

# From HIV prevention to non-communicable disease health promotion efforts in sub-Saharan Africa: A Narrative Review

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**Objective:** To synthesize published literature on noncommunicable disease (NCD) behavior change communication (BCC) interventions in sub-Saharan Africa (SSA) among persons living with HIV (PLHIV) and in the general population to inform efforts to adopt similar HIV and NCD BCC intervention activities.

**Methods:** We conducted a literature review of NCD BCC interventions and included 20 SSA-based studies. Inclusion criteria entailed describing a BCC intervention targeting any four priority NCDs (cardiovascular disease, type 2 diabetes, cervical cancer, and depression) or both HIV and any of the NCDs. The RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework was used to assess potential public health impact of these studies. We also solicited expert opinions from 10 key informants on the topic of HIV/NCD health promotion in five SSA countries.

**Results:** The BCC interventions reviewed targeted multiple parts of the HIV and NCD continuum at both individual and community levels. Various strategies (i.e. health education, social marketing, motivational interviewing, mobile health, and peer support) were employed. However, few studies addressed more than one dimension of the RE-AIM framework. Opinions solicited from the key informants supported the feasibility of integrating HIV and NCD BCC interventions in SSA potentially improving access, service provision and service demand, especially for marginalized and vulnerable populations.

**Conclusion:** Although HIV/NCD integration can improve effectiveness of preventive services at individual and community levels, potential public health impact of such approaches remain unknown as reach, adoptability, and sustainability of both integrated and nonintegrated NCD BCC approaches published to date have not been well characterized.

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## Introduction

Health promotion interventions, in particular behavior change communication (BCC) strategies (which utilize

different communication channels to promote positive health behaviors at individual and community levels), have been widely applied in developed settings to motivate demand for and adoption of preventive and

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promotive health practices [1]. The goals of BCC interventions not only include improving disease awareness and uptake of treatment but also promoting adherence to various risk reduction and pharmacologic treatment interventions [2]. Strategies such as school-based programs to reduce risky sexual behavior, workplace programs to improve physical activity, or diabetes-education programs to improve disease self-management are commonly employed in developed country settings to reduce the risk and complications of noncommunicable disease (NCDs) like cancer, cardiovascular disease (CVD), diabetes mellitus and obesity, as well as communicable diseases like HIV. Although data on effectiveness of these strategies in developed country settings has been mixed, there is strong evidence to support some BCC interventions aimed at tobacco cessation and increased physical activity [3].

Data on the effectiveness of BCC interventions in sub-Saharan Africa (SSA), which have historically been focused on HIV prevention, is limited. Considerable investment in information-education-communication (IEC) and subsequent BCC strategies in the 1990s had little impact on reported sexual risk behaviors [4]. This led to calls to re-examine the theories and models of behavior change and consider socioeconomic and cultural determinants, such as poverty, sex inequality, sexual identity, stigma, and lack of access to HIV services, that undermine people's abilities to act on prevention advice. As a consequence, HIV prevention interventions have increasingly focused on combining behavioral strategies with biomedical and structural approaches within a broader framework [5], such as the combination of safe-sex counseling and use of preexposure prophylaxis (PrEP). Combination approaches that adapt to cultural contexts, populations being addressed, and stage of epidemic, may also be more effective for NCDs [6]. Previously, the HIV response, including BCC activities were organized as 'vertical' disease oriented programs [7]. This approach was believed to have yielded more rapid results in weak health systems, but may have aggravated healthcare advances by diverting resources from more holistic preventive approaches [8].

Although there is increasing interest in utilizing BCC interventions to tackle the rising burden of NCDs [9], little is known about the effectiveness or adoptability of NCD BCC interventions in this setting [10,11]. Interest in NCD BCC interventions is increasing commensurate with rising NCD burden: CVD deaths have nearly doubled over the last two decades with an estimated one million deaths in 2013. This burden is magnified among persons living with HIV (PLHIV) who have 50% increased risk of experiencing a CVD event, even after controlling for traditional CVD risk factors [12,13]. Given the substantial resources deployed and health systems developed during the roll out of the global antiretroviral treatment (ART), leveraging lessons from the HIV response, and integrating HIV and NCD care have been suggested as approaches, to better address HIV control and the enormous rise of NCDs in general [14,15].

