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Designing Evidence-Based Preventive Interventions That Reach More People, Faster, and with More Impact in Global Contexts

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Abstract

This article demonstrates the substantial similarities globally among preventive, evidence-based interventions (EBIs) designed to address HIV by providing four examples: an HIV family-focused intervention, the Community Popular Opinion Leader intervention, a South African maternal/child health program, and an EBI for sex workers in India. Each identified the key problems in the target population, utilized well-established social cognitive theories, created processes for engaging the target population, set standards for staff accountability, and included routine data collection to facilitate iterative program improvements over time. Building EBIs based on these common, robust features is an alternative design strategy to replication with fidelity. These components provide a roadmap for researchers, especially those using new technologies, and for local providers seeking to deliver EBIs that match their clients' and communities' needs. Technology platforms and community organizations may serve as resources for designers of the next generation of EBIs, offering an alternative to repeatedly validating the same interventions and replicating them with fidelity.

Keywords

evidence-based interventions; social cognitive theories; iterative quality improvement; technology platforms for intervention delivery

INTRODUCTION

The number of evidence-based interventions (EBIs) aiming to improve health and reduce risk behaviors has increased dramatically in the last 40 years. In 1987, there were only 14 EBIs with at least 1 year of evaluation data demonstrating efficacy (Price et al. 1988). Today, there are thousands of EBIs that have been identified by approximately 20 certifying bodies both in the United States [e.g., the Centers for Disease Control and Prevention (CDC), Blueprints, the 2014 US Preventive Service Task Force] and internationally [e.g., the World Health Organization (WHO)] (CDC 2020, Cheng et al. 2018, Curry et al. 2014).

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Creation of an EBI follows a standard process. First, the researcher perceives an unmet health need or anticipates a major risk to maintaining health. Second, the researcher gathers information about the affected population, its preferences, and its habits; looks to past EBIs for information about how the problem was successfully addressed previously; identifies an attractive and engaging setting and an activity that is likely to engage the target population; selects a delivery strategy (small groups, mobile phones, games); determines a strategy to garner and maintain social support for the strategy; and builds routine data gathering systems for monitoring the implementation and outcomes of the intervention. Third, efficacy is validated in several randomized controlled trials (RCTs) and documented as an EBI. Others can then utilize the standardized, manualized, packaged EBI with new populations and new settings.

Yet, not all of the people who could or should benefit from EBIs have access to or utilize these programs. The process of designing and implementing an EBI takes approximately 30 to 40 years to conduct testing and garner support. Furthermore, once identified and validated, the norm of replication with fidelity dominates, as opposed to iteratively improving the EBI over time. This is especially true in international settings. Yet, low- and middle-income countries (LMICs) cannot afford the labor-intensive interventions that have characterized the field of EBIs; therefore, adaptations that make it “good enough” in these settings are often implemented.

In the context of poor uptake and dissemination, one approach is to iteratively improve existing EBIs as they are broadly diffused. When an intervention is adapted, however, efficacy may easily disappear. Even when an EBI is replicated with fidelity, implementing it in a new context can erode efficacy. The evolution of EBIs over time has led to many challenges for communities and providers aiming to implement EBIs. This article addresses those challenges.

Learning theorists initially created multiple strategies to demonstrate that negative emotional responses, inappropriate social behaviors, and disturbing thoughts could be reshaped. For example, desensitization increases relaxation in the presence of an anxiety-stimulating object (Van Egeren et al. 1971), and children’s aggressive behaviors decrease when positive role models and social rewards are provided or children are taught to talk to themselves in a positive manner (Bandura 1994, Bandura et al. 1961). Today, these efficacious strategies—relaxation, modeling, successive approximation, and social rewards—are some of the basic building blocks of every EBI that aims to change a health-related outcome.

By the 1970s, psychologists were designing packaged interventions to improve these general skills. For example, Spivak et al. (1976) identified the developmentally linked skills needed for children as young as 3 years to solve interpersonal problems (e.g., awareness of the consequences of an action). The interventionists designed games for parents to play with young children to improve their problem-solving abilities. Then, researchers adapted the children’s general skill-building activities to target a behavior that was costly to society (Shure 2001). The field of prevention science emerged, with researchers combining basic behavior change strategies in innovative ways to reduce a behavioral outcome that was costly to society (e.g., substance abuse, teenage pregnancy, HIV infection) or to encourage a

health-enhancing behavior that benefits society in the long term (e.g., breastfeeding, healthy diets).

Prevention scientists largely designed and then validated these EBIs by following a set of scientific rules (Flay et al. 2005). In order to be considered evidence based, an intervention requires at least two RCTs with well-defined samples and strong research designs, and at least some longitudinal outcomes. To meet the standard, intervention designers also needed to create manuals and training protocols, and their standardized program had to be evaluated under real-world conditions. The vast majority of EBIs were designed and validated in this manner. Once validated, little innovation occurs without further RCT testing of how and whether the adaptation is efficacious.

Hwang & Christensen (2008) label prevention scientists' innovation in creating and verifying a packaged EBI as a "solution shop." Experts draw upon their skills, knowledge, and a set of theories to diagnose the cause of complicated problems and identify a standardized solution. Each EBI is a packaged solution to a predictable set of challenges. While the potential list of challenges is endless, as are the populations and countries needing to improve their health, the principles behind each of the packaged solutions are similar.

However, one consequence of this approach is that penetration rates of EBIs—that is, the percentage of the population served by an EBI compared with the percentage of people who need it—remain very low, even among the most successful EBIs. The Nurse–Family Partnership is perhaps the best example of a cost-effective preventive intervention that has been repeatedly demonstrated to have long-term benefits for children of low-income, first-time mothers (Olds et al. 2014). Yet, after 40 years, at least five RCTs, and US\$5 billion of funding allocated annually, only 10% of the target population is reached in the USA annually.

In addition, over the last 40 years, many new technologies have emerged that could supplement or substitute for some aspects of the Nurse–Family Partnership. Nurses could send text messages or provide videos of efficient ways to take care of children. Perhaps social media groups of new mothers, with a nurse moderating these groups, could achieve similar outcomes. There are many available delivery strategies that could supplement or perhaps replace some aspects of the Nurse–Family Partnership. However, current rules regarding the design of EBIs require that new sets of RCTs be conducted to validate the efficacy of each innovation prior to any diffusion of the improvements.

A major obstacle to broad diffusion is the competitive approach of many researchers to brand EBIs as different when in fact they have common goals, methods, and target populations. For example, a review of the literature found 14 EBIs that have all been demonstrated to improve parenting (Sandler et al. 2011). Each of these parenting programs is considered unique, and the developers of each EBI will share why their program is better than others. These programs compete with one another. Each has been tested multiple times, fulfilling the criteria set to establish an EBI (Flay et al. 2005) and to be endorsed by the Society for Prevention Research. Thus, the population remains the same, the intervention

manuals are not adapted over time, and the delivery format is stable for each of the 14 programs. Yet, these parenting EBIs are far more similar than they are different.

