

# Intersemiotic Complementarity in Maternal and Child Health Texts: A Multimodal Analysis of Public Health Communication in Machakos County, Kenya

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DOI: <https://doi.org/10.47772/IJRISS.2026.100900115>

Received: 31 August 2026; Accepted: 15 September 2026; Published: 02 October 2026

## ABSTRACT

Maternal and child health (MCH) communication is central to the delivery and uptake of preventive and curative health services. However, the effectiveness of printed MCH materials depends not only on the availability of information but also on how verbal and visual resources work together to construct meaning. This study examines intersemiotic complementarity in MCH texts used in selected public healthcare facilities in Machakos County, Kenya. The study is guided by Systemic Functional Linguistics, Social Semiotic Theory, and Royce's framework of intersemiotic complementarity. An exploratory, qualitatively driven mixed-methods design was adopted. Data were drawn from 26 printed MCH materials collected across 10 public facilities representing Levels 2–5 of Kenya's health facility tier system. The corpus comprised 18 posters, 7 Group Antenatal Care brochures, and 1 national Mother and Child Health Handbook. The analysis was complemented by fifty key informant interviews with healthcare practitioners and six focus group discussions involving thirty-six expectant women and mothers of children under five years. The findings show that verbal and visual modes reinforce, extend, and specify one another in the construction of ideational, interpersonal, and compositional meanings. However, communication is weakened by technical English, dense layouts, culturally decontextualised imagery, limited procedural explanation, and the underrepresentation of important social actors. Fathers, community health workers, women with disabilities, and extended family members are largely absent, although these actors influence maternal and child health decision-making and service uptake. The study concludes that MCH materials should be designed as context-sensitive multimodal ensembles rather than as supplementary combinations of words and images. The findings have implications for county-level health communication policy, facility-based health education, and the development of accessible and socially inclusive MCH materials.

**Keywords:** maternal and child health communication, intersemiotic complementarity, multimodal discourse analysis, public health communication, social actors, Machakos County

## INTRODUCTION

Maternal and child health (MCH) remains a major public health priority because it concerns the survival, safety, and well-being of mothers, newborns, infants, and children. Although Kenya has implemented policy interventions, health-sector reforms, and community-based programmes to improve maternal and child health outcomes, substantial challenges remain. These challenges are associated not only with access to healthcare services but also with the quality, accessibility, and cultural relevance of the communication through which health information is delivered.

Public health communication is rarely monomodal, visual resources such as typography, colour, layout, and written language operate together to represent health practices, communicate risk, construct relationships between institutions and service users, and guide action. In MCH settings, these resources are used to

communicate information about antenatal care, delivery, postnatal care, breastfeeding, immunisation, nutrition, hygiene, and maternal and child danger signs (WHO, 2016). The effectiveness of these materials therefore depends on the degree to which their semiotic resources are integrated into a coherent message (Xie, 2022).

This study uses the term intersemiotic complementarity to refer to the relationship through which two or more semiotic modes contribute related but not identical meanings to a communicative text (Royce, 2007). The concept does not imply that words and images simply repeat the same information. Rather, the verbal mode may name, classify, explain, sequence, or direct action, while the visual mode may depict, contextualise, exemplify, attract attention, or evoke an emotional response. Complementarity occurs when these contributions work together to support a shared communicative purpose (Kress, 2010). Conversely, intersemiotic misalignment occurs when the verbal and visual modes provide contradictory, incomplete, culturally inappropriate, or insufficiently related meanings.

Intersemiotic complementarity connects specialised multimodal theory to the practical design and use of health materials. A poster is not effective merely because it contains both text and images. It is effective when the images help users understand the written message, when the written message explains what the image does not make explicit, and when both modes represent the experiences, actors, and contexts of the intended audience.

The present study investigates intersemiotic complementarity in MCH print materials used in public healthcare facilities in Machakos County. It focuses on how verbal and visual modes work together to construct ideational, interpersonal, and compositional meanings. It also examines how missing or marginalised social actors affect the practical relevance and inclusiveness of the materials

### **Statement of the Problem**

Printed maternal and child health materials, including posters, brochures, and the national Mother and Child Health Handbook, are widely distributed across public health facilities in Machakos County. used in public healthcare facilities. However, this availability does not necessarily guarantee comprehension, trust, or behavioural uptake among expectant women and mothers with varying literacy levels, nor has it translated into reduced maternal and neonatal mortality. Although these artefacts depend on the coordinated deployment of verbal and visual semiotic resources to convey critical health information, the nature of their intersemiotic complementarity remains under-explored. Similarly, the representation of diverse social actors in these texts is not well understood, raising concerns that maternal and child health may continue to be framed as an exclusively maternal responsibility. This study therefore seeks to investigate how verbal and visual modes construct meaning in maternal and child health texts in Machakos County.