In this review, we narratively synthesize literature that addresses BCC interventions for NCDs among PLHIV and in the general population in an attempt to further inform the feasibility of integrated HIV/NCD BCC approaches. We apply the RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework to evaluate the public health impact of various BCC interventions [16]. This approach, which assesses five dimensions of an intervention (reach, efficacy, adoption, implementation, and maintenance), is an expeditious strategy for evaluating the potential public health impact of interventions intended for wide-scale dissemination (Table 1). In addition, we performed key informant interviews with HIV and NCD experts in SSA, in order to highlight gaps in BCC knowledge and identify research priorities.

## Methods

We undertook a narrative review of literature between 1970 and 2017, on NCDs and dual HIV/NCD health promotion interventions within SSA. We defined BCC intervention as 'an interactive process of working

**Table 1. RE-AIM framework: dimensions or measures.**

Dimensions <sup>a</sup>	Definition
Reach	This is the absolute number, proportion, and representativeness of individuals who are willing to participate in a given intervention.
Effectiveness	Defined as the impact of an intervention on outcomes, including potential negative effects, quality of life, and economic outcomes.
Adoption	Defined as the absolute number, proportion, and representativeness of settings and intervention agents who are willing to initiate a program.
Implementation	Refers to the intervention agents' fidelity to the various elements of an intervention's protocol including consistency of delivery as intended and the time and cost of the intervention.
Maintenance	Refers to the extent to which an intervention becomes institutionalized or part of the everyday culture, norms and practice of individuals (or organization or community) 6 or more months after the most recent intervention contact.

Retrieved from [18].

<sup>a</sup>Each study was assessed in terms of whether stated interventions did or did not address the RE-AIM dimensions.

with individuals and communities through different communication channels to promote positive health behaviors and support behavior change to maintain health' [17]. We targeted BCC interventions related to four priority NCDs (CVD, diabetes mellitus, cervical cancer, and depression) and those targeting HIV and any priority NCD. We searched the 'Awareness, Education & Dissemination' database – an Endnote folder compiled by a librarian in the HIV/NCD Integration Project, and PubMed utilizing the following search terms; 'health promotion,' 'behavior change communication,' 'HIV,' 'noncommunicable disease,' and 'sub-Saharan Africa' to identify studies meeting our inclusion criteria. Studies eligible for inclusion were those peer-reviewed, described a BCC intervention or were a synthesis or meta-analyses of target BCC intervention(s), reported at least one BCC outcome, conducted in SSA, and published in English. We excluded studies

that did not focus on the health promotion aspects of an intervention. Articles were independently screened for eligibility by two authors based on title and abstract review and then rated as 'for inclusion,' 'potentially eligible,' or 'for exclusion.' Full text articles rated 'for inclusion' or 'potentially eligible' were reviewed independently by two authors to determine final inclusion in the review.

Data from included studies were extracted separately by four researchers who were blinded to each other's work. Extracted data were then compared for agreement and reconciled through group consensus. Data included basic study characteristics (setting, population, description of intervention and comparator groups, and types of outcomes reported) and completeness of reporting of RE-AIM framework elements as developed by Glasgow *et al.* [16] (Table 2). The RE-AIM model provides a useful