One of them is the Triple P Positive Parenting Program (Sanders 1999). This program was validated as an EBI to improve parenting. It was commercialized by its designer, and the initial intervention was tailored to address a large number of children's presenting issues (e.g., diabetes, obesity, conduct problems, depression); adapted into multiple delivery formats of group, family, and individual delivery as well as both web- and mobile-based delivery modalities; and implemented with varying intensities of intervention (reflected in sessions) (de Graaf et al. 2008, Marryat et al. 2017, Nowak & Heinrichs 2008). According to Google Scholar, there are approximately 5,000 references regarding this program, yet this EBI has been repeatedly criticized by the academic community for not sufficiently validating each iteration of the program (Eisner 2009). It has developed a global reach and is being implemented nationally in Canada, the USA, and several EU countries. This program reflects the tension between validating the efficacy of each iteration of a program and achieving broad diffusion of an EBI.

While criticizing Triple P, many researchers also aim to imitate it, that is, to commercialize their EBI and to have communities, families, and providers pay for their proprietary scientific products. This incentive structure is also one of the barriers to iteratively adapting and improving EBIs. If a product is being improved, it cannot be sold as-is.

There are far fewer incentives in LMICs for researchers to commercialize their programs. Yet, the contexts in these countries are often so different from settings in which many EBIs were developed that RCTs in these countries present significant challenges to researchers mounting efficacy and effectiveness trials. Below, I provide four examples of HIV interventions in LMICs, with interventions addressing very different outcomes, in different cultural niches. These examples highlight the importance of having a scientific understanding of contexts and the impact of contexts on outcomes. The examples also document the adaptation in delivery formats, length, and content of the EBIs that are being adapted globally.

While it is easy to see the similarities in programs targeting the same outcomes (e.g., parenting), interventions targeting very different outcomes, in different countries, and with different intervention delivery strategies also have many shared features. The features of the examples of EBIs are summarized in Tables 1 and 2 and discussed below.

EXAMPLES OF HIV-RELATED EVIDENCE-BASED INTERVENTIONS IN BOTH HIGH-INCOME AND LOW-/MIDDLE-INCOME COUNTRIES

Parents and Children Living with AIDS and HIV

An original EBI was mounted for an epidemiological sample of parents diagnosed with AIDS in New York City, USA. Parents with AIDS face many predictable health challenges—especially when they also have adolescent children who must be parented. To help families meet these challenges, we designed Project TALC (Teens and Adults Learning to Communicate), a three-module intervention program (Rotheram-Borus et al. 1997, 1998).

The first module addressed the parents' strong emotional reactions when they anticipate death; their decisions about who, how, and what to disclose to others; and how to make plans to cope effectively with the health system, as their length and quality of life are directly related to their skill at interacting with providers (Rabkin et al. 2006). The second module aimed to reduce both parents' and children's sexual and drug-use risk behaviors and to increase the quality of communication between parents and teens, especially about the parents' illness. Finally, because the parents were expected to die in about 14 months, we designed a third module for adolescent survivors and their new caregivers. This module also focused on improving caregiver–youth communication and coping with grief (Rotheram-Borus et al. 2001b).

By the mid-1990s, there already were many evidence-based strategies for training each of the skills needed by families with AIDS. There were EBIs for coping with strong emotions (Lazarus & Folkman 1984), harm reduction models for substance abuse prevention (MacMaster 2004), self-regulation strategies (Newman et al. 2004), grief interventions (Silverman 2004), and ways to cope with depression (Lewinsohn et al. 1990). Applying these EBI strategies to a new population was a relatively small challenge. Each EBI strategy had a manual that could be adapted to train paraprofessionals who had very good social skills to intervene with families and to design multisession, multimodule interventions. Over a series of daylong workshops, more than 75% of families attended cognitive behavioral interventions to improve families' coping with HIV.

We recruited 70% of all parents diagnosed with AIDS (approximately 350 families) who had adolescent children in 1994–1995 in New York City. We randomized families to either a family TALC intervention or a standard care condition. We reassessed these families at eight time points over the next 6 years (Rotheram-Borus et al. 2001b). After 2 years, adolescents in the Project TALC intervention reported significantly lower levels of emotional distress, fewer problem behaviors, fewer conduct problems, fewer family-related stressors, and higher levels of self-esteem than adolescents in the standard care condition (Rotheram-Borus et al. 2001b, 2003, 2004a, 2005, 2006).

Parents with AIDS in the intervention condition also reported significantly lower levels of emotional distress and decreased substance use. Intervention mothers improved their relationships with their doctors and their adherence to medical regimens. The adolescent daughters in the intervention condition delayed childbearing and had fewer children than did youth in the standard care condition (May et al. 2006). Perhaps even more importantly, the babies of the adolescents in the intervention condition had a better home environment and tended to show better cognitive development at 2 years of age, compared with the babies of the adolescents in the standard care condition (Rotheram-Borus et al. 2006).

This intervention was adapted for families living with HIV in several different countries: Latinas and African American women in Los Angeles (Rotheram-Borus et al. 2012b,c), rural families in Zimbabwe (Kasprzyk et al. 2008), patients in Haiti (Fawzi et al. 2012), patients in Thailand (Li et al. 2010), residents of rural Chinese villages with many blood donors (Li et al. 2019), and injection-drug users in Vietnam (Li et al. 2018). Table 1 lists the characteristics of each of these interventions. Across all replications, mental health

symptoms and stigma were constant issues (Rotheram-Borus et al. 2012b). However, there were huge variations in beliefs about whether the parents' risky acts had led to their HIV infection. In Thailand and Zimbabwe, HIV was very prevalent in the local communities. In such settings, acquiring HIV is regarded as bad luck, not a personal failing. In Los Angeles, Latinas and African American women had partners who were injection-drug users or engaged in sex with both men and women; few mothers themselves had any sexual or drug-risk behaviors that placed them at risk. In China, poor farmers sold their blood to the government and became HIV infected from the staff's reuse of the same equipment to draw blood. Regardless of the route of infection, depression and high perceived stigma were common in the lives of the participants.

The teams in Los Angeles, Zimbabwe, and Haiti replicated the Project TALC intervention with fidelity to the original EBI. The intervention used the same triggering events, adapted each of the scripts, and utilized the same structure of three modules and the same active format of small group meetings. Each of the replications found reductions in mental health symptoms, increases in social support, and reductions in stigma among families (Fawzi et al. 2012, Kasprzyk et al. 2008, Rotheram-Borus et al. 2012b). In contrast, Thailand is a Buddhist country and Buddhism permeates Thai culture, so Buddhism formed the context for this intervention. In Thai culture, the intervention modules became Healthy Mind, Healthy Bodies, and Healthy Parenting. Meditation started and ended each session, and fewer active problem-solving approaches were used in the intervention delivery.