### **Objective of the Study**

To determine the intersemiotic complementarity between the visual and verbal modes in maternal and child health texts.

### **Research Question**

What is the intersemiotic relationship between verbal and visual modes in enacting meaning in maternal and child health texts?

## **LITERATURE REVIEW**

Empirical evidence suggests that pairing verbal directives with relevant visuals helps to clarify abstract medical information. A systematic review by Houts et al. (2006) found that pictures closely linked to written text significantly increase attention, comprehension, recall and adherence to health instructions. This effect is a result of dual coding theory, where information is processed through both verbal and visual resources, thereby lowering

cognitive load and facilitating the translation of abstract medical concepts into concrete actions (Mayer, 2009). This multimodal alignment is particularly critical for low literacy audiences who often struggle with complex medical terminologies and abstract medical concepts. Dowse and Ehlers (2005) demonstrated that the inclusion of simple pictograms alongside written medicine instructions significantly improved comprehension among low-literate patients in South Africa. Similarly, Katz et al. (2006) showed that low literacy patients had better understanding and adherence when pictorial aids accompanied medication instructions. In the context of MCH, studies have shown that mothers are more likely to correctly prepare oral rehydration salts, adhere to recommended breastfeeding practices and recognise neonatal danger signs when verbal directives are reinforced by culturally familiar and ideationally congruent visuals (Anker et al., 2011). Such findings confirm that visual – verbal complementarity in MCH texts is not merely decorative but functionally critical in bridging the gap between health knowledge and health behaviour.

Effective intersemiosis depends on deliberate coordination of logico- semantic relations and the hierarchical status of modes (Unsworth & Cleirigh, 2014). In maternal and child health communication, misalignment between the verbal and the visual modes can compromise accuracy, relevance and accessibility. Such divergent intersemiotic relations occur when illustrations depict practices that deviate from recommended standards, or when they portray actors and cultural contexts not referenced in the accompanying text. This incongruence can prompt selective interpretations and unintended inferences, thereby weakening behavioural uptake (Aning, 2021). Consequently, analysing the intersemiotic complementarity of the verbal and visual modes in MCH texts through Royce (2007) framework is essential for assessing their persuasive impact and instructional clarity, and for promoting accurate risk perception and improved maternal and child health outcomes.

## **THEORETICAL FRAMEWORK**

To rigorously evaluate how meaning is constructed and received within the maternal and child health communication landscape, this study adopted an integrative conceptual framework that combines Systemic Functional Linguistics (SFL), Social Semiotic Theory, and Intersemiotic Complementarity. Systemic Functional Linguistics, as articulated by Halliday (1978) and Halliday and Matthiessen (2014), provides the analytical toolkit for examining how verbal mode realises meaning across the three metafunctions: ideational, interpersonal, and textual. The ideational construes experiences and health practices, the interpersonal negotiates relationships and power between authorities and mothers, and finally, the compositional organises information into coherent and accessible messages (Halliday, 1978; Halliday & Matthiessen, 2014).

The Visual semiotic resources are evaluated using Kress and van Leeuwen's (2021) framework of visual grammar, which investigates representational structures that depict participants, processes and circumstances; interactive dimensions such as gaze, distance and angle position the viewer; and compositional features which include information value, salience and framing that guide attention and reading paths (Kress & van Leeuwen, 2021).

To examine how the verbal and visual modes operate in tandem, Royce's (2007) intersemiotic complementarity framework models the degree to which visual and verbal choices reinforce, extend, or complement one another across shared communicative goals (Royce, 2007). This framework is particularly suitable for analysing MCH texts because such texts rely on the interaction of words and images in communicating instructions, warnings, and care practices. By integrating these three perspectives, the study is able to reveal not only what each mode contributes in isolation but how gaps or misalignments between modes undermine clarity, cultural relevance and behavioural uptake.

