AIDS and Behavior (2017) 21:3366–3430
https://doi.org/10.1007/s10461-017-1965-5

SUBSTANTIVE REVIEW

Structural Interventions in HIV Prevention: A Taxonomy and Descriptive Systematic Review

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Published online: 20 November 2017

Abstract
One of the four national HIV prevention goals is to incorporate combinations of effective, evidence-based approaches to prevent HIV infection. In fields of public health, techniques that alter environment and affect choice options are effective. Structural approaches may be effective in preventing HIV infection. Existing frameworks for structural interventions were lacking in breadth and/or depth. We conducted a systematic review and searched CDC's HIV/AIDS Prevention Research Synthesis Project's database for relevant interventions during 1988–2013. We used an iterative process to develop the taxonomy. We identified 213 structural interventions: Access (65%), Policy/Procedure (32%), Mass Media (29%), Physical Structure (27%), Capacity Building (24%), Community Mobilization (9%), and Social Determinants of Health (8%). Forty percent targeted high-risk populations (e.g., people who inject drugs [12%]). This paper describes a comprehensive, well-defined taxonomy of structural interventions with 7 categories and 20 subcategories. The taxonomy accommodated all interventions identified.

Resumen
Uno de los cuatro objetivos nacionales de prevención del VIH es usar combinaciones de enfoques los cuales son eficaces y basadas en evidencia para prevenir la infección por el VIH. En los campos de la salud pública, técnicas que alteran el medio ambiente y afectan opciones son eficaces. Enfoques estructurales pueden ser eficaces en la prevención de la infección por VIH. Los marcos existentes para las intervenciones estructurales carecían en amplitude, en profundidad, o en ambos. Se realizó una revisión sistemática y búsquedas en la base de datos del proyecto Síntesis de los VIH/SIDA Prevención Investigaciónes de los Centros para el Control y la Prevención de Enfermedades para intervenciones pertinentes publicado durante 1988-2013. Utilizamos un proceso iterativo para desarrollar la taxonomía. Se identificaron 213 intervenciones estructurales: Acceso (65%), Política o procedimiento (32%), Medios de comunicación (29%), Estructura física (27%), Capacitación (24%), Movilización de la comunidad (9%) y Determinantes sociales de la salud (8%). Cuarenta por ciento había concentrado en poblaciones de alto riesgo (por ejemplo, personas que se inyectan drogas [12%]). Este artículo describe una taxonomía completa y bien definida de intervenciones estructurales con 7 categorías y 20 subcategorías. La taxonomía acomodado todas las intervenciones identificadas.

Keywords Structural interventions · HIV prevention · Policy · Social determinants of health · Systematic review

Introduction

National HIV prevention goals [1] include the expansion of efforts to prevent HIV infection by using a combination of effective, evidence-based strategies. An updated, national goal [1] calls for adoption of structural approaches to reduce HIV infections and improve health outcomes in communities with high rates of infection as one of the steps to reducing HIV-related disparities and health inequities. Many public health outcomes are partly determined by individuals'

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s10461-017-1965-5) contains supplementary material, which is available to authorized users.

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behaviors. Public health efforts to reduce the consequences of such behaviors often rely on appeals to individuals to change their behavior. However, other approaches have been developed and these strategies, one of which is referred to as "structural," alter the environment in ways that facilitate or promote safer behaviors, or reduce risk in ways that do not rely on individual behavior change. Historically, major structural public health interventions have had large impacts.

Several HIV specialists have developed frameworks for classifying structural interventions for HIV prevention. However, they all consisted of a set of categories designed to be illustrative, rather than comprehensive. Sweat and Denison [2] proposed that behavior change interventions can produce change at any of four causal levels—individual, environmental, structural, and "superstructural"—and gave examples and change mechanisms for each. For example, superstructural interventions were defined as "macrosocial and political arrangements, resources, and power differences that result in unequal advantages." Examples of such interventions might include "national and international social movements, revolution, land redistribution, war, and empowerment of disenfranchised populations." Structural interventions were defined as "laws, policies, and standard operating procedures."

Blankenship and colleagues [3] reviewed the literature available at the time and proposed nine categories of structural interventions based on contextual factors of availability, acceptability (e.g., campaigns shaming people committing unacceptable behavior, such as drug use), and accessibility. Similarly to the Sweat and Denison analysis, these authors gave examples of each at the individual, organizational, and environmental levels.

In the context of a special issue of AIDS resulting from a consultation organized by scientists (including the senior author of the current manuscript) at the Centers for Disease Control and Prevention (CDC), Sumartojo and colleagues [4] presented a table listing types of structural interventions (economic resources, policy supports, societal conditions, and organizational structures and functions) crossed with types of institutions (government, service organizations, private business, workforce organization, faith community, justice system, media, educational system, and the health care system) that could be a barrier or provide support. Again, these examples were not based on the extant literature, nor meant to be comprehensive.

In 2000, Cohen and Scribner [5] described four categories of structural interventions: Availability, Physical Structures, Social Structures, and Media Messages. In a later exposition by Blankenship and colleagues [6], structural interventions were categorized into four types: community mobilization, integration of HIV services, contingent funding, and economic and educational interventions; these four were largely mutually exclusive of the four specified by Cohen et al. [5]. Another such effort was undertaken by Tsai [7] who described structural interventions as existing along two dimensions: implementation intensity, and dependence of the effects on user agency. However, only a few examples were provided. Lastly, Kaufman and colleagues [8] noted stigma as an important factor that may influence HIV-related behavior. Other efforts at structural interventions to date have suffered the same issue of lacking comprehensiveness [9–13]. Moreover, a systematic process to categorize existing structural interventions was not attempted.

As we became immersed in the literature, we found the need for an all-inclusive framework to organize the different types of structural interventions. Therefore, we conducted a systematic review of the literature on structural interventions addressing HIV and developed a detailed and comprehensive taxonomy to enable categorization of every identified structural intervention. The purpose of this paper is to describe this new taxonomy in detail and to apply it to organize interventions identified through the systematic review.

Research Questions

This review addressed the following research questions:

1. What types of HIV prevention structural interventions are currently in the literature?
2. What are the outcomes of HIV prevention structural interventions?
3. Are there patterns in types of HIV prevention structural interventions? (Do certain types go together?)
4. What are the study designs of HIV prevention structural interventions?
5. Has the mix of HIV prevention structural interventions changed across time in terms of location, structural intervention type, research design, and population groups?

Methods

Search Strategy

To identify structural interventions in HIV prevention, we used CDC's Prevention Research Synthesis (PRS) Project's cumulative database (PRS database) of citations relating to HIV, AIDS and STI prevention literature from 1988 to 2013. Citations in this database are coded for a variety of variables related to populations, settings, interventions and outcomes. At the time of this project in 2013, the database contained more than 64,000 unique citations that were coded according to topics, target populations and types of interventions. This database is updated annually with automated searches [14] designed and tailored to four research areas: (1) HIV,

AIDS, or STI behavioral prevention; (2) linkage to, retention in, and re-engagement in HIV care; (3) HIV, AIDS, antiretroviral therapy (ART) treatment and adherence; and (4) systematic reviews on HIV and AIDS. The automated searches use six electronic bibliographic databases to retrieve relevant published literature: CAB Global Health (OVID), CINAHL (EBSCOhost), EMBASE (OVID), PsycINFO (OVID), MEDLINE (OVID), Sociological Abstracts (ProQuest) [15–18]. In addition, there is a supplemental manual search, which includes a quarterly hand search of 52 journals, requesting publications from experts in the field and reviewing other sources, such as electronic mail lists, clinical trial databases (e.g., Cochrane Library, CRISP database), conference proceedings, and references harvested from relevant HIV behavioral prevention research literature [14]. Full search strategy details of databases searched, MEDLINE search strategy, and a list of hand-searched journals are provided in the online Supplementary Materials A, B, and C, respectively. Citations identified through automated and manual searches were downloaded and deduplicated in the PRS database before conducting title/abstract screening and full report coding.

To obtain citations for this project specific to structural interventions, the PRS database was searched for citations published between 1988 and March 2013 that were coded as (1) "structural intervention," yield = 135 citations; or (2) "policy intervention," yield = 38 citations; or (3) "structural change mechanism," yield = 100 citations. A second search was conducted after the taxonomy was developed and included terms that were not in the original search. These coded terms included (1) "capacity building," yield = 33 citations, (2) "community mobilization," yield = 37 citations, and (3) "social marketing/mass media," yield = 97 citations. The total citation yield from the PRS database was 440 citations, last searched on May 3, 2017. In addition, authors hand-searched reference lists of related reports and systematic reviews and identified 63 more citations. Thus, 503 potential papers were identified (see Fig. 1).

Inclusion Criteria

To be included in this review, studies were required to meet the following criteria:

- Evaluation of an intervention that included at least one structural component not controlled by the individual, affecting recipients' behavior or other aspects of HIV risk
- Reported data on at least one of the specified outcomes (see list below in Outcome Measures)
- Published in English in a peer-reviewed journal
- Research design including a comparison condition, specifically:
  - RCTs, cluster RCTs
  - quasi-experimental, cluster quasi-experimental (defined here as comparison trials where treatment assignment is not random but also not self-selected)
  - time series (requiring two or more observations before and after the intervention)
  - prospective cohort studies
  - retrospective cohort studies
  - case–control studies
  - before/after comparisons (including comparisons against a baseline of zero)

Exclusion Criteria

- Interventions delivered at the community level unless there was an explicit structural component. Interventions were considered community level and not structural if the activity focused on individual participation or transactions, such as small group empowerment meetings or one-to-one conversations.
- Exposure analysis (i.e., only comparing people reporting exposure versus no exposure to an intervention)

Variables Abstracted

The following variables were abstracted: first author name, year of publication, years and location of implementation, target population, type of structural intervention, study design, outcomes measured, and description of intervention.