**Table 2. Characteristics of included studies.**

Author and setting	Participants and sample size	Study design and intervention	Outcomes	RE-AIM component reported
Abanilla <i>et al.</i> [19] Faith Based Organization Ghana	Church leaders and church members $n = 25$ church leaders from 5 churches; 167 members from 2 churches	Qualitative study design Int: Using community health workers (CHWs) in churches to deliver health education for cardiovascular disease (CVD) prevention compared with usual methods of CVD prevention	Feasibility of delivering CVD prevention program using CHWs in churches	I
Ahmed and Abdelrhan [20] Community Sudan	Medical students and diabetics $n = 400$ students, 80 people with diabetics	Controlled before-after study design Int: Using trained medical students to prevent and control diabetes, for 15 weeks compared with routine methods of health education	Change in students' knowledge/skills in communicating health-related skills Improvement in knowledge, attitudes and practices of diabetics	E
Assah <i>et al.</i> [21] Community Cameroon	Adults with diabetes mellitus (DM) type 2 $n = 192$ (Int = 96, C = 96)	Nonrandomized trial design Int: peer support through peer-led group meetings, personal encounters and phone calls compared with no peer support	Reduction in HbA1c, BP, blood lipids, and improved self-care behaviors	E
Baumann <i>et al.</i> [22] Community Uganda	Adults with type 2 DM $n = 46$	Prepost quasi-experimental design Int: short-term telephone-based peer support program compared with routine care with no phone-based support	Change in diabetes self-care activities and glycemic control Change in social support and emotional well being Linkage to care Sustainability of intervention	R, E, I, M
Cappuccio <i>et al.</i> [23] Community Ghana	Community members $n = 1013$ from 12 villages, Mean age = 55 years	Randomized trial design Int: health education and additional health promotion sessions with advice on reducing salt intake compared with health educational sessions only	Reduction in salt intake, BP, and urinary sodium (UNa)	R, E
Chamie <i>et al.</i> [24] Community Uganda	Community members $n = 4343$ : 2323 adults, 2020 children (<18 years)	Controlled before-after design Int: Community-based HIV and NCD testing campaigns offering diagnostic, preventive, treatment and referral services compared with routine service delivery methods	Feasibility and diagnostic yield of integrating NCD into a rapid community-based multidisease screening campaign	R, E, I
Chigbu <i>et al.</i> [25] Community Nigeria	Women (30–60 years) and girls (9–13 years) $n = 1541$ : 1327 women, 214 girls	Controlled before-after design Int: house-to-house education on cervical/breast cancer prevention by community health educators for 6 months	Uptake of human papilloma virus (HPV) vaccination and cervical and breast cancer screening	R, E, I
Evans <i>et al.</i> [26] Community schools South Africa	School representatives $n = 22$	Qualitative study design Int: social marketing campaign among school representatives to prevent obesity	Feasibility of using media, health knowledge, attitudes, beliefs, and behaviors to support obesity prevention	R
Gessler <i>et al.</i> [27] Health facility Cameroon Adults	Adults attending a health facility $n = 837$	Nonrandomized trial design Int: counseling and communication intervention using various educational tools compared with counseling only	Rates of return for follow-up in newly diagnosed hypertensive and/or diabetic patients	E

Table 2 (continued)

Author and setting	Participants and sample size	Study design and intervention	Outcomes	RE-AIM component reported
Govindasamy <i>et al.</i> [28] Community South Africa	Community members $n = 9806$ , median age = 30 years	Observational cohort study Int: mobile screening unit to provide HIV, tuberculosis (TB), NCD screening compared with normal health facility-based screening methods	New diagnoses of HIV, TB, DM, or hypertension (HTN) Linkage to care within 1 month postdiagnosis	E
Khabala <i>et al.</i> [29] Health facility Kenya	HIV+, HTN, and DM patients $n = 1432$	Retrospective, descriptive study Int: Medication Adherence Clubs (MACs) for care of HTN, DM and/or HIV compared with routine care without MACs	Feasibility and early efficacy of MACs on care of HTN, DM and/ or HIV	E, I
Kotwani <i>et al.</i> [30] Community Uganda	Community members $n = 2252$	Cohort study design Int: screening, education, referral appointment and travel voucher compared with routine care without screening, education and referral support	Proportion of hypertensive patients linked to care within 6 months after a community-based multidisease screening campaign	See Chamie <i>et al.</i> <sup>a</sup>
Littman-Quinn <i>et al.</i> [31] Health facility and medical schools Botswana	Women and clinicians $n = 643$ women (95 HIV+); 24 clinicians	Controlled before–after design Int: implementation of mobile health (mHealth) initiative such as mobile telemedicine and m-learning programs (8 weeks follow-up)	Improved access to specialized cervical cancer screening utilizing visual inspection with acetic acid (VIA) Improved healthcare providers' access to medical knowledge	A, I, M
Louwagie <i>et al.</i> [32] Health facility South Africa	Smokers with TB $n = 400$ (Int = 205, C = 204)	Randomized controlled trial design Int: brief motivational interviewing by lay health-care workers (LHCW) compared with a brief smoking cessation advice from a TB nurse	Difference in self-reported sustained 3 and 6-month smoking abstinence. Difference in exhaled carbon monoxide Seven-day point prevalence abstinence at 1, 3 and 6 months Quit attempts	E, I
MakkiAwouda <i>et al.</i> [33] Health facility Sudan	Diabetics $n = 152$ diabetics (58 men, 94 women)	Quasi-experimental design Int: health education and training program for diabetic patients compared with routine care without health education	Improved knowledge, healthy behavior practices and glycemic control in diabetic patients after undergoing health education	E
Muchiri <i>et al.</i> [34] Health centers South Africa	Adults (40–70 years) with type 2 DM $n = 82$ : Int = 41, C = 41	Randomized controlled trial Int: education material and participation in group nutrition education (8 week) and follow-up sessions for 6–12 months compared with education materials only	Reduction in glycated Hb (HbA1c) levels Change in starchy-food, macronutrients, vegetables and fruit intake Change in BMI, lipid profile, blood pressure (BP)	E, I
Pastakia <i>et al.</i> [35] Home and community Kenya	Adults (>18 years) $n = 582$ : 236 home- based screening, 346 community-based	Cohort study design Int: community-based screening for DM and HTN compared with home-based screening for DM and HTN	Number and proportion screened, referred, and followed-up	E
Pastakia <i>et al.</i> [36] Community and health facility Kenya	diabetics $n = 43$	Prospective single cohort design Int: Electronic medical record, phone- based home glucose monitoring compared to routine DM treatment and control methods	Reduction in A1C levels	E, I
Rossouw <i>et al.</i> [37] Community South Africa	Three Afrikaner communities $n = 17751$ : Int = 11 702, C = 6049	Quasi-experimental design Int: high-intensity and low-intensity mass media health education and interpersonal intervention for high- risk individuals, for 4 years compared with no intervention.	Net reduction in BP, total cholesterol, smoking, and CVD risk score	R, E, I
Singh <i>et al.</i> [38] Community Ghana	Community members above 15 years $n = 85$ : 50 smokers, 35 nonsmokers	Qualitative study Int: combined text and picture warning labels on cigarette packs compared with text-only or picture-only warning labels	Reduction in smoking uptake, increased quit attempts, and reduced smoking appeal	E
Srinivas and Paphitis [39] Schools South Africa	School learners (6–19 years) $n = 289$	Controlled before–after design Int: education facilitated by pharmacy students using service-learning principles	Change in awareness and knowledge levels of HTN and DM	E
Venables <i>et al.</i> [41] Health facility Kenya	Adults with HIV and/or NCD $n = 106$	Qualitative design Int: MACs for care of HTN, DM and/or HIV compared with the routine care without MACs	Improved access to chronic HIV/ NCD care Acceptability of Integrated MACs for HIV/NCD	See Khabala <i>et al.</i> <sup>a</sup>