## **METHODOLOGY**

This study adopted an exploratory, qualitatively driven mixed-methods design to investigate intersemiotic complementarity. A mixed-methods approach was particularly suited for multimodal discourse analysis as it allows for the systematic quantitative mapping of semiotic structures alongside qualitative exploration of how

these multimodal configurations are operationalised, interpreted, and negotiated in clinical practice (Creswell & Creswell, 2018).

The empirical investigation was conducted across ten public healthcare facilities representing Levels 2 through Level 5 within the public health tier system in Machakos County, Kenya. This multi-level facility sampling frame ensured representative coverage across primary healthcare dispensaries (Level 2), health centres (Level 3), sub-county hospitals (Level 4), and a county referral hospital (Level 5), reflecting the diverse socio-demographic contexts and varied health literacy levels of service users in the region. The empirical dataset was assembled using a dual-sampling framework designed to capture both the textual artefact corpus and primary stakeholder perspectives across the county's public healthcare network. The document corpus comprised a purposively sampled collection of twenty-six Maternal and Child Health (MCH) print materials currently utilised across the ten selected facilities. This corpus was stratified into three distinct genre categories to represent the full spectrum of patient-facing visual-verbal literature: eighteen public health posters displayed in high-traffic areas such as triage points and waiting bays for rapid visual processing, seven Group Antenatal Care (ANC) brochures distributed during structured clinical sessions, and one comprehensive national MCH Handbook that serves as the standard instructional and medical record booklet for mothers.

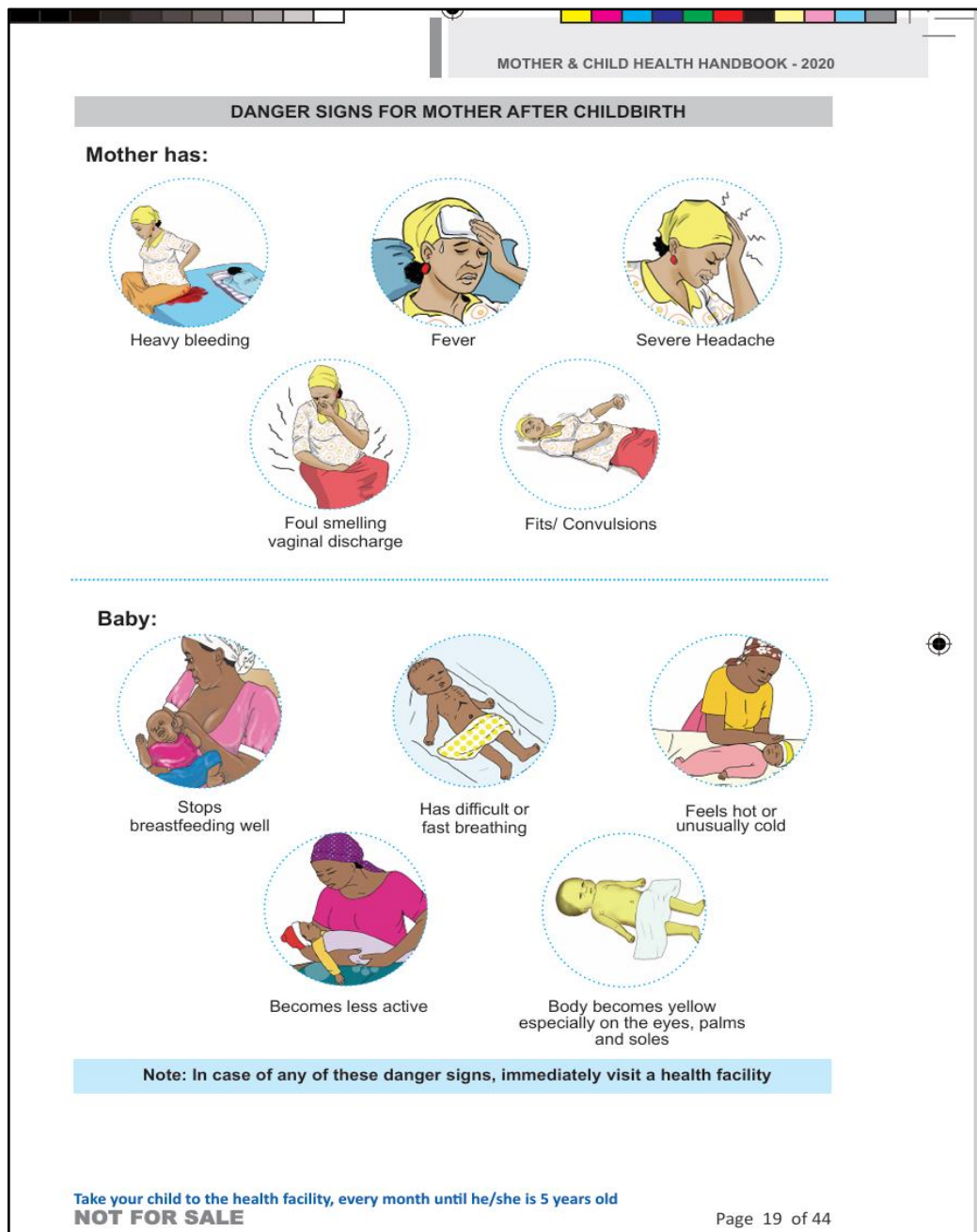
To evaluate how these semiotic structures function in clinical practice, qualitative data were gathered concurrently from human participants selected through stratified random and purposive sampling across the ten health facilities. Key Informant Interviews (KIIs) were conducted with a total of fifty healthcare practitioners providing antenatal care services and child health care services to assess service provider usage of print media during oral education and their observations of patient comprehension. To capture target-audience reception, thirty-six service users, consisting of expectant women and mothers of children under five years old, were engaged across six Focus Group Discussions FGDs, with 6 participants per session in each facility. Participant stratification accounted for maternal age, parity, and facility level to ensure a broad representation of health literacy backgrounds, allowing the study to empirically map user interpretation and modal preferences against the semiotic features of the document corpus. Data processing and analytical procedures were structured around an integrated multimodal workflow that prioritised the systematic mapping of intersemiotic complementarity. The analysis followed three sequential phases: primary intersemiotic and metafunctional analysis of document artefacts, qualitative thematic coding of user reception data, and cross-methodological synthesis