Outcome Measures

Studies were eligible for this review if they reported results on at least one of the following outcome measures:

- Sexual risk behaviors associated with HIV infection or STI (e.g., condomless sex, number of sex partners)
- Injection drug use behaviors (e.g., uptake of sterile syringes, frequency of injection drug use)
- HIV testing (e.g., number of people tested for HIV)
- HIV infection
- STI when used as a proxy for behavior change (i.e., excluding improved surveillance)
- HIV stigma
- ART prescriptions, when an outcome of provider interventions
- Adherence to HIV medication
- Engagement in HIV primary medical care (including health care utilization, linkage to and retention in care)

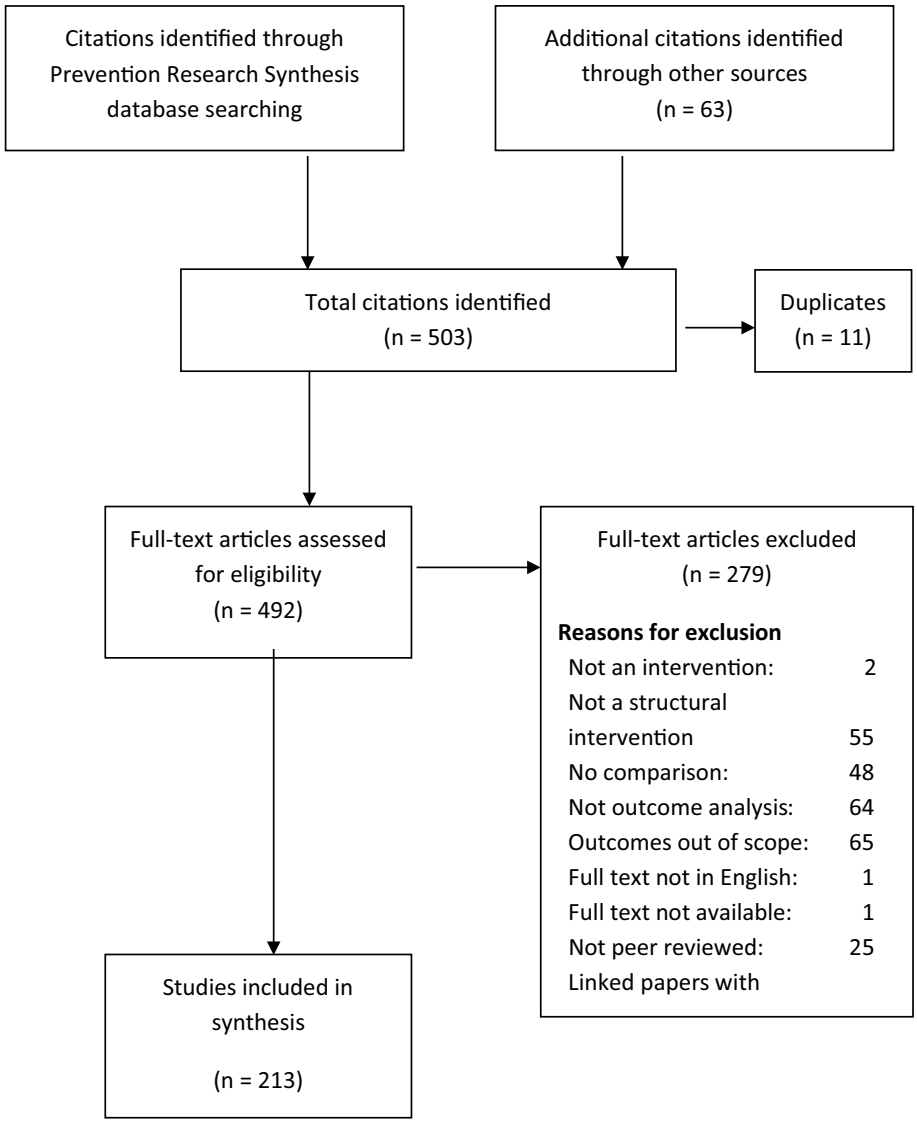

Fig. 1 Flow chart showing number of papers identified, duplicates, reasons for exclusion, and total number of included studies

We excluded certain outcomes that we considered more distal to HIV infection. The outcomes excluded, or that did not qualify a citation for the review, were:

- Number of condoms distributed/taken
- Attitudes other than stigma
- Cognition including knowledge
- Communication

Procedure

We developed a definition for structural interventions through an iterative procedure of literature review and workgroup discussion. In 2010–2011, a team of experts reviewed the first 87 citations and developed an initial definition and taxonomy. In 2012, two coders were added to the project and independently coded the 87 citations by using the categories developed in the first step. The categories and corresponding definitions were further refined. All citations were coded by pairs of independent coders. Discrepancies were resolved through discussion by all team members.

Statistical Methods

Taxonomy categories and subcategories were analyzed using descriptive statistics and cross-tabulations. We used logistic regression to examine changes across time in the proportion of studies that featured various characteristics, specifically type of structural intervention, location (high versus middle/low income economies), type of study population, and study design quality (stronger versus weaker designs). In each model, the dependent variable was presence or absence of the characteristic of interest. The independent variable was year, so that the odds ratio (OR) represents the annual increase in odds that a study includes the characteristic of

interest. For graphic presentation we grouped the 26-year review period into one group of 6 years followed by four groups of 5 years. SAS version 9.3 was used for the analyses.

Results

Structural Intervention Definition and Taxonomy Development

We defined structural interventions as:

> An intervention that affects risk and/or behavioral choices by changing something that is external to the individual and not under his/her control.

The definition is broad enough to include interventions that operate in two distinct ways along separate continua to reduce risk: intervention target and proximity to HIV infection. The first dimension refers to whether an intervention targets changes in individuals versus environment. When the intervention alters the environment (e.g., storefront HIV testing centers) or uses strategies to alter the choice structure (e.g., routine opt-out HIV testing in clinical settings), these are outside the individual's control. The second dimension refers to whether an intervention alters social determinants of the epidemic (e.g., microfinance interventions or reducing societal homophobia). We categorized all interventions along these two dimensions as illustrated in Fig. 2. Interventions are considered structural if they meet one or both criteria of being distal to the infection (e.g., social determinants of health) or targeting the environment. Thus, structural interventions fall into three of the four quadrants.

Interventions in Quadrant 1 are typically focused on changing individual behavior, knowledge, and awareness, and focused on proximal causes; these meet neither criterion, thus are considered not structural. Interventions in Quadrant 4 are considered structural as they meet both criteria (i.e., they target the environment rather than the individual and are focused on distal causes). Those in Quadrants 2 and 3 meet only one of the two criteria to affect change; however, these types of interventions were considered to be structural as well.

We next developed a taxonomy of structural interventions and refined definitions for each category in the taxonomy (Access, Policy/Procedure, Physical Structure, Capacity Building, Mass Media, Community Mobilization, and Social Determinants). Most of the categories had subcategories; all are defined below.

Taxonomy Definitions

Access Provision of a health product or service or actions that make such products or services more readily available to the intended users. Access can be modified in ways that include, but are not limited to, physical changes. Examples include locating a storefront HIV testing site in a neighborhood or expanding its hours of operation. Condom distribution counts as access only if condoms are available widely and do not require enrollment into a program to procure. Subcategories of Access include HIV testing, Condoms, STI testing, Sterile injection equipment, HIV Health Care, and Drug treatment.

Policy/Procedure Policy is formal guidance, principal, or rule adopted to bring about change. Procedure is the implementation of a policy and typically specifies a process. It is important to note that virtually all interventions require some policy or procedural change in order to be instantiated. Both are decided at an organizational or higher level that do require input at the individual level.

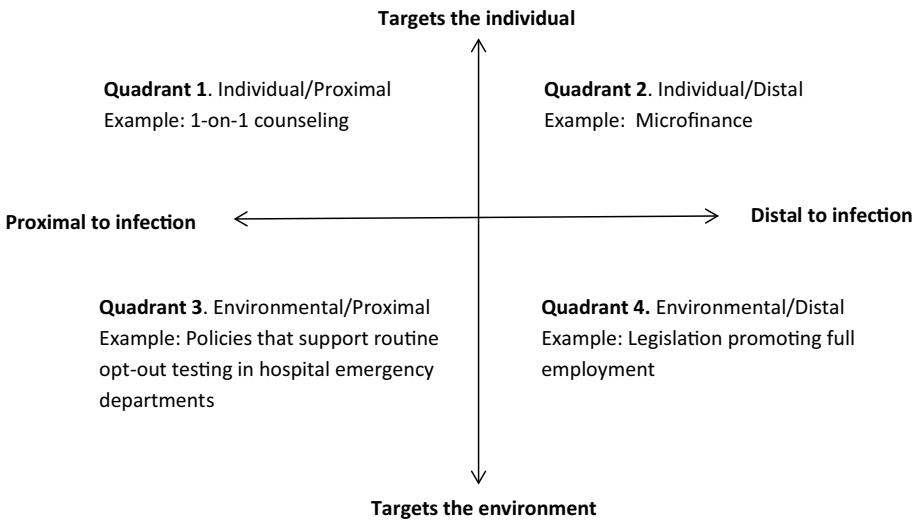

Fig. 2 Two dimensions and four quadrants useful in distinguishing structural interventions from other types of interventions. Interventions are considered structural if they target the environment and/or address determinants of health that are distal to HIV infection. Quadrant 1 is not considered to be structural

Often, policy/procedure interventions are ones in which the change is the intervention itself.

Institutional policy/procedure Policies enacted by a nonjudicial entity such as a clinic, school, or workplace that affect risk and/or behavioral choices (e.g., opt-out testing in an ER).
Governmental policy For interventions in this category, there may not be legal consequences for infractions and they may be issued from a municipal, state, or national body (e.g., CDC guidelines on preexposure prophylaxis).
Legislation Involves change in law that affect risk and/or behavioral choices (e.g., syringe access laws). Such changes have the authority of the polity behind them.

Mass Media Widely disseminated interventions via a large-scale communication medium other than person-to-person.

Social marketing The promotion of some positive social objective by employing marketing techniques used commercially; often disseminated via mass media (e.g., radio or TV spots delivering a crafted message). A requirement is that the information channel can be said *to saturate the environment*, so that exposure is largely outside the control of the individual (e.g., video shown to large waiting room; large posters displayed in multiple locations in a neighborhood). Small communication channels, such as letters, brochures, newsletters, and videos delivered to individuals or small groups, do not qualify as mass media.
Narrative interventions Interventions focused on a storyline included in the media (e.g., soap operas, podcast serial dramas).