In China, in contrast to the other trials, the UCLA team's intervention (May et al. 2006; Rotheram-Borus et al. 2001b, 2003, 2004a, 2005, 2006) deviated substantially from the initial Project TALC model, so much so that this became a novel intervention. The team designed a multilevel intervention that was composed of three activities: (a) small, multifamily group meetings; (b) home-based family activities; and (c) community fairs, sports events, and talent shows to raise the status of HIV-affected families. Over 2 years, depression significantly decreased for family members and the persons living with HIV (PLH); the ability of the PLH to cope with illness also improved over time (Li et al. 2017). Similarly, in Vietnam, the PLH were adult injection-drug users whose families lost face in the community because of their children's drug use, even though the children were themselves adults (Li et al. 2014b, 2018). There were significant benefits not only to the PLH and their families but also to the community health workers (CHWs) who mounted the intervention (Li et al. 2014a, 2018).

While Project TALC was the initial starting point for the interventional design, cultural adaptations and the variations in the challenges posed by HIV in each country required iterative changes to the intervention (Rotheram-Borus et al. 2014b). The intervention was redesigned and readapted, and "new" programs were created. Project TALC was important in providing some key elements of each of the adapted programs: It identified the key challenges for the target population; selected a single theory of behavior change, set the components of each intervention session, and defined the targeted skills; utilized attractive and convenient context for both the target population and the staff; and created strategies for monitoring outcomes and implementation and for holding staff accountable.

While the three-module intervention was initially designed for families, young and adult PLH experienced challenges in the same domains. We mounted three multicity, HIV-related intervention RCTs in the USA, two for young people and one for adults. Each trial substantially varied in its delivery modalities (telephone, individual meetings, and small group delivery) and in the length and duration of the EBI (NIMH Healthy Living Trial Group 2010; Rotheram-Borus et al. 2001a,b, 2004b, 2009a). However, each program had three intervention modules. The programs were highly similar in their targeted content and problems, underlying theory, behavior change principles, program components, and sequencing of activities that occurred at each meeting. The targeted outcomes were different; the scripts and role-plays utilized were typical of the daily lives of the target population in each setting; and the staffing selection, training, and monitoring strategies were similar. There were more similarities than differences among these interventions, and each demonstrated efficacy (Comulada et al. 2007; NIMH Healthy Living Trial Group 2010; Rotheram-Borus et al. 2001a,b, 2004b, 2009a). These three EBIs (Healthy Living, CLEAR, and Teens Linked to Care) were adapted in a similar fashion for young PLH in Uganda (Lightfoot et al. 2007); their number of sexual partners was reduced, and their condom use increased.

Within a decade of the original Project TALC intervention, there were an additional 12 family-based, HIV-related interventions, supported by the National Institutes of Health. Interventions were designed, supported, and evaluated for a wide variety of families, such as couples, families of men who have sex with men (MSM), parents (as their children's educators regarding sexuality), families of youth with psychiatric disorders, youth at high risk, and families of African American and Latino youth (Pequegnat & Bell 2012). Several of these family interventions were diffused to Africa, where the primary burden of HIV exists (Pequegnat & Bell 2012). Each of these EBIs was tailored to a specific population of families at risk of or affected by HIV. These programs were also grounded in cognitive behavioral theory and behavior change principles. Each EBI was highly engaging and efficacious and addressed an important population. Yet, there were far more common properties among these programs than differences, raising questions of what the key elements across each of these family interventions are, how many EBIs we need for each health challenge, and how many locations we need globally to demonstrate efficacy.

Community Popular Opinion Leader intervention.—The Community Popular Opinion Leader (CPOL) EBI was developed in the USA and then tested in LMICs. In the early 1990s, a highly efficacious HIV intervention was mounted in bars serving alcohol in small cities in the USA (Kelly et al. 1997). In high-income countries, MSM are at highest risk for acquiring HIV; more than 25% were HIV infected in the early 1990s. This intervention emphasized the importance of staying healthy in the context of HIV, taught social behavioral skills to build a consensus regarding safe sex and drug-use behaviors, and generated new community norms. Standard cognitive behavioral strategies were utilized to enhance social skills (e.g., role-playing, providing information). CPOL's unique theoretical contribution was to utilize Rogers's (2003) theory of diffusion to determine who should receive the intervention—that is, popular, early adopters within a social network. These early adopters would then influence their peers to protect themselves and reduce HIV risk

behaviors (Kelly et al. 1997). The intervention was effective not only with adult men in bars but also with adolescents living in housing developments (Sikkema et al. 2000, 2005). Given that most risk for HIV is in LMICs, a question emerged: Will this intervention work in LMICs?

A multicountry HIV prevention trial to evaluate CPOL was mounted in six countries (NIMH Collab. HIV/Sex. Transm. Dis. Prev. Trial Group 2007). Diverse populations were recruited from market vendors in China, growth-point villagers in Zimbabwe, college dormitory residents in Russia, bar patrons in India, rural villagers in Uganda, and MSM in Peru. In each country, the process for selecting CPOL was the same as in the original intervention, as were the training and its duration, number of sessions, content, and sequencing of activities. The frequency of community meetings was similar, as were the evaluation criteria. Thus, each country attempted to replicate the original intervention with as much fidelity to the original procedures as possible.

I led the Chinese adaptation of the CPOL model (Rotheram-Borus et al. 2011b). China's HIV epidemic was predominantly in the economic development zones along China's east coast. We explored mounting the intervention with a large range of populations: truck drivers, sex workers, factory workers, and men in karaoke bars. Ultimately, we mounted an RCT in 40 food markets in Fuzhou, China, with approximately 4,000 salespersons. All vendors in half of the markets were randomized to the CPOL intervention, and those in the other 20 markets were assigned to a standard care condition. Opinion leaders were identified and trained to diffuse messages regarding safer sex, treatment of sexually transmitted infections (STIs), and partner discussions of sex. Over 2 years, there was a significant 50% reduction in STIs in the intervention markets compared with control markets, especially among women (Rotheram-Borus et al. 2011b). The Chinese Centers for Disease Control, the primary collaborating agency on this project, diffused this intervention throughout its provinces—cognitive behavioral approaches were then atypical in China, and the skills-based approach was broadly adopted at that time.

However, HIV/STI incidence overall was not significantly reduced across the six countries (NIMH Healthy Living Trial Group 2010). The initial EBI did not appear to be effective in LMICs.

The lack of effectiveness of the CPOL intervention may not stem from deficiencies in the EBI but rather may reflect the many challenges in scientifically validating the efficacy of an EBI, especially replicating it with fidelity in LMICs. To demonstrate change scientifically, many criteria must be met: sufficient preexisting risk, stable populations, culturally appropriate and desirable change messages, no possibility of contamination, a sample that is large enough to provide power to detect differences but small enough to detect a positive outcome signal, and both high internal and external validity to the target population (Padian et al. 2010). Keeping six countries in sync with these criteria at the same time is a difficult process, and it is not clear that this was achieved in this multicountry trial (Schneider & Laumann 2011).