C, Control; CVDs, cardiovascular diseases; DM, diabetes mellitus; HTN, hypertension; Int, Intervention; NCD, noncommunicable diseases; PA, physical activity, BP, blood pressure; RE-AIM, Reach, Effectiveness, Adoption, Implementation, and Maintenance; TB, tuberculosis.  
<sup>a</sup>Additional publication coming from a study already reported.

**Table 3. Characteristics of behavior change communication interventions in sub-Saharan Africa.**

Intervention strategy	Reference	Intervention setting	Communication channel	Targeted disease(s)		Levels of HIV and NCD cascade addressed
				NCD only	NCD and HIV	
Health education and/or training	[19,23,25,33,34, 37–39,41]	Community, faith-based settings, homes	Mass education, lectures, role plays, information booklets, pictorial and written warnings	X		Uptake of testing, uptake of HPV vaccination, adherence to medication and retention in care
Social marketing	[26]	Community	Mass media	X		Creating knowledge and awareness
mHealth	[31,36]	Health facility, medical schools and community	Mobile phones, m-learning, mobile telemedicine, electronic medical records	X	X	Delivery and uptake of screening, care and adherence to treatment
Motivational Interviewing	[32]	Health facility	Interpersonal communication	X	X	Adherence to prevention advice
Individual peer support	[22]	Health facility	Education session, personal encounters, telephone calls	X		Linkage to care, retention in care, adherence to treatment
Group-based peer support	[21]	Health facility	Small group meetings	X	X	Adherence to treatment
Multidisease screening campaigns	[24,29, 30,35,40]	Community, home	Community outreach meetings, health fairs	X	X	Testing and linkage to care

BCC, behavior change communication; NCD, noncommunicable disease.

framework for determining the public health impact of health promotion interventions, such as those included in this review. The ability of an intervention to have public health impact is dependent not only on intervention effectiveness but also its ability to reach those most in need, ability of institutions/individuals to adopt the intervention, extent to which it can be implemented in various settings as designed, and extent to which it can be maintained over time in resource constrained settings. In our analysis we sought to evaluate the extent of completeness of reporting on each RE-AIM dimension (i.e. whether studies did or did not address the RE-AIM dimensions; Table 1), and to narratively synthesize these dimensions in our study results and conclusions. To highlight the various types of BCC interventions that have been used, we grouped all studies into seven strategy types (Table 3), and presented a synthesis of literature for each main BCC intervention type.