## RESULTS

The empirical findings from Machakos County demonstrate that the persuasive efficacy and usability of MCH print communication depend on the patterned interaction of visual and verbal modes, rather than any single mode in isolation. While the presence of material process clauses and imperative structures theoretically creates clear action directives (Halliday & Matthiessen, 2014), their real-world instructional value is severely diminished when paired with uncontextualized visuals. This finding reinforces prior research by Houts et al. (2006), which emphasises that health materials must align visual representation with verbal text to reduce cognitive processing load for low-literacy audiences. The communicative strength of the MCH texts lies in the way verbal and visual modes jointly enact meaning across ideational, interpersonal, and compositional dimensions.

### Ideational complementarity

The findings of this study show that MCH texts are effective ideationally when they represent knowledge through close integration of participants, processes and circumstances (Royce, 2007). The verbal mode specifies and explains maternal and child health practices while the visual mode makes them concrete through familiar actors, local settings and recognisable health actions. Figure 1 demonstrates ideational complementarity.



**Figure 1: Danger signs for the mother after childbirth**

This text is about postnatal danger signs for both mother and baby, it aims at helping the mothers and care givers to quickly recognize life threatening postnatal complications and seek care early.

**Source:** Extracted from the Mother and Child Handbook (Obtained from Machakos Level 5)

Figure 1 demonstrates how ideational meaning is constructed through the complementarity relationship between the verbal list of danger signs and the accompanying illustrations. While the verbal mode classifies and names the specific health risks for mothers and babies after childbirth, the visual mode concretises these abstract medical terms by depicting observable bodily states, actions and contexts. For example, the text “heavy bleeding” is reinforced by an illustration of a woman seated on a blood- stained cloth while “fever” is represented by a woman with a wet cloth on her forehead and “convulsions” by a human figure in spasm. Similarly, baby-related signs such as “stops breastfeeding well” and the “body becomes yellow” are made tangible through images showing a baby turning from the breast and a baby with yellow colour being highlighted on the eyes, palms and soles as specified in the text. The visual representations thus elaborate and specify the verbal labels,

translating clinical language into recognisable embodied experiences within domestic and cultural settings. Through this synergy, the verbal mode and the visual mode do not function independently but work together to construct a complete ideational meaning. This complementarity is critical in low-resource settings as it reduces ambiguity and supports comprehension.