Physical Structure Any physical form that affects risk directly or the ease with which healthy behaviors can be performed (e.g., creating new clinics, integrating services in one location, building a road, using a mobile van to deliver services).

Integration of services Services or products are brought together (i.e., co-located) for the sake of the convenience of the intended user and the efficiency of service provision. This is an important subset of physical structure interventions.
New physical structures Development of structures that did not exist previously, at least in the present location (e.g. clinics, vans, doors on bathhouse rooms).
Service provided in nontraditional setting Health services made available to people in a particular setting (e.g., homes, workplaces, prisons, schools) and the original service provided in the setting is not related to health or located in a health setting.

Capacity-Building Change that improves an agency's ability to provide services or programs.

Provider/supervisor training Training of health care or other staff to help them use more effective procedures with patients/clients.
Technology Using tools to increase productivity.
Hiring staff/funding Adding personnel to start interventions or increase productivity or securing monies to implement or enhance interventions.
Staff incentives Providing inducements, either monetary or nonmonetary, to increase productivity.

Community Mobilization A process of change involving multiple stakeholders within a community, including people who live in the community. A key criterion is that the community becomes involved through interaction with each other and the resulting change includes emergent properties, such as collective efficacy (e.g., commercial sex workers who unite together to demand condom use from clients). A substantial amount of the change is generated by community members who play a role in developing and implementing the intervention.

Social Determinants of Health Interventions Interventions addressing survival or acceptance and respect.

Survival Interventions that address factors having to do with basic necessities, such as money, food, and shelter, rather than, or in addition to, addressing HIV-related risk behavior directly.
Acceptance and Respect Interventions that address prejudice, discrimination, HIV stigma, or homophobia in the social environment of those whose health and/or health behaviors are affected by them. Interventions aimed at reducing internalized prejudice do not necessarily count as structural interventions because they may directly influence only the affected individuals.

The categories are mutually exclusive with the exception of the Access category. Often, interventions in other categories provided access to things by their very nature, such as condoms, HIV testing, or sterile syringes, and thus meet the definition of the Access category. On the other hand, interventions can also be classified in more than one category when they have multiple components, such as an intervention that includes community mobilization of commercial sex workers in addition to a policy of 100% condom

use. Most of the interventions in these categories fit into quadrants 3 or 4 in Fig. 2. Only interventions in the social determinants of health category may fit into quadrant 2 or 4.

Characteristics of Structural Interventions and Categorization using the New Taxonomy

Sample of Studies

From the 503 citations identified by the search, 213 intervention studies published between 1988 and 2013 met criteria and are therefore included in this review (Fig. 1, Appendix Table 6). The interventions were conducted between 1984 and 2010; more than half began in 2001 or later.

Type of Structural Intervention

The majority of interventions were categorized as Access (65%, n = 139) (Table 1); the most common Access types were HIV testing (n = 52), condoms (n = 48), and STI testing and treatment (n = 34). The next largest category was Policy/Procedure (32%, n = 68) with 51 studies employing institutional policies/procedures and 18 employing governmental. Twenty-nine percent of the interventions were developed as Mass Media interventions (n = 62), most of which included social marketing campaigns (n = 56). Five of the social marketing studies also included narrative interventions while six were narrative interventions only.

Twenty-seven percent of studies were categorized as a Physical Structure (n = 58), either by providing services in a nontraditional setting (n = 23), integrating services (n = 22), or developing a new physical structure (n = 20). Twenty-four percent of the studies featured Capacity Building (n = 51), most frequently through provider or supervisor training (n = 42) or new technology (n = 12). Nine percent of studies were categorized as Community Mobilization (n = 20) and eight percent of studies were considered to be Social Determinants of Health (n = 16).

There was a significant increase across time in the proportion of studies that included three SI types (Fig. 3). The proportion including Physical Structure increased from 13% in 1988–1993 to 33% in 2009–2013 (OR per year = 1.08, 95% CI 1.02, 1.14). The proportion including Policy and Procedure increased from 27 to 44% (OR 1.06, 95% CI 1.01, 1.11). The proportion including Social Determinants of Health increased from 0 to 14% (OR 1.24, 95% CI 1.06, 1.46). There was a significant decrease across time in the proportion of studies that included Mass Media from 47 to 14% (OR 0.91, 95% CI 0.88, 0.97). There was no significant change across time in the proportion of studies that included Access, Capacity Building, or Community Mobilization.

Table 1 Type of structural intervention in HIV prevention (k = 213)

Type of structural intervention	Frequency	%
Access	139	65%
HIV testing	52	
Condoms	48	
STI testing and treatment	34	
Sterile injection equipment	21	
HIV health care	17	
Drug treatment	2	
Policy/procedure	68	32%
Institutional	51	
Governmental	18	
Legislation	0	
Mass media	62	29%
Social marketing	56	
Narrative	11	
Physical structure	58	27%
Services provided in nontraditional setting	23	
Integration of services	22	
New physical structures	20	
Capacity building	51	24%
Provider/supervisor training	42	
Technology	12	
Hiring staff/funding	1	
Staff incentives	0	
Community mobilization	20	9%
Social determinants of health	16	8%
Survival	9	
Acceptance and respect	8	

Totals exceed 100% because of multiple response

HIV human immunodeficiency virus, *STI* sexually transmitted infections

Intervention Location

The interventions were located in countries around the world (Table 2). The largest proportion (49%, n = 104) of studies were conducted in the Americas, most of them in the United States (n = 84); within the United States, the largest numbers were from the West (n = 30), Southeast (n = 16) and Northeast (n = 15). Twenty-four percent of studies were conducted in Africa (n = 52), including nine from Tanzania, eight from South Africa, and six from Uganda. Seventeen percent of the studies were conducted in Asia (n = 36) including nine each from China, India, and Thailand. Eight percent were conducted in Europe (n = 18), including nine studies from the United Kingdom and two each from France, Italy, and the Netherlands. Three studies were from Australia. In analyses examining change over time, there was no significant change in

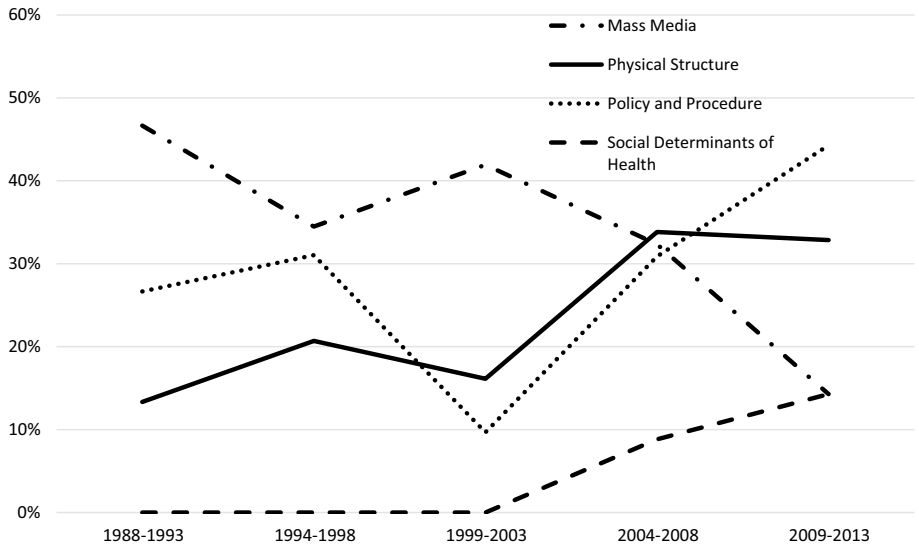

Fig. 3 Changes over time in proportion of studies by type of structural intervention, 1998–2013

Table 2 Location of intervention by type of structural interventions in HIV prevention (k = 213)

Continent/region	Type of structural intervention							Total[a]
	PP	MM	PS	CB	CM	SDH	A	
Americas	38 (37%)	22 (21%)	28 (27%)	23 (22%)	6 (6%)	5 (5%)	72 (69%)	104 (49%)
United States	32	18	22	21	4	3	56	84
Latin America & Caribbean	3	2	3	1	2	2	9	13
Canada	3	2	3	1	0	0	7	7
Africa[b]	12 (23%)	16 (31%)	17 (33%)	18 (35%)	4 (8%)	8 (15%)	30 (58%)	52 (24%)
East Africa	4	5	7	8	1	1	12	20
Southern Africa	4	3	6	6	2	6	10	17
Central Africa	4	4	3	3	1	0	6	9
West Africa	0	4	1	1	0	1	2	6
Asia[b]	8 (22%)	16 (44%)	7 (19%)	7 (19%)	10 (28%)	3 (8%)	24 (67%)	36 (17%)
Southeast Asia	6	8	2	2	4	0	10	15
East Asia	2	4	2	3	1	1	7	11
South Asia	0	4	3	2	5	2	7	10
Europe[c]	10 (56%)	6 (33%)	5 (28%)	3 (17%)	0 (0%)	0 (0%)	12 (67%)	18 (8%)
Australia	0 (0%)	2 (67%)	1 (33%)	0 (0%)	0 (0%)	0 (0%)	1 (33%)	3 (1%)

A access, *CB* capacity building, *CM* community mobilization, *MM* mass media, *PP* policy/procedure, *PS* physical structure, *SDH* social determinants of health

[a]Percentages in far right column indicate the proportion of 213 studies from each continent/region; all other percentages represent the proportion of interventions within each continent or region that include each structural type

[b]5 multi-regional studies are included in the region with the most countries represented, e.g., a study in 4 countries in Southern Africa and 1 country in East Africa is included in the row for Southern Africa; if the largest number of countries is a tie then the study is included with the country that has the largest population, e.g., a study in Zambia and Rwanda is included in the row for Central Africa

[c]Includes Western and Eastern Europe

the proportion of interventions conducted in high income economies versus middle/low economies (OR 0.99, 95% CI 0.95, 1.04).