**Table 4. Research questions for noncommunicable disease/HIV integration of behavior change communication interventions.**

What are clinically effective NCD BCC intervention strategies for PLHIV and for the general population?
How feasible is it to integrate HIV and NCD communication interventions?
How does the integration of HIV and NCD BCC interventions improve service provision and demand (including cost-effectiveness and sustainability)?
How can NCD prevention programs benefit from HIV prevention efforts to reach marginalized communities and vulnerable populations and efforts to address specific disparities emanating from population differences?
How can NCD behavioral interventions in PLHIV help develop integrated health promotion programmes targeting various sub-populations [such as young people (children and adolescents), rural populations, and pastoralists]?

BCC, behavior change communication; NCD, noncommunicable disease; PLHIV, people living with HIV.

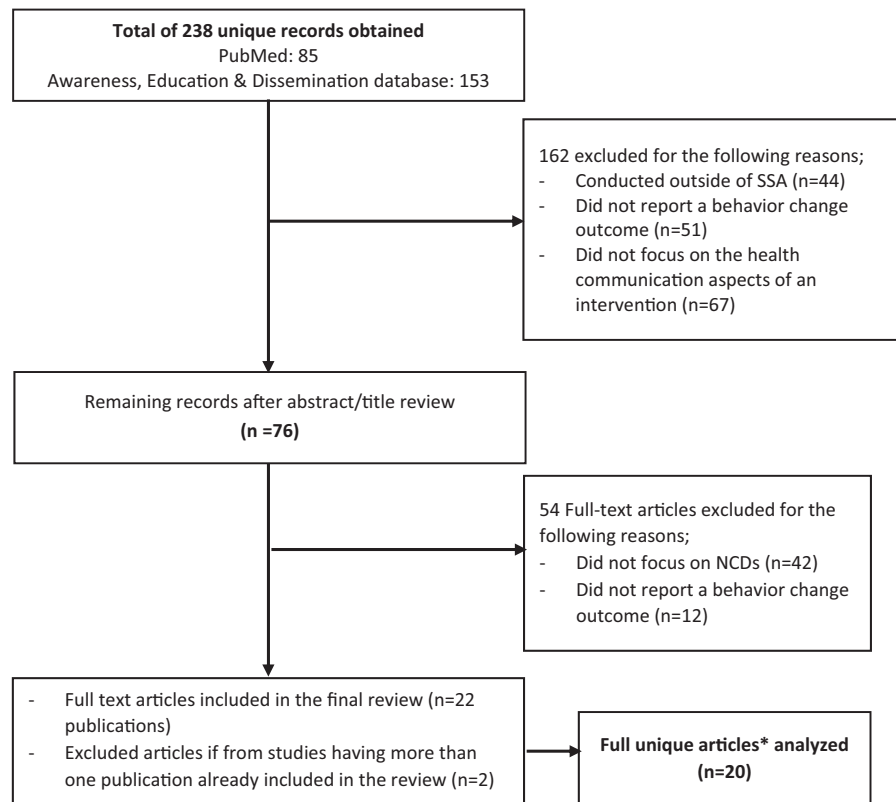
In addition, we conducted a total of 10 key informant interviews (KIIs) with HIV/NCD specialists and program managers (five in HIV and five in NCDs) from five countries in SSA (Kenya, Uganda, Ethiopia, Cameroon, and South Africa). The KIIs solicited perceptions of these experts on the feasibility, opportunities, and challenges of implementing integrated HIV/NCDs BCC interventions using a semi-structured interview guide. Interviews were recorded and later transcribed and analyzed using the ATLAS.ti version 8.0 inductively using grounded theory to identify emergent themes. We conclude this review by presenting a set of priority research questions within the integration of HIV/NCD BCC domain (Table 4).

## Results

### Description of included studies

A total of 238 peer reviewed articles were retrieved. Of these, 216 (91%) were excluded for the reasons specified in Fig. 1, resulting in 20 unique studies that met the inclusion criteria (summarized in Table 2). Of the 20, 4 (20%) focused on dual HIV/NCDs whereas 16 (80%) focused on NCDs alone. Only four (20%) studies specified a behavior change model or theory as the basis for the intervention and its theoretical mechanism of effect.

The greatest number of studies reviewed were conducted in South Africa 6/20 (30%). All studies targeted both sexes, women made up 46.3% (740/1600) of participants in the randomized trials combined. Most of the studies targeted adults 85% (17/20), and the majority of interventions were community-based 65% (13/20).