### **Ideational Complementarity Constraints and Missing Social Actors**

Ideational complementarity is weakened when written information is technically dense, procedurally incomplete, or disconnected from the situations represented visually. Some texts identify a danger sign but do not explain its possible cause, the immediate response required, or the referral pathway. Similarly, some visuals show mothers and infants without representing the wider social network involved in health decisions.

The most significant omissions concern fathers or partners, community health workers, healthcare providers, women with disabilities, adolescents, and extended family members. These omissions have practical consequences. When fathers and partners are absent, the texts underrepresent the people who may control transport, finances, consent, or decisions about seeking care. When community health workers are absent, the materials obscure the referral and follow-up structures that connect households with facilities. When women with disabilities are absent, the texts provide limited recognition of diverse access needs. When adolescents are absent, younger mothers may not see themselves as part of the intended audience.

The analysis therefore shows that missing social actors are not a minor representational issue. Their absence narrows the implied audience, weakens the representation of shared responsibility, and reduces the social completeness of the health message.

### **Interpersonal complementarity**

The study findings also show that the texts are interpersonally effective because they build a supportive relationship with the audience while still maintaining authority. The verbal mode uses advisory and instructional language, while the visual mode uses gaze, distance, camera angles and colour to create engagement, trust and emotional engagement. In some MCH texts, the two modes reinforce each other to encourage compliance, create controlled tensions and to emphasise risk. This means that the texts do not only inform but also persuade, reassure and motivate expectant women and mothers to act. In Figure 1, the verbal and the visual modes work together to establish a relationship between the content of the texts and the mother/ caregiver while conveying urgency and responsibility. The verbal text uses imperative and direct language through the statement at the bottom: “in case of any of these danger signs, immediately visit a health facility”. This commands action and positions the health system as the authority while positioning the mother/caregiver as the agent who must act. The word “immediately” intensifies the modality, constructing a sense of urgency and seriousness. The visual mode complements this interpersonal function by depicting relatable participants with Kenyan features of dressing and domestic settings; this creates proximity and identification. The visual illustrations do not show medical professionals in a clinic, but show mothers and babies at home, which addresses the reader directly in their own context. The facial expressions of pain, worry and lethargy, along with caregiving actions such as touching the forehead to check the temperature, function as affective cues. They evoke empathy and concern, prompting the reader to recognise these signs in themselves and in their baby. Collectively, the verbal command provides the directive force while the images provide emotional and social engagement. This complementarity therefore constructs an interpersonal relationship of care, responsibility and urgency.

### **Interpersonal complementarity constraints**

The interpersonal complementarity analysis reveals several key weaknesses that reduce the effectiveness of these materials as health communication tools. Based on Royce’s (2007) framework, interpersonal meaning is not realised by the verbal and the visual mode in isolation, but through how both work together to shape relationships between the text, the reader and the institutional modes jointly position the reader and negotiate social relations. In these texts, the verbal mode employs authoritative directives, cautionary language and institutional discourse

that constructs mothers as passive recipients expected to comply, rather than as active agents in health decision-making. This is reinforced by the visual mode, which presents standardised, idealised images of mothers and babies that assume homogeneity in ability, literacy and cultural context. Although Figure 2 achieves coordination of interpersonal meaning through reinforcement and extension, interpersonal intersemiotic complementarity is constrained.



**Figure 2 Benefits of good breastfeeding attachment**

This text is about benefits of good breastfeeding attachment aimed at teaching mother's the correct way to attach a baby during breastfeeding and explains why it matters.