Target Population

Table 3 summarizes the target populations across the interventions. Forty percent of the structural interventions focused on high-risk populations, including 32 studies targeting commercial sex workers, 26 studies targeting

Table 3 Target population of structural interventions in HIV Prevention (k = 213)

Population type	Frequency	%
Sex	64	30%
Female	47	
Male	24	
Age	38	11%
Young adult (18–25 years)	20	
Youth (< 18 years)	30	
Race/Ethnicity	21	10%
Black or African American	12	
Hispanic/Latino	8	
People of color	5	
High-Risk Populations	86	40%
Commercial sex worker	32	
PWID	26	
MSM	17	
Sex partner, high risk[a]	10	
Noninjection drug users	4	
Sexually active youth	3	
Unspecified[b]	8	
Populations	69	32%
Low income	11	
Health service providers	13	
General population	10	
Hospital in-patients	5	
On ART/Treatment experienced	4	
Homeless	4	
Pregnant females	4	
Incarcerated	4	
Other[c]	20	
Clinic Patients	44	21%
HIV clinic	16	
Emergency department	10	
Primary care	3	
STI/genitourinary clinic	6	
Other clinic[d]	12	
Residence	56	26%
Urban/inner city	26	
Rural	19	
High-risk area	14	
HIV Status	39	18%
HIV positive	32	
HIV negative	7	
Not specified	1	0.5%

Totals exceed 100% because of multiple response

ART Antiretroviral therapy, *HIV* human immunodeficiency virus, *MSM* men who have sex with men, *PWID* persons who use drugs, *STI* sexually transmitted infections

[a]Includes sex partner of PWID, new or multiple sex partners, and high risk sex partner

[b]Reported by author as people at high risk for HIV and/or STI but not specified

Table 3 (continued)

[c]Includes heterosexuals, employees, mentally ill, transgender persons, parents, teachers, community leaders, and tuberculosis infected patients

[d]Includes tuberculosis clinics, Veterans Affairs health clinics, antenatal clinics, traveler clinics, and health departments

individuals who inject drugs (PWID), and 17 studies targeting men who have sex with men (MSM). Several studies focused on females (n = 47), persons living with HIV (n = 32), youth (n = 30), people residing in urban/inner city areas (n = 26), young adults (n = 20), HIV clinic patients (n = 16), blacks or African Americans (n = 12), and Hispanics/Latinos (n = 8).

Fewer studies targeted homeless persons (n = 4), noninjection drug users (n = 4), pregnant females (n = 4), incarcerated persons (n = 4), or sexually active youth (n = 3). Only one study focused on transgender persons. There was a significant increase over time in the proportion of interventions focusing on persons living with HIV, from 7% in 1988–1993 to 30% in 2009-2013 (OR = 1.17, 95% CI 1.06, 1.28), and a significant decrease in the proportion of interventions targeting PWID, from 53 to 7% (OR 0.89, 95% CI 0.84, 0.95). There was no significant change across time in the proportion of studies focusing on commercial sex workers (OR 0.97, 95% CI 0.91, 1.03) or MSM (OR 1.00, 95% CI 0.92, 1.08).

Outcome

Sex behavior outcomes constituted the largest category of outcomes (50%, n = 106); condom use was the most frequent outcome in this category (n = 81) (Table 4). Testing or treatment outcomes were the next largest category (40%, n = 86); HIV testing (n = 60) was the most frequent type of testing/treatment, followed by retention in care (n = 13) and antiretroviral adherence (n = 11). Twenty-five percent of the interventions reported biologic outcomes (n = 53), which consisted predominantly of STI (n = 31) and HIV infection (n = 26). Other biologic outcomes included viral load/suppression, CD4 counts and AIDS mortality. There was a smaller proportion of drug injection behavior outcomes (13%, n = 28); among these, sharing of equipment or injection drug use were reported most frequently. There were only 5 studies with stigma outcomes (2%).

Type of Research Design

The majority of interventions was evaluated using before/after research design, either one group or cross-sectional (57%, n = 121), but other research designs of randomized controlled trials, quasi-experimental, and serial

Table 4 Type of outcomes reported in structural interventions in HIV Prevention (k = 213)

Type of outcome[a]	Frequency	%
Sex behaviors	106	50%
Condom use	81	
Multiple partners	22	
Unprotected (condomless) sex	19	
Sex risk behaviors	17	
Abstinence/sex initiation	8	
Testing/Treatment	86	40%
HIV testing	60	
Retention in care	13	
Antiretroviral adherence	11	
Engaged in care	10	
Linked to care	9	
Antiretroviral uptake	8	
HIV diagnosis or serostatus awareness	4	
STI testing[b]	3	
Biologic	53	25%
STI	31	
HIV infection	26	
Viral load/suppression	9	
CD4 counts	9	
AIDS mortality	3	
Injection Drug Behaviors	28	13%
Sterile injection equipment	28	
Injection drug use	12	
Stigma	5	2%

AIDS acquired immune deficiency syndrome, *HIV* human immunodeficiency virus, *PWID* people who inject drugs, *STI* sexually transmitted infections

[a]Categorized for uniformity

[b]Used when interpretable as a proxy for behavior

Table 5 Type of study design employed in structural interventions in HIV prevention (k = 213)

Type of study design	Frequency	%
Before/after, one group	61	29
Before/after, cross-sectional	60	28
Cluster RCT	20	9
Quasi-experimental	19	9
Cluster quasi-experimental	14	7
Serial cross-sectional	14	7
RCT	12	6
Retrospective cohort	10	5
Prospective cohort	8	4
After only, two groups	7	3
Time series	6	3
Other[a]	2	0.9

Totals exceed 100 because of multiple response. *RCT* Randomized control trial

[a]Other includes alternating comparison trial, after-only four group comparison

cross-sectional designs were also employed (Table 5). There was no significant change over time in proportion of high-quality study designs (i.e., RCT, cluster RCT, quasi-experimental and cluster quasi-experimental) versus low-quality study design (e.g., before/after designs or after-only designs) (OR 1.01, 95% CI 0.96, 1.06).

Discussion

Overall HIV incidence in the United States has remained stable despite increasing prevalence [19]. Several federal initiatives have been used to maintain or reduce new HIV diagnoses, the most recent of which is High Impact Prevention [20], a strategy to allocate resources on activities found to have the greatest impact in HIV prevention. Moving forward, the national HIV prevention goals [1] emphasize structural interventions as a way to reduce new HIV infections, thus it is timely to have a comprehensive framework for structural interventions. In this study, we developed a taxonomy of structural interventions comprising 7 categories and 20 subcategories, and classified 213 structural interventions into the new taxonomy. The new taxonomy is parsed similarly to Cohen et al. [5] and Blankenship et al. [6], but is more comprehensive than either taken singly and also includes social determinants of health (survival and acceptance). Blankenship et al. [6] included "community mobilization" and "integration of services," which are also part of our own taxonomy. "Contingent funding," while being sparse in the literature at the time we conducted our review, would be an example of using Social Determinants of Health-Survival, as would "economic development programs." The category of "educational interventions" has more to do with site of delivery than type of intervention per se, and therefore does not appear in our taxonomy.

In earlier work, Blankenship and colleagues [3] proposed "availability" and "accessibility" categories, which are similar to our access category. Sumartojo and colleagues [4] included "economic resources," which is similar to our category of social determinants of health-survival; "policy supports" is similar to our policy/process; and both "societal conditions" and "organizational structures and functions" encompass more than a single category in our taxonomy. Tsai [7], on the other hand, gave a few examples but none of them overlap with our categories. In summary, our taxonomy encompassed every structural intervention identified from the systematic review in HIV prevention and was built to be inclusive and comprehensive of interventions beyond the systematic review. Each category and subcategory has

detailed definitions that were tested and refined during an iterative process. Moreover, since this taxonomy is broad, it is useful in presenting a wide variety of options to consider when choosing strategies that will best address the specific needs of a community.

Access, Policy/Procedures, Mass Media, and Physical Structure were the most common structural interventions identified in the literature. By contrast, interventions addressing social determinants of health were infrequently found in the HIV prevention and treatment literature. The largest proportion of the interventions were conducted in the United States but it is important to note that many of the interventions in low-middle–income countries were conducted by researchers from high-income countries. In general, the evaluation of the interventions consisted of before/after research designs and the rigor did not increase over time, possibly because it is often not feasible to randomly allocate structural interventions or study them in controlled situations.

While nearly 40% of the structural interventions focused on high-risk populations, interventions targeting MSM were relatively few compared to PWID and commercial sex workers.

Some structural interventions—namely, those addressing social determinants of health (both survival-related and tolerance/acceptance-related)—have the potential to influence multiple health conditions. Poverty, for example, is related to many health outcomes [21]. While conducting a microfinance intervention to address HIV risk alone may appear to be prohibitively expensive, a study assessing its effects on multiple health outcomes may demonstrate cost-effectiveness. Unfortunately, the disease-specific silos around which health promotion and illness prevention funding are organized make it difficult to conduct such studies. Thus, most interventions target intermediate structural factors associated with HIV and do not address fundamental contributors to health disparities, such as poverty, housing, and education. These contributors are termed frequently as "social determinants of health" and, for many health conditions, generally account for more variance in health than most factors and arguably more than individual behaviors [21]. Agencies that are capable of addressing these major structural determinants, such as US Departments of Housing and Urban Development (HUD), Labor (DOL) or Education (ED), do not necessarily focus on public health, but their programs are likely to have great impact on health outcomes. Evaluation of programmatic or policy interventions directed towards employment generation, school retention, or housing stability can be designed to examine effects on HIV and other health outcomes. It is often considered outside the reach of public health to intervene on these domains due to narrow organizational missions and vertical funding streams. However, with shrinking public health dollars, an HIV epidemic characterized by extreme disparities driven by social conditions, and the syndemic nature of infectious disease, chronic illness, substance abuse, and mental health, meaningful action-oriented collaborations that alter the fundamental causes of HIV and other health outcomes are needed urgently. Given the lack of integration between the health care system and other key non-health care systems, more of these collaborations from different arenas will be necessary.

