological mothers, who comprised nearly two-thirds of primary guardians, experienced intense psychological remorse regarding vertical HIV transmission, expressing deep fears that disclosure would provoke adolescent resentment, hatred, or permanent relational rupture. Within the framework of the Disclosure Processes Model, disclosure decisions are driven by competing approach motivations, such as improved treatment adherence, and avoidance motivations, such as fear of blame or emotional disruption (Kim et al., 2022; Mpofu & Mbandlwa, 2026; Philpot et al., 2022; Wells et al., 2023). Unresolved maternal guilt significantly amplifies avoidance motivations, constructing an emotional avoidance loop in which caregivers continually defer disclosure to protect themselves from anticipated emotional rejection. As highlighted by Fauk et al. (2023), Rencken et al. (2022), Sevenoaks et al. (2022), and Sherr et al. (2023), among families affected by HIV, maternal and caregiver psychological distress has been consistently associated with poorer child health and psychosocial outcomes, whereas improving caregiver mental health is considered essential for optimizing child care and treatment outcomes. The failure of current global and national disclosure guidelines to incorporate guilt-focused counseling represents a critical implementation defect, as caregivers cannot effectively support adolescent readiness while remaining paralyzed by unaddressed self-blame.

A central paradox emerging from this study is the severe miscalibration between caregivers' anticipated catastrophic fears and the actual long-term post-disclosure clinical trajectories. Caregiver fear of causing acute adolescent psychological distress operated as the dominant inhibitor in multivariable modeling, reducing disclosure likelihood by 73% (aOR = 0.27, 95% CI: 0.10-0.74, $p = 0.011$). However, this paralyzing dread directly contradicts empirical post-disclosure outcomes, where 93.9% of disclosed adolescents demonstrated improved ART adherence and 92.6% achieved enhanced emotional well-being. While transient post-disclosure distress occurred in 34.6% of cases, longitudinal adjustment was overwhelmingly positive, mirroring findings from systematic reviews and cohort studies across sub-Saharan Africa (C. Laurenzi et al., 2026; Mengesha et al., 2023; Mukuku et al., 2025). This stark divergence demonstrates that caregiver fear is sustained by catastrophic forecasting and lack of experiential preparation rather than empirical reality. Interventions must therefore focus on recalibrating caregiver risk perceptions through peer exchange, testimonial sharing, and structured post-disclosure support, demonstrating to guardians that adolescents possess far greater psychological resilience and coping capacity than their caregivers anticipate.

4.3. Paradigm Shift: From Dyadic Household Decisions to a Triadic Service Delivery Ecosystem

A fundamental theoretical contribution of this study is the paradigm shift from a dyadic household perspective to an integrated triadic service delivery ecosystem. Historically, disclosure frameworks and clinical guidelines treated status communication as an isolated, private transaction occurring exclusively within the domestic sphere between caregiver and child. Placing the sole responsibility on caregivers creates profound emotional isolation, paralyzing guardians who lack clinical communication tools, emotional regulation strategies, and institutional backing. This dyadic assumption directly accounts for the widespread implementation inertia observed across resource-limited settings, as caregivers default to

silence when forced to navigate disclosure without structured health system reinforcement (Chem et al., 2022; Magill et al., 2023; Toromo et al., 2022). Re-conceptualizing disclosure through a socio-ecological and systems lens demonstrates that status communication is inherently a multi-level service delivery process that succeeds only when health facility infrastructure actively supports the household unit (McGray et al., 2023; Mugo, Firdawsi, et al., 2023).

The critical role of health system enabling environments is strongly substantiated by the quantitative findings, particularly the significant effect sizes associated with peer support access (aOR = 3.33, 95% CI: 1.24-8.96, p = 0.017) and facility-level capacity variation (aOR = 2.96, 95% CI: 1.16-7.53, p = 0.023). These statistical associations demonstrate that health facility infrastructure operates as a primary determinant rather than a passive backdrop. When healthcare facilities establish adolescent peer support groups, provide confidential counseling spaces, and train clinical staff in adolescent-friendly communication, the immense psychological burden resting on caregivers is substantially lightened. Studies conducted in Eastern Africa indicate that peer-led support groups enhance adolescents' psychosocial resilience, foster supportive social networks, reduce stigma, and strengthen confidence in managing lifelong antiretroviral treatment, thereby improving engagement in HIV care (Ahmed et al., 2023; Mbanjwa et al., 2026; Ronen et al., 2023). Caregivers become significantly more willing to initiate disclosure when they know that post-disclosure emotional adjustment and adherence support will be cushioned by established facility support systems.

Furthermore, the Triadic Model directly resolves the operational standoff generated by provider-caregiver misalignment. Qualitative narratives highlighted a pattern of mutual deferral in routine clinical care: caregivers perceived young adolescents as emotionally fragile and waited for clinicians to initiate disclosure, while healthcare providers viewed youth as ready but hesitated to act without explicit caregiver consent. This ambiguity creates a service delivery vacuum in which status disclosure is repeatedly postponed until a clinical crisis intervenes. By formalizing disclosure as a shared institutional responsibility involving adolescent readiness, caregiver capacity, and health system support, the Triadic Model bridges this communication gap. Establishing written disclosure plans within medical records and conducting joint planning sessions transforms disclosure from an uncertain, caregiver-isolated event into a coordinated, multi-disciplinary continuum of care.