**Source:** Ekalakala Level 2

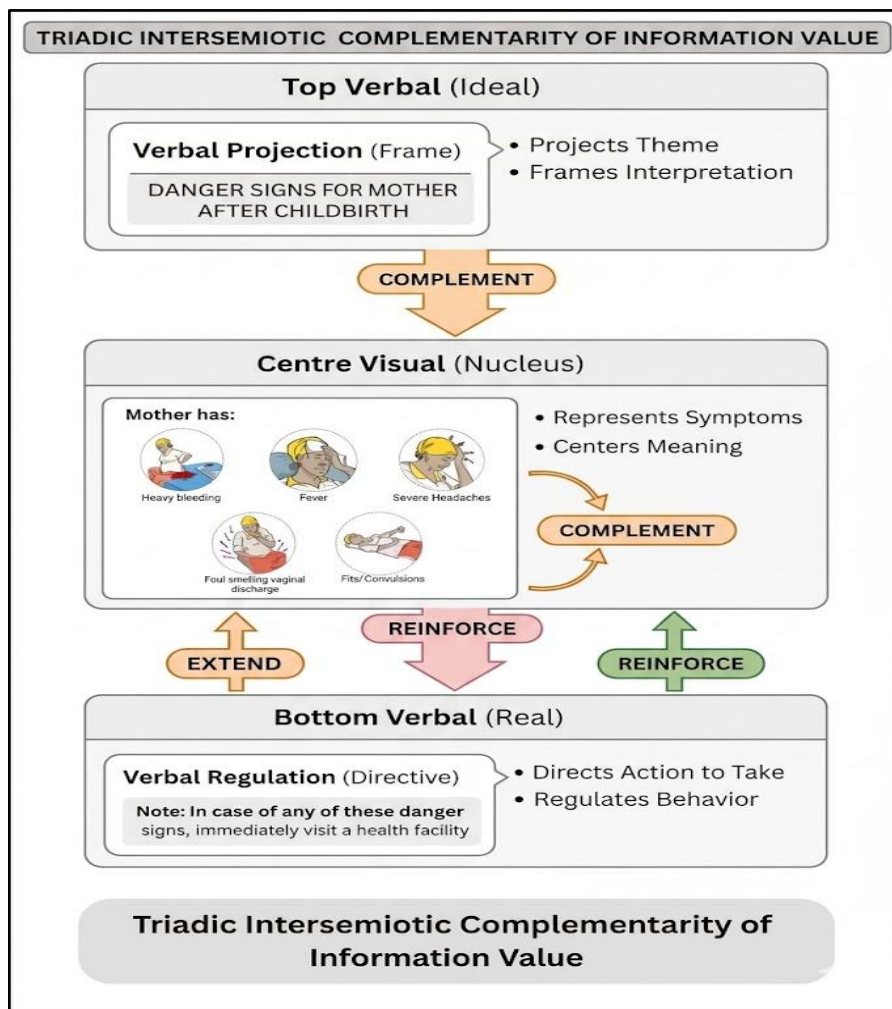
### Constraints Hinder its Full Communicative Effectiveness

Figure 2 demonstrates interpersonal intersemiotic constraints that limit the persuasive impact of the text. First a participant representation arises from the misalignment between the inclusive pronoun "let's all" in the verbal text and the exclusive visual representation of only a mother and infant. While the language constructs a collective responsibility the image restricts the interpersonal "we" to maternal caregiving potentially reducing male and community engagement. Second, an addressivity constraint is observed. The verbal mode employs an inclusive imperative to directly engage the audience whereas the visual mode uses an "offer" with averted gaze, positioning the viewer as an external observer rather than an addressee (Kress & van Leeuwen, 2021). Third, a social distance constraint emerges as the solidarity-marked language seeks to reduce institutional distance, while the presence of the Ministry of Health logo and instructional framing maintains an expert-public hierarchy. Finally, an affective scope constraint is noted where the verbal text articulates multiple benefits including health risk reduction, but the visuals depict only bonding. Consequently, the emotional and reassurance functions are carried by language rather than by the visuals. Combined, the visual and the verbal modes narrow the audience to mothers only, reduce opportunities for dialogic engagement and emphasise instructions over empathy. As a result, the text is ineffective in fostering trust and lacks sufficient cultural appropriateness.

### Compositional Complementarity

Compositionally, the texts are effective because their layout guides reading and strengthens message clarity. The triadic layout, together with salience and framing, creates a clear reading path from headline to image to

instruction. The visual at the centre often carries the main message while the verbal elements frame, explain and direct action. This structured arrangement helps users to quickly notice key information, follow the intended sequence and understand the message even when literacy levels differ (Royce, 2007). Figure 3 presents the triadic organisation of the visual and the verbal elements in Figure 1.



**Figure 3: Triadic intersemiotic complementarity of information value**

The layout of Figure 3 reflects the ideal-real structure of information value, while also demonstrating that meaning in multimodal texts emerges through dynamic intersemiotic relations across modes. The diagram highlights how MCH texts employ a verbal – visual – verbal semiotic chain to move the viewer from conceptual awareness to visual recognition and finally to informed action (Kress & van Leeuwen, 2021; Royce, 2007).