It was a challenge to develop a definition for identifying that an intervention was truly structural and then to create a taxonomy that was able to encompass all structural interventions identified in our review. Our definition of structural interventions necessitates that exposure to the intervention is outside of the control of the person affected. For example, small-group interventions are not considered structural, as people self-select into group interventions and are thus in control of the receipt of the intervention. The distinction is that of personal agency (i.e., individuals controlling their own actions). We did include interventions that required some personal agency, as in the case of individuals using syringe exchange programs, because the environment is changed in a way that is not under the control of the involved person. By contrast, an example that would be excluded is a community-level intervention with no structural components. Even though these interventions are delivered in community settings, most also feature significant one-on-one transactions (e.g., Popular Opinion Leader and Community PROMISE) or small group risk-reduction meetings (e.g., Voices/Voces) [22–24]. Thus, interventions with a large reach do not necessarily meet the criteria as structural interventions unless the intervention entails an environmental change. Lastly, small communication media, such as brochures or pamphlets, even if they have a large reach, do not translate to structural change unless they change the environment.

Limitations

Our taxonomy may not be broad enough to apply to structural interventions reported for other health conditions. While we were highly inclusive in allowing less rigorously evaluated studies to be included, there are many interventions that are structural in nature that have not been evaluated. On the other hand, there may be some structural intervention evaluations not included in this study that report outcomes not directly related to HIV, but in theory could impact HIV risk. Lastly, we did not quantify the effectiveness of these interventions, nor did we assess in detail the quality of studies. Examining these

dimensions in future studies will enhance the usefulness of the findings reported here.

Conclusions

To our knowledge, this is the first time a framework for structural interventions in HIV prevention has yielded a comprehensive, well-defined taxonomy of structural interventions. The taxonomy may move the field toward a more precise and shared language for discussing these types of interventions. It can be used to develop further generalizations about different types of interventions, as well as providing insight into the gaps in research in various categories within the taxonomy.

Acknowledgements We thank Lyle McCormick for data analysis; Mary Mullins and Julia DeLuca for conducting the original search in the PRS database and assisting with writing the search strategy section; and Tom Painter, Linda Kay, Juarlyn Gaiter who were involved in early process of defining structural interventions and operationalizing taxonomy. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the U.S. Centers for Disease Control and Prevention.

Funding This study was supported by the Prevention Research Branch, Division of HIV/AIDS Prevention at the U.S. Centers for Disease Control and Prevention and was not funded by any other organization.

Compliance with Ethical Standards

Conflicts of interest All the authors declare no conflict of interest.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors as part of the current study.

Appendix

See Table 6.

Table 6 Structural interventions for HIV prevention, 1989–2013 (k = 213)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Ajuwon 2008 [25]	Primary health care workers; truckers; high school students; FSW; villagers	NR	Oyo state, Nigeria	West Africa			CB-PT					B/A one group	CU; UPS	Training primary health care workers to train others and implement community-based AIDS prevention activities
Alamo 2012 [26]	HIV-positive clinic patients; Low income/indigent	2008	Kampala, Uganda	East Africa	PP-I		CB-T					B/A one group; Serial x-sect	Retention in care; ART uptake; ART adherence	Use of electronic medical records and same day patient tracing to improve clinic efficiency and appointment adherence
Alstead 1999 [27]	Sexually active adolescents	1995	King County, WA	US				MM-SM			A-Cdm	Serial x-sect	CU	Condom Campaign, HIV prevention program to promote CU among sexually active adolescents
Anderko 2000 [28]	Rural college students	1996–1997	Rural IL	US							A-Cdm; A-HT	B/A x-sect	Sex initiation; NSP; CU; STI; HIV testing	Community and individual level interventions with HIV testing, counseling and condom distribution at campus health center
Baird 2012 [29]	Never-married women age 13–22, low income	2008–2009	Zomba, Malawi	Southern Africa						SDH-S		Cluster RCT	HIV infection; STI	Cash transfer for attending school
Bardsley 1990 [30]	PWID	1989	Vancouver, BC	Canada	PP-G	PS-NPS					A-SIE	B/A x-sect	SIE	Needle exchange program

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Basu 2004 [31]	FSW; Urban/ Inner city	2000–2001	Cooch Behar, India	South Asia		PS-NPS	CB-PT		CM		A-Cdm; A-STI	Cluster RCT	CU	Replication of Sonagachi intervention (multi-faceted intervention with brothel-based FSW in red light district)
Batavia 2010 [32]	Adult HIV-positive clinic patients on ART	2007	South India	South Asia							A-HC	B/A one group	ART Adherence	Graduated cost recovery program to access ART
Blake 2003 [33]	Youth in school	1995	MA	US	PP-G						A-Cdm	Cluster RCT	CU; UPS	Condom availability program in Massachusetts high schools
Blank 2005 [34]	MSM	2002–2004	New York, NY	US		PS-IS; PS-NTS					A-HT; A-STI	B/A one group	HIV testing; STI testing	Field-based holistic approach to MSM health and wellness with specific interventions targeted to neighborhoods most affected by syphilis. A package of integrated services were offered at nontraditional venues such as bars and clubs
Blankenship 2008 [35]	FSW	2006	Andhra Pradesh, India	South Asia					CM			Retro cohort	CU	Community mobilization of FSW

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Bollen 2010 [36]	Brothel-based FSW	2008–2009	Bintan Island and Salatiga, Indonesia	Southeast Asia	PP-G; PP-I						A-Cdm; A-STI	B/A x-sect	STI; CU	Provision of adequate drugs for STI as periodic presumptive treatment followed by syndromic treatment; condom supply and promotion involving the local community
Bortolotti 1992 [37]	PWID	1985–1990	Padua, Italy	Europe				MM-SM				B/A x-sect	SIE; CU	AIDS public information and education campaign
Boulay 2008 [38]	General population	2001–2003	Ghana	West Africa				MM-SM		SDH-A		B/A x-sect	HIV stigma	National mass media campaign using religious leaders to reduce HIV stigma
Bowles 2008 [39]	HIV-negatives; People of color; High risk	2004–2006	CA; DC; IL; MA; MI; MO	US		PS-NTS					A-HT	B/A one group	HIV	Rapid HIV testing in outreach and community settings, including public parks, homeless shelters, and bars with confirmatory testing and referral to care in 7 US cities

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Brooks 2009 [40]	STI clinic patients; Urban/inner city	2003–2006	Denver, CO	US	PP-I						A-STI	B/A one group	HIV testing	Optional rapid HIV testing, opt-out testing and new procedure for obtaining consent in a large metro STI clinic
Brown 2005 [41]	PWID; women	2000–2003	Santa Clara County, CA	US		PS-NTS					A-HT; A-STI	B/A one group	HIV testing	HIV and STI testing and workshops
Brown 2007 [42]	Emergency department patients; HIV-negatives; Urban/Inner city	2006	Washington, DC	US	PP-I	PS-IS					A-STI	B/A one group; Serial x-sect	HIV testing	Emergency department-based testing program using CDC recommendations
Buchanan 2009 [43]	PLWH in hospitals; Homeless; Urban/inner city	2003–2006	Chicago, IL	US						SDH-S		RCT	CD4 count; Viral load	Provision of permanent housing with intensive case management
Bull 2008 [44]	African American and Latina Women aged 15 to 25	2004–2006	CA; NV	US				MM-SM				Cluster QE	CU	POWER (Prevention Options for Women Equals Rights) Social marketing campaign to increase use of both male and female condoms by young women in areas with high rates of STI and teen births
Busza 2004 [45]	Migrant FSW	2000–2001	Phnom Penh, Cambodia	Southeast Asia					CM			B/A x-sect	CU	Promotion of female condoms to migrant FSW

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Casalino 2012 [46]	Patients in adult emergency department; HIV-negatives	2009–2010	Paris, France	Europe	PP-I						A-HT	B/A one group	HIV testing; Linkage to care	Routine HIV screening with a rapid test in emergency departments
CDC ACDP 1999 [47]	PWID; Female partners of PWID; FSW; NGI-MSM; High risk youth; Residents in high STI risk areas	1994–1997	CA; CO; NY; TX; WA	US							A-Cdm; A-SIE	B/A x-sect	CU; SIE	AIDS Community Demonstration Projects (ACDP): Theory-based community-level intervention in which community members distributed role model stories, condoms and bleach kits to promote behavior change
Cervantes 2003 [48]	Substance abusing Hispanic mothers not in drug treatment	NR	Los Angeles, CA	US		PS-IS; PS-NPS					A-DT	B/A one group	Sex risk behavior	HIV prevention in substance abuse treatment for Hispanic women
Chan 2010 [49]	HIV-positive primary care clinic patients; Low income/indigent; Rural	2004–2008	Zomba, Malawi	Southern Africa	PP-G	PS-IS					A-HC	Cluster QE	Mortality; Retention in care	Decentralization of follow-up ART care to rural health facilities
Charalambous 2007 [50]	South African employees	2002–2005	South Africa	Southern Africa		PS-NTS	CB-PT				A-HC	B/A one group	Viral suppression; CD4 count; ART adherence	Workplace HIV treatment program

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Chiao 2009 [51]	FSW	NR	4 islands, Southern Philippines	Southeast Asia	PP-I	PS-NTS	CB-PT		CM		A-Cdm; A-STI	Cluster RCT	CU; HIV testing; STI testing	Multiple interventions for female bar workers and community mobilization for FSW
Chipfakacha 1993 [52]	Female and male sex workers	1988	Zimbabwe	Southern Africa	PP-G						A-STI	B/A x-sect; Serial x-sect	STI	STI prevention program for Shurugwi sex workers. Required health cards and STI testing for all sex workers.
Christopoulos 2011 [53]	Emergency department patients; patients with HIV risk factors; Urban/Inner city	2008–2010	San Francisco, CA	US	PP-I						A-HT	Retro cohort; B/A x-sect	HIV testing	Testing and linkage to care for a clinician-initiated rapid HIV testing program in an urban emergency room
Cohen 1999 [54]	Public clinics; high risk areas	1994–1996	LA	US				MM-SM			A-Cdm	B/A x-sect	CU	Statewide social marketing, free condoms in public clinics and over 1000 businesses in high STI risk neighborhoods
Conkling 2010 [55]	Pregnant clinic patients at antenatal clinics	2001–2002	Kigali, Rwanda; Lusaka, Zambia	Central Africa; East Africa			CB-PT				A-HC; A-HT	Prospective cohort; After only, two groups	Engaged in care; ART adherence	Couples VCT and nevirapine use in antenatal clinics