The CPOL line of research has now evolved to repeatedly demonstrate the efficacy of interventions with social networks and to determine who within a social network will be the best deliverer of an intervention message (Kelly et al. 2020). However, CPOL research has been under way for more than 30 years but is not yet being used to influence public health at the national level. Diffusion and testing of the CPOL intervention reflect the field's challenges at integrating science with the process of community behavior change.

The next two examples—one from Africa and one from India—demonstrate a different approach to designing, validating, and expanding EBIs over time. While HIV remains a burden for MSM in high-income countries, Africa carries 70% of the HIV disease burden (Dwyer et al. 2019), and in the late 1990s and early 2000s, India was expected to have a generalized HIV epidemic. The two studies described next were performed because the National Institutes of Health encouraged researchers to identify positive community models in Africa and India.

Maternal and child health in Africa.—Established in the 1970s, the Philani Program initiated home visits for pregnant women to improve nutrition, breastfeeding, and caretaking. Pragmatism, rather than theory, initially led the Philani Program to train CHWs in a manner closely aligned to cognitive behavioral principles, with a focus on skills. The field team learned to articulate links among feelings, actions, and thoughts in monthly, in-service staff training sessions. Philani learned from Vietnamese maternal/child health workers in the 1970s (Marsh et al. 2002) that the best change agents are so-called positive peer deviants, that is, good role models. The Philani Program was built on a cadre of Mentor Mothers, paraprofessionals who had good social and problem-solving skills, had children who were thriving, and were accountable (that is, followed the rules of documentation of all home visits on an ongoing basis). Mentor Mothers were chosen from nearby neighborhoods, not the neighborhoods they would be visiting, reducing the possibility of gossip and stigma. Mentor Mothers were given a routine to follow on each visit and props to support their approach—a Philani-branded T-shirt, a scale, and a carrying case containing growth charts. Mentor Mothers explained to mothers how the quality of their parenting is reflected in their children's growth. Weighing a child normalized the home visit and created opportunities for discussion and support around a variety of issues. The benefits of this program were transparent as well as inspiring.

By 2009, HIV and alcohol abuse had become serious township problems, adding to the existing nutrition and caretaking challenges (Rotheram-Borus et al. 2011a). A team from UCLA and Stellenbosch University (Rotheram-Borus et al. 2011a) initiated an evaluation of the program and supported cognitive behavioral training of Mentor Mothers for work with HIV- and alcohol-related issues. Yet, the core aspects of the Philani Program remained unchanged. The basic structure, engagement, and staffing policies were already in place. The team expanded the targeted outcomes and provided concrete, evidence-based strategies for alcohol- and HIV-related outcomes.

We then conducted a cluster RCT in 24 matched neighborhoods. Almost all pregnant women (98%) were randomized by neighborhood ($N = 1,238$) and reassessed at five time points over 8 years with high retention (85–96%) (Rotheram-Borus et al. 2011a, 2014b;

Tomlinson et al. 2016). The Mentor Mothers delivered eight messages during the antenatal period and first 6 months of life regarding HIV, alcohol, nutrition, and maternal caretaking behaviors. There were benefits that lasted for 5 years (Tomlinson et al. 2020). At 6 months, mothers living with HIV were 50% more likely to complete tasks to prevent mother-to-child transmission of HIV, were more likely to use a single feeding method for the first 6 months of life, were more likely to breastfeed and for a longer period, and had babies whose growth was better (le Roux et al. 2013, Rotheram-Borus et al. 2014b). Approximately 25% of mothers drank alcohol prior to learning they were pregnant (le Roux et al. 2013). Alcohol-using mothers, especially those with problematic drinking, increased their alcohol use in the standard care condition, whereas mothers receiving home visits drank significantly less during pregnancy and 5 years later (Tomlinson et al. 2020). While we did not target maternal depression, intervention mothers were significantly less depressed 3 years later compared with mothers in the standard care condition (Tomlinson et al. 2015). Intervention children of depressed mothers were far less likely to be damaged by their mother's depression. The growth and cognitive development of children with depressed mothers were better among intervention children compared with mothers in the standard care condition at 6 and 18 months.

The Philani Program is now being diffused to the deeply rural Eastern Cape of South Africa, Swaziland, Ethiopia, Egypt, and Sweden. Philani has established a social enterprise to train other sites. The publication and availability of evaluation data were essential for the program to expand. Three additional RCTs showed many of the same findings from the original RCT and have documented the important implementation principles that create effectiveness—structure, engagement strategies, staffing selection, supervision, accountability, and inspiration (I.M. le Roux et al. 2010, 2011; K.W. le Roux et al. 2020; Rotheram-Borus et al. 2011a; Stansert Katzen et al. 2020).

Sex workers in India: an empowerment program that is also a community-led structural intervention.—A similar type of collaboration, the Sonaguchi Program, was mounted in India in the early 1990s and led to outstanding outcomes (Jana et al. 2004). Dr. Jana, a physician leading a department of occupational health in Calcutta, India, was approached by officials from the WHO. Calcutta is the first stop for drugs being trafficked into India, and the WHO believed that HIV would be imported along this route. In particular, local sex workers would be highly likely to become HIV infected and to transmit HIV to the general population. Conceptualizing this problem from his prospective of occupational health, Jana advocated that sex work is work and workers' rights need to be protected to remain healthy. He approached the police and political parties to request that they enforce condom use as a means of sustaining the local economic environment. They agreed. Local administrative regulations called for condom use in all sex work. This regulation empowered sex workers to follow local laws when negotiating sex—doing so was not an individual worker's request but rather implementation of a law that would hopefully reduce the probability of violence toward the sex worker requesting condom use.

Jana organized a team of sex workers who became CHWs, equipped with blue laboratory coats. Very similar to the Philani Program workers, women with little education and little work experience were trained to deliver interventions. The CHWs visited all households in a

geographically defined neighborhood to identify sex workers and then visited them monthly, sold them condoms, and encouraged them to visit the local STI clinic to be tested for STIs including HIV. CHWs provided emotional support in addition to encouraging clinic visits. There was a routine for each visit, and accountability was documented by monitoring clinic visits by sex workers in each district (Basu et al. 2004). Thus, the Sonaguchi Program had four components: peer-led outreach education, program-supported clinical services to treat STIs other than HIV, commodity distribution (promoting and distributing free condoms for sex workers as well as needle and syringe exchange for injection-drug users), and facilitating community mobilization and capacity for community ownership of the program.

The program was a great success. Our team evaluated the program by implementing a pilot RCT in four small, deeply rural towns 150 km north of Calcutta (Basu et al. 2004, Jana et al. 2004, Swendeman et al. 2009a). The UCLA team randomized two villages to the Sonaguchi intervention and two to the control condition. Jana et al. implemented the intervention, and we evaluated it. Two clinics to treat STIs were created in the two intervention villages. The Sonaguchi team came to the rural villages, organized local women, and hired and trained sex workers to be CHWs, with consultations from UCLA over time. We found lower rates of STIs and higher rates of condom use in the intervention communities compared with the control communities (Basu et al. 2004).