**Fig. 1. Selection of articles for review on noncommunicable disease and HIV/ noncommunicable disease behavior change communication interventions in sub-Saharan Africa.** \*There were 20 unique articles (studies); 22 publications.

### Completeness of reporting Reach, Effectiveness, Adoption, Implementation, and Maintenance framework elements

There were 15 different combinations of reporting on RE-AIM dimensions; 50% (10) of the articles reported solely on one dimension, 25% (5) reported on two dimensions, 20% (4) reported on three dimensions, 5% (1) reported on four dimensions, and none reported on all five dimensions of the framework. Effectiveness was the most frequently reported dimension (47.2%), followed by implementation (25%), reach (19.4%), maintenance (5.6%), and adoption (2.8%; Table 2).

### Behavior change communication strategies used for health promotion of noncommunicable diseases

#### Health education interventions

Nine studies sought to prevent NCDs through health education in health facilities, communities, faith-based settings, or at home. Most health education interventions were targeted at patients, but some targeted health workers and/or policy makers. Cappuccio *et al.* [23] described a community program to reduce salt intake and blood pressure (BP) levels in Ghana. Population-wide, intensive education sessions open to all villagers, were delivered over a 6-month period. Using a standard health education package from Ghana Health Services,

community health workers (CHWs) delivered health promotion messages on major public health issues. Intervention villages received additional lessons on dietary prevention of HTN and advice to limit salt intake. The six intervention villages showed significant reductions in SBP [2.54 mmHg (1.45–6.54)] and DBP [3.95 mmHg (0.78–7.11),  $P=0.015$ ] compared with six control villages. There was no change in urinary sodium concentration. The results show that community-level education promoting dietary recommendations can lead to community-level reductions in average salt intake, which can result in significant, albeit small, reductions in individuals' BP levels.

#### Social marketing interventions

One intervention [26], assessed the potential use of social marketing to prevent childhood obesity in Western Cape, South Africa utilizing print, radio, television, internet, outdoor media (i.e. billboards, community acting), or a combination of these. The study interviewed school representatives to understand the family, social, nutrition, and physical activity environments of children attending school. Nutrition and physical activity environments at family and community levels were highly complex and characterized by security concerns, lack of organized markets, and inadequate resources for physical activity. The study identified key components of community outreach

and mass media to deliver multichannel messaging that would change social norms around food choices and social desirability of exercise. Several opportunities exist for marketing healthy lifestyle to parents of school-going children, including a preference for print, radio, and educational entertainment; use of social role models and opinion leaders to deliver interpersonal messages; and outdoor advertising such as murals.

#### *mHealth interventions*

We found three examples of mHealth applications used to target patients or health workers. These include mobile telemedicine for the screening, diagnosis, and treatment of women at risk of cervical cancer [42], mobile phones to facilitate phone-based home glucose monitoring for diabetic patients [22], and mobile learning (mLearning) to provide online training to physicians in remote settings [43]. Littman-Quinn *et al.* [31] reported on the use of mobile telemedicine to improve access to specialized cervical cancer screening and diagnosis among HIV-positive women, using VIA [42]. Cervical images for 95 HIV-positive women were taken with a mobile phone and transmitted by multimedia messaging service to an off-site gynecologist for remote evaluation using photographic inspection with acetic acid. Results suggest that mobile telemedicine is useful in improving access to cervical cancer screening utilizing the VIA 'see-and-treat' approaches among women in remote areas. Similar mHealth initiatives aimed at cervical cancer prevention have been applied to the general populations in Zambia [44] and Cameroon [45].

#### *Motivational interviews*

Only one study was found to have utilized motivational Interviews. Louwagie *et al.* [32] reported the efficacy of brief motivational interview by LHCWs in assisting tuberculosis (TB) patients in a setting with high HIV/TB coinfection rates to quit smoking. Newly diagnosed TB patients in South Africa identified as current smokers were randomized to brief MI intervention by a LHCW or brief smoking cessation advice from a TB nurse. Over 6 months, 21.5% of the intervention group reported sustained abstinence versus 9.3% in the control group [relative risk (RR) = 2.29, 95% confidence interval (CI) = 1.34–3.92]. Biochemically verified 6-month sustained abstinence was also higher in the intervention group (RR 2.21, 95% CI = 1.08–4.51) who took carbon monoxide testing. Results demonstrated that motivational interviews by LHCWs to promote smoking cessation approximately doubled sustained smoking abstinence for at least 6 months compared with brief advice alone.