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Cunningham 2005 [56]	Homeless PLWH	1999–2000	Bronx, NY	US		PS-NTS					A-HC	B/A x-sect	CD4 count; ART uptake; ART adherence	Medical outreach program for homeless PLWH in single room occupancy hotels
Davila 2013 [57]	African Americans; HIV-positive clinic patients; Hispanic/Latino; Youth	2002–2008	Houston, TX	US		PS-NPS					A-HC	B/A x-sect	Retention in care	Centralization of clinical care and addition of supportive services to youth HIV clinic to improve retention in care
de Vroome 1990 [58]	General public, targeted high risk groups such as FSW and clients, ethnic minority groups, STI clinic patients	1987–1989	Netherlands	Europe				MM-SM				B/A x-sect	CU; STI	Mass media campaigns initiated by the Dutch government on various aspects of AIDS with supplementary AIDS prevention campaigns
Dennison 1998 [59]	Pregnant women in antenatal clinic; Urban/inner city	1995	London, UK	Europe	PP-I	PS-IS	CB-PT				A-HT	B/A one group	HIV testing	Antenatal HIV screening in inner city population
Du 2011 [60]	General population	2008	US	US	PP-G						A-HT	Retro cohort	HIV testing	Opt-in vs opt-out state laws for HIV testing
Egger 2000 [61]	Motels in high risk areas	1997	Managua, Nicaragua	Latin America & Caribbean							A-Cdm	Cluster RCT	CU	Condoms provided in motels, either on check-in, on request, or placed in room

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Elkins 1997 [62]	Rural women and men	1991–1992	Thailand	Southeast Asia				MM-NI; MM-SM				Cluster RCT	CU; UPS	Narrative intervention to encourage risk reduction practices, particularly among and with FSW
Eloundou-Enyegue 2005 [63]	Adolescent and young adult males aged 16–26 years	1993–1996	Dar es Salaam, Tanzania	East Africa				MM-SM				Retro cohort	CU	Tanzania Condom Social Marketing Program to reduce HIV/STI transmission by increasing CU through condom distribution, AIDS/STI education and condom brand promotion
Feldman 2004 [64]	Physicians in residency; Health service providers	1997–2000	Minneapolis, MN	US	PP-I		CB-PT					QE	HIV testing	Development and evaluation of curriculum to train family practitioners in 5 residency programs in HIV care
Figueroa 2010 [65]	Persons with new or multiple sex partners	2005–2007	Kingston, Jamaica	Latin America & Caribbean	PP-I	PS-NTS					A-Cdm; A-HT	RCT	CU; NSP; HIV testing	Multi-level site-based prevention program tailored to types of social sites (e.g., bars, hotels) to increase condom use

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Fisher 2011 [66]	PLWH	NR	CT	US			CB-T					RCT	ART adherence	Theory-based computer-administered antiretroviral therapy adherence support intervention delivered at routine clinical care visits
Ford 1996 [67]	FSW and clients	1994	Bali, Indonesia	Southeast Asia				MM-SM			A-Cdm	B/A x-sect	CU	Education program for FSW, condom sales and distribution, media for clients
Fraze 2009 [68]	African American females	2005–2008	Cleveland, OH; Philadelphia, PA	US				MM-SM			A-HT	B/A one group	HIV testing	Take Charge. Take the Test: HIV testing social marketing campaign
Fuller 2007 [69]	PWID; Pharmacists	2002–2003	Harlem, NY	US			CB-PT				A-SIE	Cluster QE	IDU; SIE	Community-based participatory research partnership with a multilevel intervention to increase sterile syringe access
Futterman 2001 [70]	Sexually active youth of color in high risk areas; heterosexual females and homo/bisexual males	1999–2000	CA; DC; FL; MD; NY; PA	US		PS-NTS		MM-SM			A-HT	B/A x-sect	HIV testing	Social marketing campaign to promote HIV testing among youth
Gao 2007 [71]	Gay men and MSM	NR	Chengdu, China	East Asia				MM-NI				QE	CU	Gay bar based melodrama series on CU in gay community

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Garcia 2012 [72]	Truck drivers; FSW	1990–1993	Peru	Latin America & Caribbean			CB-PST				A-Cdm; A-STI	Cluster RCT	CU; HIV prevalence; STI prevalence	Strengthened STI management by pharmacists and clinicians; mobile outreach to FSW for STI treatment; condom promotion for FSW and general public
Ghys 2002 [73]	FSW	1991–1998	Abidjan, Côte d'Ivoire	West Africa				MM-SM			A-HT; A-STI	Retro cohort	CU; HIV infection; STI	"Programme de Prévention et de Prise en charge des MST/SIDA chez les femmes libres et leurs Partenaires" (PPP) HIV prevention campaign for FSW
Gibson 2010 [74]	PWID	1999–2000	Sacramento, CA	US				MM-SM				B/A one group; QE	SIE	HIV prevention social marketing campaign with 4 components: convenience advertising, wide distribution of a newsletter, late night broadcast of a television program on a public access channel, and distribution of prevention booklet in cartoon format.

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Godin 2008 [75]	MSM	2002–2003	Québec City, Québec	Canada				MM-SM			A-Cdm	Time series	UPS	Safe sex promotion program in gay bars, saunas, and sex shops
Goetz 2008 [76]	Patients at VA health facilities	2004–2006	CA; NV	US	PP-I	PS-IS					A-HT	QE	HIV testing	5 VA hospital clinic reminders and feedback reports for HIV testing
Goetz 2009 [77]	Health care providers; Patients at risk for HIV attending VA health clinics	2004–2006	CA; NV	US	PP-I		CB-T	MM-SM			A-HT	B/A x-sect; Serial x-sect	HIV testing	Improving HIV testing in the 5 VA facilities at systems level with clinical reminder and feedback
Golden 1996 [78]	Newly diagnosed PLWH; STI clinic patients	1991–1993	Baltimore, MD	US		PS-IS					A-STI	Retro cohort	STI	Early intervention medical and social work services for newly diagnosed HIV-positive persons who underwent posttest counseling
Gomez 1999 [79]	Low-income Latina immigrant women	NR	Northern CA	US					CM			B/A one group	CU	Empowerment model for HIV prevention in Latina immigrant women
Grabbe 2010 [80]	High risk area; Rural; Urban/Inner city	2005–2006	Kenya	East Africa		PS-NPS					A-STI	Retro cohort; After only: four group comparison	HIV testing	Comparison of mobile HIV testing approaches against stand-alone site

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Gray 1995 [81]	PWID; Rural	1992–1994	Chiang Rai, Thailand	Southeast Asia							A-SIE	B/A x-sect	HIV infection; SIE	Needle exchange;
Greenwald 2006 [82]	Hospital inpatients	1999–2003	Boston, MA	US	PP-I						A-HT	B/A x-sect; Serial x-sect	HIV testing; HIV infection	Offer of HIV testing in inpatient setting without physician referral requirement at large medical center
Gregson 2007 [83]	FSW and male clients	1998–2003	Zimbabwe	Southern Africa		PS-NTS					A-Cdm; A-HT; A-STI	Cluster RCT	HIV infection; STI; UPS; sex initiation; NSP	Community-based peer education, free condom distribution, training providers for improved STI management, and clinic open days with HIV/AIDS info to promote safer sex and uptake of STI treatment
Griffith 2010 [84]	African Americans; Low income/Indigent; Young adults; Youth	2004–2007	Flint, MI	US					CM	SDH-A		B/A one group	CU	Faith-based community-based participatory research project to increase HIV/AIDS awareness and reduce HIV-related stigma among African American faith community

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Grimes 2001 [85]	Pregnant females	1995–2000	Houston, TX	US	PP-I		CB-PT					B/A x-sect	HIV testing	Continuing medical education program to increase HIV testing of pregnant women attending maternity clinics in Houston
Grosskurth 1995 [86]	Rural	1991–1994	Mwanza, Tanzania	East Africa		PS-NPS	CB-PT				A-Cdm; A-STI	Cluster RCT	HIV infection; Sex risk behavior; STI	Improved STI services in primary health care system, to reduce HIV incidence
Guttmacher 1998 [87]	Youth	1991	New York, NY	US	PP-I						A-Cdm	Cluster QE	CU; UPS	Condom availability in high schools
Guy 2009 [88]	MSM	2004–2005	Melbourne, Australia	Australia				MM-SM				B/A x-sect	HIV testing	Social marketing campaign for MSM to increase regular HIV and STI testing and promote sexual health
Guydish 1993 [89]	PWID	1987–1990	San Francisco, CA	US							A-SIE	B/A one group; QE	IDU; SIE	Comparison of neighborhoods with vs without needle exchange programs
Hagan 1993 [90]	PWID	1988–1989	Tacoma, WA	US		PS-NPS					A-SIE	B/A one group	IDU; SIE	Effectiveness of first legally operated needle exchange program in United States

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Hammett 2006 [91]	PWID in high risk area	2002–2004	Guangxi, China; Lang Son, Vietnam	East Asia; Southeast Asia							A-SIE	B/A x-sect	IDU; SIE	HIV prevention intervention of sterile equipment and information diffused for PWID
Handy 2006 [92]	General population; Men and women; MSM and MSMW; Sex workers	2004–2005	Newcastle, UK	Europe	PP-I						A-STI	B/A one group	HIV testing	Drop-in, nurse-led clinic provided to expand access to HIV testing
Hanenberg 1994 [93]	Clients of FSW	1989	Thailand	Southeast Asia	PP-G			MM-SM			A-Cdm	B/A x-sect	CU; HIV infection; STI	Thai 100% Condom Use Program: HIV control program by government with condom distribution to cover much of commercial sex in the country, sanctions against sex establishments where condoms were not used consistently and media campaign on TV and radio to use condoms for sex with FSW