The visibility of the Sonaguchi Program has grown and evolved. It was recognized on the front page of the *New York Times* in 1999 (Dugger 1999). It became a labor union of 60,000 sex workers; offered interventions for maternal and child health, reading programs, and temporary shelters for women and children; and sold condoms (rather than giving them away) to sex workers. The Bill & Melinda Gates Foundation funded a broad diffusion of this program throughout India: the Avahan Project (Avahan 2008). Run by the Gates team, not the Sonaguchi team, the \$250 million intervention, called the Business of HIV Prevention at Scale, was diffused throughout India. The Gates project addressed additional high-risk populations (e.g., MSM); created infrastructure for treatment of STIs for high-risk groups nationally; and created the types of evaluation, monitoring, and implementation materials that would advance prevention science around the world. Over the life of the Avahan Project, more than 100 articles analyzed and documented the efficacious components and processes of this adapted program.

COMMONALITIES ACROSS EVIDENCE-BASED INTERVENTIONS

The interventions listed in Tables 1 and 2 address very different populations, countries, and outcomes. However, the underlying theoretical model of behavior change, the principles of change, and the program elements were highly similar globally. The below subsections describe these similarities and address the tension in the field between replicating EBIs with fidelity and adapting EBIs in innovative ways.

All Efficacious Preventive Programs Apply Cognitive Behavioral Principles of Behavior Change

Almost all EBIs build on the learning principles of behavior change typically labeled cognitive behavioral change strategies. We summarize these principles in one sentence in our trainings with CHWs:

People change slowly over time, by changing their thoughts, feelings and actions, with small steps, in relationships and with opportunities and rewards. (Rotheram-Borus et al. 2009a, p. 1101)

In creating training models, program designers must be able to teach CHWs to understand this sentence in such a deep way that they can apply these principles to new problems in field settings. To become competent CHWs, trainees must be repeatedly challenged to apply the principles of behavior change to daily problems in a trusted setting. This is not easy; our experience and data with CHWs in rural Africa suggest that paraprofessionals require 9–12 months of experience and training to develop these skills. Yet, most paraprofessionals receive approximately 1 week of training, and many programs do not provide ongoing supervision, even in high-income countries (Witkin 2013).

The affective, behavioral, and cognitive skills required to create healthy routines are discrete and have been repeatedly identified by researchers. For example, Chorpita & Daleiden (2009) reviewed more than 900 EBIs to improve the mental health of children and families. These EBIs used a list of 54 practice elements, 14 of which were used in 80% of the EBIs. Our research team classified these 14 practice elements as reflecting strategies for behavior change (e.g., monitoring, response cost, modeling, praising, relaxing), ways to engage others (role-playing, instructing), problem management (goal setting), and relationship skills (seeking social support). This tool kit of skills and knowledge about how change occurs and the skills needed to implement health have been used for decades. New interventions, regardless of delivery format or setting, hopefully include these skills.

Our research group also attempted to identify common elements of EBIs. We analyzed the EBI prevention manuals for adolescents at risk of HIV and families at risk of or living with HIV (Ingram et al. 2008; Rotheram-Borus et al. 2009b,c, 2012a; Swendeman et al. 2009b). Once they learn the principles of behavior change and the necessary skills, CHWs need to use them in an EBI that accomplishes five goals (Rotheram-Borus et al. 2009c).

First, the EBI removes environmental barriers to implementing the targeted behaviors. The best example of removing barriers prior to implementing a program was Jana's negotiation with police and political parties to create a law requiring the use of condoms during sex work. A sex worker presenting condoms to a client represents an attempt to act lawfully, not a request for a personal favor. In our pilot study, the Sonaguchi Program also opened clinics to treat STIs in small villages—only with this resource can monthly STI and HIV testing be implemented.

Second, the EBI frames and normalizes the issue or problem. A good frame nests the intervention within a life-course perspective and a cultural context, identifies a personal strength that leads to an expectation of successfully changing the issue, and highlights how

the issue is consistent with the person's values. Almost all persons at risk, especially those in LMICs, experience multiple challenges—there is never only one problem area to target in an intervention. Mothers living with HIV in the periurban townships outside Cape Town, South Africa, face many challenges: poverty, problematic partnerships, their own risk behaviors, mental health symptoms, and HIV (Rotheram-Borus et al. 2011a). Similarly, in high-income countries, disenfranchised populations face multiple challenges. Young Black and Latino MSM in the USA face incarceration, hospitalization for mental illness, substance abuse treatment, drug use, and past suicide attempts (Rotheram-Borus et al. 2019), and almost all of them have experienced discrimination for being MSM and/or being Black or Latino. In this context, what should be targeted, and how? Building resiliency by focusing on skill building, similar to the prevention strategies of the 1970s, and teaching these skills to address the client's day-to-day priorities represent our current intervention approach (Arnold et al. 2019, Rotheram-Borus et al. 2019).

Third, the EBI teaches and applies new information and skills that can address the program's targeted outcomes. Every bit of health information to be acquired must have an engaging, easy way to demonstrate the issue. For alcohol prevention, we shared with mothers a room-temperature glass of alcohol in which we broke an egg—the egg poached. We communicated the message, “This is your baby's brain on alcohol.” In Thailand, we informed mothers about the need to practice a single feeding method for the first 6 months of life by sharing a vial of milk of magnesia into which we dropped water—the milk of magnesia curdled on the sides of the vial. This was an example of a baby's stomach getting more than one type of feeding. Displaying baby dolls who look like they have fetal alcohol spectrum disorder alongside “nonaffected” dolls can demonstrate the physical consequences of alcohol abuse far better than any description or admonition.

Similarly, each skill must be translated into the culture in which it is taught. Recognition and management of one's emotional state/intensity of feelings are central skills in all behavior change programs. By the 1950s, early behavior therapists were using a Feeling Thermometer (Wolpe & Lang 1964) to teach clients emotional self-regulation. The Feeling Thermometer rating can be adapted to many contexts and can be flexibly used to rate discomfort, happiness, anxiety, or depression. In the USA, the scale is often a 0–100 rating, as most Americans are familiar with numbers in that range. In South Africa, where numbers are not a familiar concept, having participants fill a glass of water to represent the level of their feelings is a simple and meaningful task.

Another basic concept is how to change social perceptions. In the USA, behavior change programs use active self-talk. In Thailand, the concept of *dukkha* is invoked to acknowledge the impermanence in the world; it is a useful concept for supporting changes in perceptual shifts. Key skills for behavior change were highly similar in both high-income countries and LMICs. Cognitive behavioral principles have been well established for more than half a century, yet these principles and skills are not in broad use in almost any culture.