#### *Peer group support*

Two studies reported use of peer support approaches. Baumann *et al.* [22] tested the feasibility of peer support groups to improve diabetes self-care behaviors, glycemic control, social support and emotional well being, and

linkage to care over the course of 18-months among adults with type 2 diabetes in Uganda. Patients underwent a 1-day diabetes education session and made weekly contacts with each other by phone or in person over 4 months. Results demonstrated that a short-term peer support program was feasible, improved diabetes care, increased healthy eating behaviors, and achieved significant reductions in DBP and HbA1C values. Sustainability was evaluated beyond 18-months postintervention. Khabala *et al.* [29] reported on early efficacy and outcomes of MACs designed to improve access to chronic HIV/NCD care and support within city slums in Kenya. Results showed strong evidence for feasibility, including offloaded consultations from regular clinic, and found that BP, weight, and laboratory testing were completed correctly in 99% of consultations during MAC attendance.

#### *Multidisease screening campaigns*

Five studies reviewed used multidisease campaigns for testing and linkage to care within communities and homes. In the SEARCH study in Uganda, entire communities were invited to community health campaigns. Uptake of screening was high (4282/6844 of residents and 597 for nonresidents), and identified almost half (125/257) of HIV infections as new infections, (18%) 483/2687 of new hypertensive patients, and 2% (63/2672) of new diabetes cases. The SEARCH investigators also provide what little data exists in the published literature on the cost-effectiveness of HIV/NCD integration efforts. In their study, the cost per HIV+ adult identified was \$231 (\$87–\$1245) and the marginal costs of testing for hypertension and diabetes was \$1.16/person [46].

#### *Findings from key informants*

Interviews with the key informants identified a few emerging themes concerning integration of HIV/NCD BCC interventions including: communication targeting behavior change, perceived feasibility and outcomes of integration, concerns about integration, and facilitators and what is needed for successful integration.

#### *Issues about communication targeting behavior change*

Respondents considered communication strategies as critical in an effective BCC intervention. In communication, the kind of information, and how and where it is delivered matters. Multiple communication channels are preferred and should be attractive, sustainable, trustworthy, and adapted to population's preference. Communication channels must deliver messages repeatedly and include a feedback mechanism.

#### *Perceived feasibility and outcomes*

Integrating HIV/NCD BCC activities are perceived as feasible for a range of reasons, including similarity in target population, messaging channels, desired outcomes,

and existing positive results from pilot studies. There was consensus that integration, if feasible, will require some effort to make it work perfectly. Several potential health system outcomes were cited, including improved effectiveness and efficiency in service delivery and management of HIV/NCD using the same resources, and improved access to services for marginalized populations. Where HIV/NCD is already integrated, achievement of targeted health goals have improved, as compliance and adherence to preventive messages or prescribed care is better.

#### *Integration concerns*

Fears exist that integration may compromise existing HIV success and undo the health gains already made. These fears stem from how HIV/NCD integration is perceived. In contrast to the HIV response, NCDs are seen as broad and complicated with low funding support. Exclusivity seen in vertical disease programming where policy, financing, and implementation have unique deliverables limits integration. Concerns of increased workload and levels of NCD knowledge among CHWs working in HIV were also cited.

#### *Facilitators and what is needed for successful integration*

Interview participants felt that the biggest facilitator is the number of PLHIV with or at risk of NCDs. They noted that HIV prevention efforts created widespread community structures and a knowledgeable workforce capable of communicating HIV messages that could be used to scale-up integrated HIV/NCD approaches. Positive effectiveness results from integration studies and existing resources like ‘expert patients’ – patients with both HIV/NCD, provided critical support for integration moving forward. Nevertheless, key informants stated that there is need to carefully identify what works in integration, and conduct research to guide new approaches to scale. Following implementation frameworks like RE-AIM that embed the planning and monitoring and evaluation in the early years of implementing integration is important. Suggestions to selectively introduce HIV/NCD integration, starting with the priority NCDs is plausible, and it is important to introduce innovation and creativity that improves outcomes.

## **Discussion**

BCC interventions in SSA have historically been utilized to address the HIV epidemic and are now beginning to be employed in combating the growing burden of NCDs. This narrative review highlights some of the strategies utilized for NCD health promotion. Although the majority of interventions we identified were targeted only towards NCDs, a small number of studies

highlighted the feasibility and effectiveness of integrating HIV and NCD health promotion efforts.