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Harris 2008 [94]	HIV-positive and TB patients in ART and TB clinics; Urban/inner city	2005–2007	Zambia	Central Africa	PP-I	PS-IS	CB-PT				A-HC; A-HT	B/A one group	HIV testing; Linkage to care	Integration of HIV and TB care and offer of HIV testing to TB patients
Hart 1989 [95]	PWID	1987–1988	London, UK	Europe							A-SIE	B/A one group	IDU; SIE; NSP	Needle exchange program in Middlesex Hospital
Harte 2008 [96]	PLWH; Urban/inner city	2004–2005	London, UK	Europe	PP-I	PS-NTS					A-STI	Retro cohort; After only, two groups	Viral load; Engaged in care	Home delivery service of ART
Haukoos 2007 [97]	Emergency department patients at high risk for HIV; HIV-negative persons; Urban/inner city	2004–2007	Denver, CO	US	PP-I						A-HT	B/A one group	HIV testing; Linkage to care	Highly selective physician-determined rapid HIV testing in emergency department setting with counseling and referral to services
Henderson 2011 [98]	Pharmacy-based HIV clinic patients; Treatment experienced; Non-adherent to treatment	2009	Denver, CO	US		PS-IS					A-STI	Prospective cohort; B/A one group	ART adherence; Viral load; CD4 count	Pharmacist managed adherence clinic

Table 6 (continued)

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Henry 2012 [99]	African Americans; Clinic patients; Drug users; PLWH; Homeless; Military; Mentally ill; STI diagnosis	2007	Los Angeles, CA	US			CB-T					Cluster RCT	Retention in care	Telephone reminders for HIV care
Herbert 2012 [100]	Patients attending the open-access returning traveler clinic	2008–2010	London, UK	Europe	PP-I						A-HT	B/A x-sect	HIV testing	Nurse-delivered universal point of care testing for HIV in Hospital for Tropical Diseases
Hightow-Weidman 2011 [101]	PLWH; African Americans; Latino; MSM; Young adults; Youth	2006–2009	NC	US		PS-NTS		MM-SM			A-HC; A-HT	B/A one group	HIV testing; Engaged in care; ART uptake; Retention in care	Social marketing campaign for minority young MSM to diagnose, engage, and retain newly positive minority young MSM
Hirsch 2009 [102]	PLWH on ART	2004–2005	CA	US	PP-I	PS-IS	CB-PT				A-HT	QE	ART adherence	Pharmacist provided medication therapy management
Hogben 2010 [103]	Young adults; Youth	2001–2005	US	US	PP-G							Retro cohort	STI	State level sexuality education policies
Holman 1994 [104]	Pregnant or postpartum females	1990–1992	NY	US	PP-I						A-HT	B/A one group	HIV testing	Statewide obstetrical HIV counseling and testing in 24 hospitals

Table 6 (continued)

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Hsieh 2011 [105]	Emergency department patients; HIV-negatives; Low income/Indigent; Urban/Inner city	2005–2007	Baltimore, MD	US	PP-I						A-HT	QE	HIV testing; Linkage to care	Rapid oral HIV testing services using exogenous vs. indigenous staffing model, vs. hybrid staffing model in urban emergency department
Jacob Arriola 2007 [106]	PLWH; African Americans; People of color; Incarcerated	2001–2004	FL; GA; IL; MA; NJ	US	PP-I						A-HC	QE	Sex risk behavior	Case management for inmates with HIV upon release
Jana 1998 [107]	FSW	1992–1995	West Bengal, India	South Asia					CM		A-Cdm	Serial x-sect	CU; STI; HIV infection	Sonagachi HIV/STI Intervention to reduce risky sex behaviors among FSWs and their clients with emphasis on respect for FSWs, recognition of their profession, and reliance on their understanding
Javanbakht 2009 [108]	Incarcerated MSM	2000–2005	Los Angeles, CA	US	PP-I						A-STI	B/A x-sect	STI; STI testing; HIV infection; HIV testing	Voluntary vs mandatory screening for STIs and HIV for MSM in Los Angeles County Men's Central Jail

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Kagimu 1998 [109]	Muslim communities	1992–1994	Uganda	East Africa			CB-PT					B/A x-sect	CU	Over 3,000 religious leaders and assistants trained to educate their communities on AIDS during home visits and religious gatherings
Kamali 2003 [110]	Adults in rural areas	1994–2000	Masaka district, SW Uganda	East Africa			CB-PT					Cluster RCT	HIV infection; STI	Information, education and communication activities and improved management of STIs by training health workers in syndromic management of STIs and including drugs and supervision
Keating 2006 [111]	Youth	2000–2004	Bauchi, Enugi, and Oyo states, Nigeria	West Africa				MM-SM				B/A one group	CU; UPS	VISION project (media campaign on HIV/AIDS awareness and prevention)
Keene 1993 [112]	PWID; Rural; Urban/Inner city	1990–1991	Wales, UK	Europe							A-SIE	B/A x-sect	SIE	Syringe exchange program among opiate and non-opiate drug injectors

Table 6 (continued)

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Kegeles 1996 [113]	Young adult MSM	NR	Eugene, OR	US					CM			B/A x-sect	UPS; NSP; Sex risk behavior	MPowerment: Local young MSM participated in developing and delivering a community-level HIV prevention intervention for their community. Peer outreach, peer-led small groups; publicity campaign; a young men's center
Keitz 2001 [114]	Physicians in general medicine clinic; PLWH	1994–1998	Durham, NC	US			CB-PT					RCT	ART uptake; ART adherence	Provider intervention for residents and physicians in HIV primary care
Kennedy 2000 [115]	Sexually active youth in high risk area	1996–1998	Sacramento, CA	US				MM-SM				B/A x-sect	CU	Sacramento Prevention Marketing Initiative to increase condom use
Kerr 2010 [116]	PWID	1998–2003	Vancouver, BC	Canada	PP-I						A-SIE	Prospective cohort	SIE; HIV infection	Syringe exchange policy change from syringe exchange to syringe distribution

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Kerrigan 2006 [117]	FSW	1999–2000	Santo Domingo & Puerto Plata, Dominican Republic	Latin America & Caribbean	PP-G						A-Cdm; A-STI	B/A one group; Serial x-sect	CU; STI	Community solidarity and government policy for FSW
Kerrigan 2008 [118]	FSW	2001–2003	Rio de Janeiro, Brazil	Latin America & Caribbean					CM			B/A x-sect	CU	Community development for FSW based on Sonagachi Project
Khumalo-Sakutukwa 2008 [119]	General population; Rural	NR	Tanzania; Zimbabwe; South Africa; Thailand	East Africa; Southern Africa; Southeast Asia		PS-NPS			CM	SDH-A	A-HT	Cluster RCT	HIV testing	Multilevel intervention providing community mobilization, community based HIV mobile VCT, and post-test support services
Klepp 1997 [120]	Youth in primary school	1992–1993	Arusha and Kilimanjaro, Tanzania	East Africa							A-Cdm	Cluster RCT	Sex initiation	Education program in sixth grade to reduce children's risk of HIV and improve tolerance and care for people with AIDS
Knittel 2010 [121]	PWID	2003–2006	Ypsilanti, MI	US							A-SIE	B/A one group	SIE	Evaluation of a small, peri-urban, legal needle exchange program

Table 6 (continued)

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Ko 2009 [122]	MSM	2004–2006	Taiwan	East Asia	PP-I	PS-NTS					A-Cdm	Cluster QE	CU; HIV infection; STI	Condom distribution and access at bathhouses
Kyaddondo 2012 [123]	General population	2008–2009	Kumi district, Uganda	East Africa		PS-NTS					A-HT	B/A one group	HIV testing	Home-Based HIV counseling and testing
Landon 2004 [124]	HIV-positive primary care clinic patients; Rural; Urban/Inner city	2000–2001	US	US			CB-PT					Cluster QE	ART uptake; Viral load; Engaged in care	A multi-institutional quality improvement collaborative to improve care for people with HIV in 69 Ryan White clinics
Larke 2010 [125]	Adults; Young Adults; Youth	1998–2001	Mwanza, Tanzania	East Africa			CB-PT				A-Cdm; A-STI	Cluster RCT	STI; Engaged in care	Adolescent sexual health intervention services provided in a youth friendly manner
Lauby 2000 [126]	High risk African American women	1991–1996	Philadelphia, PA; Pittsburgh, PA; Portland, OR	US							A-Cdm; A-SIE	B/A x-sect	CU; SIE	Prevention of HIV in Women and Infants Demonstration Project (WIDP) aimed to increase positive community norms and behaviors among women at risk for HIV infection

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Laukamm-Josten 2000 [127]	Truck drivers; FSW	1990–1993	TanZam Highway, Tanzania	East Africa				MM-NI; MM-SM			A-Cdm	B/A x-sect	CU; STI	Peer education and condom promotion at 7 truck stops along TanZam Highway
Liambila 2009 [128]	Family planning clients in public-sector hospitals, health centers, and dispensaries	2006–2007	Central Province, Kenya	East Africa	PP-G	PS-IS	CB-PT				A-HT	B/A one group	HIV testing	HIV testing offered by family planning providers
Lipovsek 2010 [129]	Male clients of FSW	2004–2008	Southern India	South Asia				MM-NI; MM-SM			A-Cdm	Time series	CU	Behavioral change communication program with interpersonal communication, posters in 100 FSW venues, affordable condoms, street theater and interactive gameshows followed by small group discussions
Liu 2007 [130]	PWID	NR	Sichuan and Guangxi, China	East Asia							A-SIE	B/A x-sect; Serial x-sect	SIE; IDU	Needle exchange program models
Lowndes 2007 [131]	FSW and male clients	1993–2006	Benin	West Africa		PS-NPS					A-STI	B/A x-sect	CU	Condoms and STI care intervention targeting male clients of FSW

Table 6 (continued)

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Luque-Fernandez 2013 [132]	Adult HIV-positive clinic patients that are treatment experienced	2007–2011	Cape Town, South Africa	Southern Africa	PP-I		CB-PT					After only, two groups	Engaged in care; Mortality; Viral load; Retention in care	Adherence clubs for adults on ART for > 18 months and virologically suppressed
MacGowan 2009 [133]	Inmates	2003–2006	FL; LA; NY; WI	US	PP-I						A-HT	B/A one group	HIV infection; HIV testing	Rapid HIV testing in jails
Magnus 2010 [134]	PLWH; MSM; People of color; Transgender persons; Young adults; Youth	2006–2008	CA; IL; MI; NC;NY; TX	US		PS-NPS	CB-PT	MM-SM			A-HC	Prospective cohort	Retention in care	SPNS demonstration projects for retention in care of young minority MSM
Marcus 2009 [135]	Newly diagnosed HIV-positive patients from health departments with high risk sex partners	2004–2008	San Francisco, CA	US	PP-I						A-HT	B/A one group	HIV testing	Partner notification for HIV
Martinez-Donate 2004 [136]	Youth in school	NR	Tijuana, Mexico	Latin America & Caribbean							A-Cdm	Cluster RCT	Sexual initiation	HIV prevention workshop and free condom distribution in Mexican high schools