Fourth, the EBI enables the practice of new behavioral routines in situations with role-playing and ritualized ways to give feedback (e.g., sharing tokens of colored construction paper that punctuate or signal each positive feeling). Each intervention contact needs to be

predictable, and every EBI must follow a similar sequence of activities. Intervention contacts in EBIs repeatedly follow the same pattern in order to build habits that, hopefully, clients will use in a similar, habitual way in their lives. The sequence a specific EBI chooses is arbitrary, but the UCLA team (Rotheram-Borus et al. 2014a, 2015) follows the following sequence:

- Begin with a ritual (e.g., singing in South Africa, listing goals on a blackboard in Uganda, meditating in Thailand);
- review recent behavioral successes, pleasant events, or good feelings;
- determine whether there are any crises, and problem-solve them;
- introduce new information and role-play situations to apply the information;
- identify aspects of the day's meeting that went well or generated positive feelings;
- set a goal for the next week; and
- end with a ritual.

Fifth, the EBI builds a social support network for sustaining new behavior patterns. Interventions delivered in small group settings have built-in social support. With young South African men we nested HIV interventions in soccer groups—another way to build support (Rotheram-Borus et al. 2018). One of our interventions was to open family wellness centers in a shopping mall and six schools serving low-income students in order to interject prevention activities into martial arts, lunchtime, meditation classes, homework workshops, summer camps, and family parenting workshops (Rotheram-Borus et al. 2014a). These interventions attempt to permeate families' daily lives with opportunities to practice healthy behaviors.

Selection and Training of Paraprofessional Trainers or Community Health Workers

Our research focuses on paraprofessionals for the delivery of preventive interventions. Beginning with the barefoot doctors of China in the 1930s, paraprofessionals have been found to be cost-efficient alternatives to highly trained professional personnel. In 2002, Marsh and colleagues selected maternal and child health workers who were positive peer deviants, in a strategy widely adopted (for example, by the Philani Program). Selecting CHWs with good social and problem-solving skills and CHWs whose children are thriving increases the chances that the CHWs will bond with their clients.

While there are more than two million CHWs, scientific evaluations of their efficacy have been highly controversial. In the context of efficacy trials, CHWs have consistently been found to be efficacious (Gilmore & McAuliffe 2013, Gogia & Sachdev 2016); when broadly scaled, however, efficacy often disappears (Scott et al. 2018). Rather than reflecting a failure of the CHWs, these observations show that sustained efficacy from this workforce requires ongoing feedback, in-service training, and rewards for good performance over time. Rarely are these services provided. This failure reflects our need to focus on organizational capacities and performance, rather than on programs.

Should researchers design evidence-based interventions or support exceptional, community-led programs to thrive and evaluate their programs?

—CPOL and Project TALC were designed by researchers, and the Philani and Sonaguchi Programs were designed by local community leaders. Clearly, the programs led by community leaders were sustained and expanded over time; not so the programs led by the researchers. Researchers had a significant role in validating and extending the efficacy of these on-the-ground programs. The Gates Foundation found a good model but then expanded and built infrastructure independent of the Sonaguchi Program to allow broad diffusion of the program. Researchers almost always design their own programs. If researchers adopted the role of identifying and evaluating exceptional community-based programs with solid outcomes, EBIs might be broadly diffused much more quickly by teams highly invested in the local communities. A question emerges, however: How do we identify exceptional community-led programs?

Often, the community generates ineffective programs. For example, D.A.R.E. (<https://dare.org>) is an international drug abuse prevention program that was introduced and diffused in the USA by then-First Lady Nancy Reagan. Police officers are sent to school classrooms to provide substance abuse prevention messages to children. Although 11 national evaluation studies failed to find any benefits of the program (des Jarlais et al. 2006, Pan & Bai 2009, West & O’Neal 2004), it continues to be broadly diffused. Researchers even attempted to inject elements of EBIs into D.A.R.E. in order to increase its efficacy—this effort failed (Sloboda et al. 2009). Supporters of D.A.R.E. argue that having police visit classrooms improves community–criminal justice relationships (Birkeland et al. 2005), and the broad implementation of this program persists.

In contrast, efficacious community-led programs share a number of characteristics:

- They are well organized and inspiring;
- the community members being targeted are central decision makers and leaders in the organization;
- the leaders focus on promoting junior staff, rather than seeking attention and recognition of their own accomplishments, according to Collins (2001); and
- the organization has systems for training and monitoring quality and outcomes over time, and there are mechanisms for implementing accountability for nonperformance.

Use delivery formats that already saturate people’s lives.—Most preventive interventions are regarded as some type of health care intervention—complete with expectations that people want care and seek it in an organized setting. In most LMICs, this would mean traveling long distances, waiting all day, and navigating complex rules and bureaucracies. All successful and sustainable EBIs are embedded in daily routines that are attractive and convenient to the targeted population, the staff, and the delivering agency. Television, mobile phones, shopping malls, and meals are examples of settings that have saturated families’ daily lives during the last 40 years.

EBIs that have been launched by researchers collaborating with private entrepreneurs provide the best examples of making attractive and sustained interventions that are accessible daily in a flexible fashion. The Children's Television Workshop, the creator of *Sesame Street*, has influenced multiple generations, and more than 3,000 research studies have demonstrated its influence (Kolbe & Muehling 1995). Weight Watchers is another example of such a program. Developed by Jean Nidetch, an overweight woman in New York City, Weight Watchers started as a women's support group in 1961. Soon thereafter, Richard Stuart, a cognitive behavioral intervention researcher, cowrote the book *Slim Chance in a Fat World: Behavioral Control of Obesity* (Stuart & Davis 1972) and collaborated with Weight Watchers for many years. Stuart's cognitive behavioral approach set the key structural characteristics of the Weight Watchers Program; that is, cost-contingency contracts require payment regardless of attendance, behavior is routinely monitored (weighing upon arrival) in order to document progress/no progress over time, and tools are employed to increase cognitive behavioral skills (e.g., bookmarks with affirming statements printed on them). Repeated RCTs evaluating Weight Watchers have demonstrated the program's efficacy (Ahern et al. 2011, Dansinger et al. 2005, Tsai & Wadden 2005).

Entertainment broadly changes public health knowledge and attitudes, yet our evaluations have typically focused on the potential negative consequences of entertainment and video games. For example, extensive research on modeling and the impact of TV violence on children (Anderson et al. 2017) also suggests the potency of TV's impact. Many Disney movies targeting children may have long-term influences and potential benefits. *Inside Out*, an animated movie about a young child coming to learn about emotions, presents information on children's developmental pathways to both parents and children that may enhance understanding of how feelings influence daily life and offers strategies for modifying negative feelings. *Frozen* directly addresses the potential deference of women to men, especially in romantic relationships, and offers powerful models of women supporting women. Yet we have no systematic understanding of how these movies influence their audiences or how scientists might harness them as tools for EBIs.