4.4. Bridging Policy and Practice: Implementation Science Contributions and Health System Integration

From an implementation science perspective, the primary contribution of this study lies in translating abstract, normative policy directives into an actionable, standardized clinical workflow tailored for resource-constrained primary healthcare settings (Damschroder et al., 2022; Pickel et al., 2023). While national and international guidelines consistently advocate for timely status disclosure, they rarely articulate the specific implementation strategies required to overcome institutional inertia, caregiver anxiety, and provider hesitation (Evangeli et al., 2026; Toromo et al., 2022). The five operational components formulated in this framework bridge this execution gap by establishing concrete clinical mechanisms across every stage of the disclosure process. By institutionalizing structured annual readiness screening starting at age 8, the framework replaces subjective caregiver estimates with standardized developmental metrics, preventing the prolonged operational delays observed among early adolescents. Furthermore, the three-session caregiver preparation model directly operationalizes the study's strongest empirical predictor (aOR = 15.61), providing guardians with practical communication skills while systematically resolving maternal guilt surrounding vertical transmission. Documenting written disclosure plans within electronic medical records resolves provider-caregiver misalignment, transforming disclosure from a reactive crisis into a coordinated clinical milestone. Finally, embedding these processes within an enabling facility environment and enforcing a multi-contact, trauma-informed post-disclosure follow-up protocol from 48 hours to 12 months ensures that adolescents receive sustained psychosocial support, directly mitigating the immediate post-disclosure distress observed in over one-third of cases.

This operationalized framework directly advances global policy imperatives, particularly the updated World Health Organization rights-based disclosure guidance (WHO, 2025) and the Kenya National AIDS and STI Control Programme operational guidelines (NASCOP, 2024). By establishing a structured pathway toward status literacy, the framework serves as a vital catalyst for achieving the UNAIDS 95–95–95 targets among pediatric and adolescent populations in high-burden settings (Beima-Sofie et al., 2023; Peter & Jani, 2023). Timely, well-supported status disclosure is a mandatory prerequisite for long-term treatment adherence, retention in chronic care, and sustained viral suppression, directly supporting the second and third 95 targets (Edun et al., 2022; Mengesha et al., 2023). Moreover, grounding the implementation framework in adolescent developmental readiness aligns directly with the United Nations Convention on the Rights of the Child (UN, 1995), honoring the child's evolving capacity and fundamental right to health information and bodily autonomy. In resource-limited primary healthcare systems where specialized psychiatric or high-cost counseling services are absent, this triadic implementation model provides a scalable, low-cost, and sustainable blueprint to bridge the policy-to-

practice divide, ensuring that adolescent status disclosure yields sustained therapeutic and public health benefits.

5. CONCLUSION

In conclusion, this study demonstrates that adolescent HIV status disclosure in high-prevalence, low-resource settings operates not as a linear function of chronological age, but as a threshold-driven event dictated by the triadic convergence of adolescent developmental readiness, caregiver capacity, and health system support. By uncovering non-linear age dynamics, the massive effect size of caregiver training (aOR = 15.61), and the critical affective bottleneck of unaddressed maternal guilt, this research reframes disclosure from an isolated domestic transaction into an integrated, multi-level service delivery continuum. Bridging the persistent policy-to-practice disconnect, the operationalized Triadic Implementation Framework and its five operational components transform abstract normative directives into a concrete, standardized clinical workflow that protects adolescent mental health while optimizing treatment literacy and long-term adherence.

The rigor and validity of these findings are supported by several notable methodological strengths, including a robust convergent parallel mixed-methods design, an adequately powered sample (n = 310), thorough multivariable modeling incorporating non-linear quadratic terms and diagnostic validations, and a comparative matrix mapping empirical findings against five major global and national guidelines. Nevertheless, certain methodological limitations should be acknowledged when interpreting these results. The cross-sectional design precludes definitive causal inferences regarding long-term post-disclosure clinical trajectories. Additionally, quantitative data relied primarily on caregiver proxy reporting regarding adolescent readiness, and data collection was concentrated within public health facilities in rural Western Kenya, necessitating contextual adaptation before generalizing findings to urban health systems or differing socio-cultural settings.

To build upon these empirical and theoretical contributions, future research should prioritize prospective longitudinal cohort studies and pragmatic implementation science trials to evaluate the scalability, implementation fidelity, and cost-effectiveness of the five operational framework components in routine primary care. Further investigation is also needed to explore mechanisms of onward disclosure among older adolescents navigating romantic relationships and peer networks, alongside health system strategies to reduce community-level stigma. Ultimately, shifting from reactive, age-bound disclosure to a structured, trauma-informed triadic service continuum honors adolescent rights, strengthens family communication, and provides an essential foundation for achieving sustained viral suppression and the UNAIDS 95–95–95 global targets.

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