Peer support approaches have been widely deployed to improve HIV outcomes for PLHIV in SSA [47], and studies in this review suggest that similar approaches could be used to support health promotion strategies for NCDs. Similarly, mHealth strategies are increasingly used among PLHIV and there is considerable interest in leveraging such strategies to address NCDs in SSA given that mHealth interventions are relatively democratized, have low barriers to entry and capitalize on the mobile phones already owned and existing data platforms. However, to date, such applications have not always shown impact at scale [48]. Although the mHealth studies in this review demonstrated feasibility and early effectiveness in a variety of NCD diseases and settings, more data on wide-spread implementation and sustainability is needed. In contrast, there is less experience with educational and social marketing interventions. These approaches, although theoretically providing ample reach, have less data to support their effectiveness. The cost-effectiveness of a community-based education approach to reduce blood pressure [23], and the effectiveness of a multilevel marketing strategy to reduce childhood obesity [26] are unknown. Motivational interview, which is ‘a counselling style of guiding to elicit/strengthen personal motivation for behavior change’ [49], has been effectively used to bring about long-term changes in smoking cessation programs in developed countries [50]. However, in our review, we found only one study addressing the role of motivational interview in mitigating NCD risk factors among PLHIV in SSA. Although theoretically a promising strategy, questions remain about how to scale up motivational interview training programs for health-care workers while ensuring that motivational interview techniques are contextually relevant so that front-line providers in SSA (facing competing demands and limited time) can incorporate these approaches into their clinical practice. Finally, community-based screening interventions, such as the SEARCH study, are among few examples we found that demonstrated both impact at scale and the feasibility of integrating both HIV and NCD health promotion efforts.

In addition, few studies reported on the reach, adoption, or maintenance dimensions of the RE-AIM framework, highlighting ongoing gaps in knowledge of intervention impact and sustainability at scale. Reporting of all RE-AIM dimensions is critical in providing a balanced assessment of internal and external validity, and to address key issues important for dissemination and implementation [16]. For instance, unlike other BCC interventions, which are facility-based or targeting those already in care, community-based screenings have a broader reach to undiagnosed individuals who may be vulnerable or marginalized populations having limited access to care.



Studies reviewed highlighted, however, how implementation of integrated BCC interventions may be more cost-effective and enhance health system effectiveness, particularly in resource-limited settings [51]. Likewise, studies discussed how use of existing HIV CHWs to do community-based NCDs screening, health education, or peer support was likely to improve program sustainability as these workers had close ties to the community and are integrated in the health system [35]. As outlined in the article by Nugent *et al.* [52] the incremental cost of adding NCD screening (such as for diabetes and hypertension) is small compared with the cost of HIV testing. Furthermore, strategies targeting common sociocultural norms impacting both HIV and NCD-related behaviors may have synergistic effects in driving healthy behavior. For instance, social marketing messaging addresses multiple risks at multiple levels to achieve more than just awareness, but also, social capital and community mobilization, while eliminating barriers to adoption of healthy lifestyles [53].

Opinions solicited from the key informants supported the feasibility of integrating HIV and NCD BCC interventions in SSA and noted that this approach may improve access, service provision and service demand, especially for marginalized and vulnerable populations. Fears that integrating HIV/NCD may interfere with gains made in HIV were cited. However, there was consensus that potential outcomes far outweigh its risks and that several opportunities exist to strengthen integration for both diseases. Nevertheless, there are unique challenges that only apply to HIV or to NCDs (i.e. industry promotion of food, tobacco, and alcohol), and risk factors for communicable diseases and NCD differ. These differences may limit the extent to which BCC interventions can be integrated.

Limitations of this review included the overall small number of integrated HIV-NCD studies in existence, the heterogeneity of the included studies, lack of quantification of study quality, and the paucity of studies reporting on most REACH dimensions, which precluded comparisons between strategies or conclusions regarding the potential impact of HIV/NCD health promotion integration.

In conclusion, although data on integration of HIV/NCD health promotion efforts is limited, our review found a fair amount of evidence to support the feasibility of integrating HIV/NCD within multidisease screening campaigns in Uganda [31,54], Kenya [24,31,35], and South Africa [28]. More generally, strategies already employed in the HIV global response (including peer support and mHealth) have provided program developers and policy makers with the initial experience, tools, and platforms potentially useful in planning NCD health promotion programs. There is a pressing need for more quality research addressing the best way to scale NCD health promotion interventions in high HIV burden

settings and the need for more rigorous research methods to characterize important implementation science dimensions that have not been evaluated by the studies included in our survey of the subject.

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## Conflicts of interest

There are no conflicts of interest.

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