### Compositional complementarity constraints

The compositional complementarity analysis shows compositional limitations centred on four interrelated issues: excessive verbal density and complexity, restricted linguistic accessibility, inadequate visual hierarchy and disjointed information sequencing. The verbal mode manifests these constraints through the use of technical jargon, prolonged textual segments and monolingual English content, all of which pose comprehension challenges for many readers. On the other hand, the visual mode compounds these difficulties through cluttered page layouts, insufficient salience to direct attention, poor logical ordering of information and illustrations that draw focus without adequately supporting conceptual understanding. In combination, the verbal and visual modes produce texts that are deficient in readability, navigability and practical usability. As a result, the intended meaning is only partially conveyed, preventing clear and complete communication of health information to the target audience.

## DISCUSSION

The findings demonstrate that intersemiotic complementarity is central to the communicative effectiveness of MCH materials. Verbal resources specify, classify, direct, and sequence information, while visual resources depict, contextualise, attract attention, and create affective engagement. When the two modes are aligned, they produce a more accessible and memorable message.

The findings also show that multimodal effectiveness cannot be assessed solely by identifying whether a material contains both words and images. The relevant question is whether the modes contribute complementary meanings and whether those meanings are socially and culturally appropriate. A technically accurate poster may remain ineffective if its language is inaccessible, its imagery is culturally unfamiliar, its layout is difficult to navigate, or its social actors are too narrowly represented.

The facility-tier analysis further suggests that the communicative demands placed on MCH texts vary across Levels 2–5. Materials used in lower-level facilities may need to function more independently because users may have limited access to extended counselling or specialised services. Materials used in higher-level facilities may be more readily supplemented by provider explanation. This distinction supports the development of tier-sensitive communication guidelines rather than a single uniform model for all facilities.

The absence of key social actors is especially important. MCH communication that depicts only mothers may unintentionally reinforce the idea that maternal and child health is an individual maternal responsibility. A more inclusive design should represent fathers, partners, healthcare providers, community health workers, women with disabilities, adolescents, and other caregivers where their participation is relevant to the recommended behaviour.

## CONCLUSION

This study examined intersemiotic complementarity in MCH texts used across Levels 2–5 of the public healthcare system in Machakos County. The findings show that verbal and visual modes jointly construct ideational, interpersonal, and compositional meanings. Verbal resources provide explicit naming, explanation, sequencing, and direction, while visual resources offer recognition, contextualisation, emotional engagement, and attention management.

The study concludes that MCH materials are most effective when they function as coherent multimodal ensembles rather than as simple combinations of words and pictures. Their effectiveness is reduced by weak modal integration, technical English, dense layouts, culturally decontextualised imagery, incomplete procedural information, and the absence of important social actors. The analysis further demonstrates that social representation is part of communicative effectiveness. Materials that exclude fathers, partners, community health workers, women with disabilities, adolescents, and other relevant caregivers provide an incomplete account of how maternal and child health decisions are made and implemented.

## RECOMMENDATIONS

The structural imbalances identified across MCH communication materials present substantial policy and development challenges within devolved healthcare systems. County health departments should develop standardised multimodal authoring guidelines for MCH materials. These guidelines should require clear relationships between verbal and visual content, simplified language, appropriate visual hierarchy, culturally relevant imagery, and explicit representation of shared caregiving responsibilities. MCH materials should be adapted to the communicative demands of different facility levels. Level 2 materials should prioritise rapid comprehension, essential danger signs, immediate action, referral information, and local-language accessibility. Level 3 materials should support routine health education and community-linked care. Levels 4 and 5 should incorporate more specialised information while maintaining accessible summaries for patients and caregivers.

The representation of social actors should be expanded. Designers should include fathers or partners, healthcare workers, community health workers, women with disabilities, adolescents, and extended family members where their participation is relevant to the health behaviour being communicated. County health departments should conduct user testing with expectant women, mothers, fathers, adolescents, persons with disabilities, and community health workers before materials are approved for widespread use. Testing should assess comprehension, cultural relevance, visual interpretation, readability, and the clarity of recommended action.

Healthcare workers should be trained to use MCH print materials as structured communication tools rather than merely as decorative or supplementary resources. Training should address how to explain visual content, identify modal misalignment, adapt technical language, and ensure that users understand the recommended action.

### Conflict of Interest Statement

The author declares that there is no conflict of interest

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