ADDITIONAL INNOVATIVE APPROACHES TO BROAD DIFFUSION OF EVIDENCE-BASED INTERVENTIONS

The next generation needs to break away from the traditional approach to EBI development and dissemination. The fact that it takes decades to create, test, retest, diffuse, and increase adoption of EBIs indicates the need to create cheaper interventions, faster, that meet the needs of more people at less cost—that is, to create disruptive innovations (Christensen et al. 2006). Rotheram-Borus et al. (2012d) advocated for four activities that would enable researchers to move more quickly from the stage of a formative idea to a broadly diffused EBI available for more people at a lower cost: synthesize common elements across EBIs to identify robust components, processes, and principles; experiment with new delivery formats (e.g., consumer controlled, self-directed); adopt market strategies to promote and diffuse EBIs; and adopt continuous quality improvement as a research paradigm for systematically improving EBIs.

The decision points embedded in every EBI are key to expanding our field; it is past the time when a relatively small group of clinicians designed multicomponent interventions that would then be replicated with fidelity for decades. To have a greater impact, prevention scientists can harvest and diffuse their scientific contributions from the last 40 years in new ways. PracticeWise (<https://www.practicewise.com/>), a private company, has developed and implemented models for the quality of clinical services by synthesizing existing EBIs and translating their ratings into practice guides that are made easily accessible on computerized databases. Clinicians can utilize these practice guides and databases during treatment to quickly provide information on the optimal interventions for families and children of a specific age and/or presenting complaint. The synthesized PracticeWise database indicates which interventions have been most successful in treating similar cases. This data set of EBIs is an example of a platform that might support clinicians and community leaders who are deciding which interventions to mount. Prevention researchers need similar syntheses.

Many other untapped data are available in EBI prevention manuals. Each of these manuals provides scripts for role-playing situations that can serve as models for local programs and/or inform the adaptation of EBIs into new delivery formats. In the manuals created for EBIs cited in this article, there are approximately 200–300 scripts that could serve as role models for practitioners or CHWs globally. It is critical to create a clearinghouse that categorizes each script according to its relevance for a population, targeted age, gender, presenting complaint, or behavior change principle. A platform that synthesizes these scripts and facilitates access by local providers would be a useful tool for prevention practitioners globally.

Practitioners' experiences are likewise untapped by researchers—practitioners are a great source of on-the-ground firsthand experience. In the 1990s, the Cochrane Collaborative created a website, DIPEX (<https://dipexinternational.org>), for practitioners to share their experiences with EBIs. Practitioners' experiences provide critical information regarding how to improve existing EBIs, and they would be able to document the ongoing practical problems that each EBI creates during implementation. Over the last 20 years, the mission of DIPEX has drifted, and it now comprises a global group of qualitative researchers. However, there is no group sustaining a universal site for practitioners to share their experiences with EBIs. The broad penetration of social media today could mobilize practitioners, researchers, community leaders, and CHWs to inform their peers globally about effective implementation of EBIs. Creating learning collaboratives represents a strategy to increase access to field observations in a systematic manner on a virtual platform.

Notably, almost all EBIs have been conducted in person; the in-person contacts took place in individual, family, small group, classroom, and community meetings. Yet, there has been underinvestment in new technologies. Mobile phones now permeate families' lives. Globally, more than 5.24 of 7.5 billion people have mobile access, and half of them, 2.5 billion, are using smartphones (Lenhart 2015). Even in LMICs, the penetration rate of mobile phones is often more than 100% (Silver et al. 2019). Tasks that used to require a personal computer are now being executed on phones, enabling the 6 billion people in LMICs to share in the technological revolution. Globally, people spend an average of more than 2 hours per day on social media (GlobalWebIndex 2015), creating virtual rather than

in-person relationships. Access to information, relationships, and work is available almost anywhere in the world, at any time, via mobile technologies. These technologies allow researchers to personalize the content, dose, and settings for intervention delivery and to rapidly expand the penetration and reach to new populations. Mobile interventions can take many forms: texts, apps, games, and videos. Regardless of delivery modality, more than 80% of the programming on each of these delivery formats rests on cognitive behavioral theories; change principles; and basic emotional, behavioral, and cognitive skill acquisition. Yet each researcher reinvents the programming for these skills and principles. A generic, robust, open-source cognitive behavioral technology platform could jump-start our mobile interventions. Mobile EBIs could then be made more robust, at much lower cost, and then diffused if governments or foundation were to invest in building a mobile, cognitive behavioral change infrastructure. This does not yet exist. Being open source would be critical to the platform's utility.

In addition, almost all mobile EBIs remain in pilot stages (Tomlinson et al. 2013), even 7 years after initial analyses. Many mobile programs are broadly diffused without any evidence of their efficacy. For example, Johnson & Johnson developed text4baby, a maternal/child mobile health program that is available throughout Africa to support strong parenting by mothers of small children (van Velthoven et al. 2012). Yet no one knows how useful this program is. Technology companies routinely invest tens of millions of dollars to create a popular game (Hilleman 2020, Kotaku 2014), but researchers are lucky to get \$300,000 for a pilot phase and then must apply to get a \$1 million investment (through Small Business Innovative Research grant funding programs). There is far too little investment at too slow a pace to leverage the potential power of researchers' technology-based EBIs; collaboration with private enterprise is crucial in this area.

Enthusiasm for mobile technologies is high, both for delivering interventions and for establishing accountability systems—basic processes for improving the quality of EBIs, staffing, and organizations over time. Over the last 10 years, all data collection, monitoring of staff, and many of our interventions have been done on mobile phones in Asian, African, and high-income countries. Major challenges for implementing or establishing accountability systems for mobile-based programs remain and cannot be easily problem-solved, especially in deeply rural sites. There are many reasons for these challenges. In LMICs, it is expected that most interventionists will have less than a high school education and limited technical/smartphone skills. Even with training, it is not possible to problem-solve many technological glitches and problems on an ongoing basis—the electricity is turned off for “load shedding,” the only electricity is at a local store, battery packs are insufficient to last a day, and the available 3G networks cannot handle the data load. Given these challenges, each staff member often needs paper backup recording abilities to capture information on contacts and transactions. Yet, phones play a helpful role for EBI delivery, staff accountability, and communication, especially in rural areas. For example, supervisors are able to see when a CHW has not logged intervention contacts over several days and can follow up to ensure that work proceeds. There are many unused opportunities, but the global reality of 5G networks functioning routinely is likely decades away. Simpler, fail-proof technologies are currently the most important to implement. For example, regions of South Africa are moving to electronic medical records, yet every citizen also has a Road

to Health 5- by 7-inch cardboard card that summarizes their health status and treatments. Such a backup system will remain necessary for many years.

There is a need to permeate families' lives with preventive EBIs. The scientific norms for how and when to implement these programs need to be reconsidered. Replication with fidelity remains the gold standard for how to design, test, and diffuse EBIs, but it is leading to low uptake, rigidity, and a failure to iteratively improve our science. However, mounting ineffective programs, as often occurs, is not a solution. Routine, systematic evaluation of our work is critical—whether through a research intervention, a community-led program, a business venture, a game, or a homegrown technology initiative. We need alternative ways to synthesize data from preventive interventions from the last 40 years, along with ways to garner the types of resources that will enable major experiments with promising programs, not small RCTs with poor external validity. Only then will we obtain cheaper interventions that reach more people, faster, and harness the scientific breakthrough of preventive intervention research.

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SUMMARY POINTS

1. Replicating manualized, evidence-based interventions (EBIs) with fidelity is unlikely to result in programs that are broadly scaled, sustained, and delivered with efficacy.
2. Any EBI must be designed to utilize existing funding streams, rather than requiring novel funding mechanisms to become endemic.
3. Novel EBIs build on common, robust features shared by many EBIs.
4. All EBIs identify key problems; utilize well-established social cognitive theories and behavior change principles; engage the target population and the delivery organization; set standards for selecting, training, monitoring, and holding staff accountable over time; and routinely evaluate the quality of implementation to iteratively improve the intervention over time.
5. Researchers would do better to identify exceptional community or government agencies that are implementing high-quality programs consistently and then demonstrate the efficacy of the agency's approach, rather than mount stand-alone research trials.
6. Diffusion of science-based interventions can benefit from private enterprises' management and implementation expertise.

FUTURE ISSUES

1. Designing interventions with broadly diffused technology platforms will facilitate broad diffusion of novel programs.
2. Community-led structural interventions are underutilized by researchers, have greater impact than interventions targeting individuals or small groups, and may be sustained more effectively.
3. Researchers should design to meet the needs of most of the population, rather than trying to meet everyone's needs. The interventions need to be good enough to meet most people's needs in a specific area.
4. Practitioners should utilize the wealth of knowledge that exists in existing EBIs to adapt to new settings, populations, and challenges.

Table 1

A summary of the key characteristics of the original Project TALC intervention and five adapted programs

	New York City	Los Angeles	Haiti	China	Thailand	Vietnam
Population	Parents with AIDS and children	Mothers with HIV and children	Parents with HIV and children	All family members with one person with HIV	All patients with HIV	IDU and a family member
Context	70% of centralized registry	Clinic samples	Clinic	Rural villages	Clinic	Four communes
Targets	Mental health symptoms, stigma, sex and drug-use risk behaviors, children's health behaviors Parent-child communication	Mental health symptoms, stigma, children's health behaviors Parent-child communication	Medication adherence, mental health symptoms, stigma, children's health behaviors Parent-child communication	Community acceptance, mental health symptoms, stigma, children's health behaviors Parent-child communication	Mental health symptoms, stigma, medical adherence, children's health behaviors Parent-child communication	Depression and family communication
Outcome	Reduced sex and drug-use risk behaviors and depression for both parents and children; fewer teenage pregnancies; adolescents had babies that tended to have higher IQ and did have significantly better home environments	Less depression and less stigma	Fewer mental health symptoms and less stigma, increased social support	Better CHW-IDU interactions over time, CHWs reduced stigma at 12 months, greater drug avoidance at 6 months, adolescents' negative behaviors reduced, no impact on young children	Better general and mental health over 12 months	Less depression and better family relations over 6 months; highly correlated IDU and family measures
CHWs	Parents in community, BA degree, good social skills	Parents in community, BA degree, good social skills	CHWs already in the clinic	CHWs from the Chinese CDC	Existing clinic support staff	CHWs in the communes
Implementation	Daylong, small groups with parents and adolescent children	Small group meetings throughout the county	Small groups at the clinic	Three venues: clinics, families' homes, and community fields (e.g., fairs, contests)	Thirteen weekly sessions in 4 modules: healthy mind, body, family, and community	Four separate small-group sessions each for IDU and family members
Social support	Peers at the intervention	Peers at the intervention	Peers at the small group meeting	Community events, small group meetings of other PLH	Peers at the small group meetings	Peers at the day treatment sites and in the small group meetings
Environmental barriers	Transportation	Transportation	Transportation	Transportation	Transportation	Transportation

Abbreviations: CDC, Centers for Disease Control and Prevention; CHW, community health worker; IDU, injection-drug user; PLH, people living with HIV; TALC, Teens and Adults Learning to Communicate.

Table 2

Characteristics of three broadly diffused evidence-based interventions: CPOL, the Philani Program, and the Sonaguchi Program

Characteristic	CPOL	Philani	Sonaguchi
Population	Market vendors, China Students in college dormitories, Russia MSM in neighborhoods, Peru Bar patrons, India Growth-point villagers, Zimbabwe MSM in bars, USA	Pregnant women in 24 neighborhoods	Sex workers in four deeply rural villages
Context	Six countries in Asia, Africa, South America, eastern EU, and Africa	Periurban townships outside Cape Town, South Africa	150 km north of Calcutta, India
Outcome	Reduced STI/HIV incidence	Increased tasks to prevent mother-to-child transmission of HIV, breastfeeding and child nutrition, caretaking Reduced alcohol use/abuse	Reduced STI rate Increased condom use Increased self-reported empowerment
CHWs	Staff from Chinese CDC	Local mothers with good social skills who documented their work consistently and who themselves had thriving children	Sex workers with good social skills
Implementation	Small group meetings with meals	Perinatal home visits	Home visits to sex workers in geographic area Sale of condoms Referral to clinics
Frame	Community protection	Improving child well-being and supporting maternal strengths	Labor problem
Social support	Community events Social marketing campaign	Home visitor support Neighborhood care groups	Rallies Low-interest loans
Environmental barriers	Treat all initial STIs to ensure no infections Provide access to free condoms	Endemic poverty; no supports given, but encouraged to spend money in cost-efficient ways to avoid food insecurity	Potential violence by partners reduced by making condom use a law Police and political party support
CBT method	Identify popular opinion leaders, use cognitive behavioral skills to deliver social messages encouraging HIV prevention to peers Build community cohesion	Socially reward breastfeeding, buying healthy food, and good parenting Role-model talking and playing with baby Encourage mothers to caretake, even if depressed	Be a role model Reinforce seeking STI/HIV testing, condom use, and assertiveness
Skills	Initiate social contact Deliver a socially responsible message in a conversation Refer to clinics to test for STIs	Knowledge and practice of good parenting skills Refusal skills with partners Assertiveness with medical personnel	Communicate with partner Self-reward for assertiveness
Evaluations	Cluster RCTs of approximately 40 venues with at least 4,000 participants per country	Cluster RCTs in 24 township neighborhoods with approximately 50 pregnant women each ($N = 1,238$)	Randomly assign two villages to intervention and two villages to control condition
Results	Individual country reductions; no effect across six countries	50% higher task completion to prevent mother-to-child transmission Better growth for 6 months Better outcomes for children of depressed mothers to 18 months Lower maternal depression 3 years post birth Less alcohol use in pregnancy and at 5 years and less problematic drinking in pregnancy and at 5 years	Fewer STIs Better feelings about self Increased knowledge More condom use

Abbreviations: CBT, cognitive behavioral therapy; CDC, Centers for Disease Control and Prevention; CHW, community health worker; CPOL, Community Popular Opinion Leader; MSM, men who have sex with men; RCT, randomized controlled trial; STI, sexually transmitted infection.