Table 6 (continued)

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Martínez-Donate 2010 [137]	Heterosexually identified Latino MSMW	2006	San Diego, CA	US				MM-SM			A-Cdm; A-HT; A-STI	B/A x-sect	UPS; HIV testing	Hombres Sanos [Healthy Men], a social marketing campaign to increase CU and HIV testing including Spanish-language print materials, condom promotion posters, radio ads, free condoms, community-based outreach, promotional activities at local clubs, health exams including STI and HIV testing
Marum 2008 [138]	Urban/inner city youth	2001–2005	Kenya	East Africa				MM-SM				B/A one group	HIV testing	Mass media campaign to encourage uptake of VCT services
Matovu 2002 [139]	Adults	1999–2000	Rakai, Uganda	East Africa		PS-NTS					A-HT	B/A x-sect	HIV testing	Rakai Project counselling program for adults aged 15-49 years with home visits for HIV counseling, testing, and results

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
McCoy 1992 [140]	PWID; PLWH	1990–1991	Miami, FL	US	PP-I		CB-PT					QE	IDU; SIE; NSP; CU; ART uptake; Engaged in care	Modification of case management programs for HIV-positive PWID
McDonald 2009 [141]	PWID	2005–2006	Canberra, Australia	Australia		PS-NPS; PS-NTS					A-SIE	B/A one group	SIE	Syringe vending machines
McOwan 2002 [142]	Gay and bisexual men of Black and South European Origin under 25 years old	2000	London, UK	Europe				MM-SM				B/A one group	HIV testing; CU; UPS	Multimedia HIV testing campaign
Meekers 2000 [143]	Youth	1996–1997	Soweto, South Africa	Southern Africa				MM-SM				QE	CU	Targeted social marketing program to promote adolescent reproductive health behaviors
Meekers 2005 [144]	Youth aged 13–24 years	2000–2002	Yaoundé and Douala, Cameroon	Central Africa				MM-NI; MM-SM				B/A x-sect	CU	"100% Jeune" social marketing campaign to improve CU through intensive youth-oriented mass media and interpersonal communications and widespread distribution of subsidized condoms
Metsch 2012 [145]	HIV-negatives; PWID in treatment	2009	AZ; CT; MD; MO; NC; NM;OR; PA; SC; VA	US		PS-IS					A-HT	RCT	UPS; Sex risk behavior; SIE; HIV testing; Serostatus awareness	Risk reduction counseling and on-site HIV testing in drug treatment centers

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Meyer 1991 [146]	General population	1986–1987	France	Europe			CB-PT	MM-SM			A-Cdm; A-STI	Cluster RCT	STI	STI prevention program in French health departments
Mollen 2008 [147]	Emergency department patients aged 14–24 years (youth and young adults)	2003–2006	Philadelphia, PA	US	PP-I						A-HT	Cluster QE	HIV infection; HIV testing; Linkage to care	30-minute sexual health counseling with optional HIV testing and linkage to care for persons testing HIV positive
Morisky 2005 [148]	Taxicab and tricycle drivers	1999–2000	Lapu-Lapu & Mandawe City, Philippines	Southeast Asia				MM-SM				Cluster QE	CU	Peer Education Program to increase HIV/AIDS knowledge, attitudes toward condoms, and CU behavior among taxicab and tricycle drivers
Morris 2001 [149]	Sugar mill employees	1999–2000	Kwa-Zulu Natal, South Africa	Southern Africa							A-Cdm	B/A x-sect	CU	HIV care package (i.e., condom promotion, social marketing, mass educational initiatives, peer counselors, therapeutic isoniazid and cotrimoxazole prophylaxis) in occupational setting for sugar mill employees;

Table 6 (continued)

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Muñoz 2011 [150]	ART-naïve PLWH; High risk area; Low income/ Indigent; Tertiary public hospital patients	2005–2007	Lima, Peru	Latin America & Caribbean		PS-NTS				SDH-S		Prospective cohort	Viral load; Mortality	DOT of ART, coupled with peer support groups and microfinance
Myers 2009 [151]	Health clinic patients	2006–2008	MS NC SC	US	PP-I						A-HT	B/A x-sect	HV testing; Linkage to care	Routine HIV testing program implemented in 6 community health centers
Nelson 1996 [152]	Males aged 21 years	1991–1995	Northern Thailand	Southeast Asia	PP-G			MM-SM			A-Cdm	Serial x-sect	HIV infection; CU	Thailand's Ministry of Public Health CU Program to promote CU during commercial sex
Ng'weshemi 1996 [153]	Males; Urban/ Inner city	1991–1996	Mwanza, Tanzania	East Africa		PS-NPS; PS-NTS					A-STI	B/A one group	NSP; CU; UPS; STI	STI treatment in urban textile factory
Nigro 2000 [154]	PWID	NR	Sicily, Italy	Europe	PP-I	PS-NTS					A-SIE	B/A x-sect; Serial x-sect	SIE	6-month pilot of needle exchange program
Odek 2009 [155]	FSW; Low income/indigent; Urban/ inner city	2003–2005	Nairobi, Kenya	East Africa			CB-PT		CM	SDH-S		B/A one group	Sex risk behavior	Microenterprise program and peer-mediated HIV intervention

Table 6 (continued)

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O'Leary 1996 [156]	College students	NR	NJ	US				MM-NI			A-Cdm	QE	Sex risk behavior; NSP	Multiple component intervention on college campus including; video, Sex Matters, developed by and for campus students; safer sex stories in campus newspaper, and campus talk radio program.
O'Leary 2007 [157]	General population	2002–2003	Botswana	Southern Africa				MM-NI		SDH-A		After only, two groups	HIV stigma	HIV narrative story line in Bold and the Beautiful
Olshefsky 2007 [158]	Latinos living on the California-Mexico border	2002–2003	San Diego & Imperial Valley, CA	US				MM-SM				B/A x-sect	HIV testing	Social marketing campaign *Tu No Me Conoces (You Don't Know Me)* to promote awareness of HIV risk and testing in Latinos living on the California-Mexico border
Papaevangelou 1988 [159]	FSW	1984–1987	Athens, Greece	Europe	PP-G			MM-SM				B/A x-sect	HIV infection; STI	Intensive educational campaign with HIV screening of FSW every 3 months

Table 6 (continued)

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Parry 2004 [160]	HIV-positive clinic patients and hospital in-patients	1995–2001	Stamford, CT	US	PP-I	PS-NPS	CB-H; CB-PT; CB-T				A-HC	B/A x-sect; Serial x-sect	HIV infection; CD4 count; Viral load	Comprehensive disease management approach including electronic database to standardize care
Pauw 1996 [161]	General public in high-risk areas	1991–1992	Managua, Nicaragua	Latin America & Caribbean				MM-SM			A-Cdm	QE	CU; NSP; Abstinence; Sex risk behavior	House to house campaign with activities in schools and public meeting places. Condoms were offered and information was given to the public over loudspeakers installed on the roof of a car.
Peak 1995 [162]	PWID	1991–1994	Kathmandu, Nepal	South Asia							A-SIE	B/A x-sect	SIE; Sex risk behavior; HIV infection	Harm-reduction education and needle exchange program
Peltzer 2004 [163]	Rural youth	2001–2002	Limpopo Province, South Africa	Southern Africa				MM-SM		SDH-A	A-STI	B/A x-sect	NSP	HIV prevention intervention messages in rural youth (15-24 years) in South Africa
Pfeiffer 2010 [164]	Clinic patients (primary healthcare) in high risk area	2001–2007	Mozambique	Southern Africa		PS-IS	CB-PT				A-HC	B/A one group	Retention in care	ART scale-up and integration of HIV/AIDS services in primary care

Table 6 (continued)

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Proeschold-Bell 2010 [165]	HIV-positive clinic patients at infectious disease clinics	2002–2004	NC	US	PP-I		CB-T					RCT	CD4 count; Viral load; ART uptake	Information exchange program between primary care providers and case managers
Pronyk 2006 [166]	Low income women in villages	2001–2005	Limpopo province, South Africa	Southern Africa						SDH-S		Cluster RCT	HIV testing; NSP; UPS; HIV infection	Intervention with Microfinance for AIDS and Gender Equity (IMAGE) study and HIV training curriculum
Reza-Paul 2008 [167]	FSW; Urban/inner city	2004–2006	Mysore, India	South Asia		PS-NPS; PS-NTS		MM-SM	CM	SDH-S	A-Cdm; A-STI	B/A x-sect	CU; STI; HIV infection	Community led intervention for FSW
Richardson 2004 [168]	HIV-positive clinic patients	1998–2000	CA	US	PP-I		CB-PT					RCT	UPS	Brief safer sex counseling using provider delivered messages (gain and loss frame) for HIV-positive clinic patients
Richter 2011 [169]	Employees at ExxonMobil worksites	2005	Angola; Cameroon; Chad; Cote D'Ivoire; Equatorial Guinea; Kenya; Nigeria	Central, West, and East Africa	PP-I						A-HC; A-HT	B/A one group	HIV testing; Sex risk behavior	Workplace-based intervention to expand medical coverage and offer referral for testing and treatment

Table 6 (continued)

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Robbins 2012 [170]	Clinicians; HIV-positive clinic patients	2007–2008	Boston, MA	US			CB-T					RCT	CD4 count; Retention in care	Clinical decision support system implemented in Massachusetts General Hospital HIV Clinic
Robles 1998 [171]	PWID	1995–1996	San Juan, PR	US		PS-NPS					A-SIE	B/A one group	SIE; IDU	Effectiveness of first needle exchange program in Puerto Rico
Rose 2010 [172]	Medical providers of PLWH	2004–2006	Northern CA	US			CB-PT					RCT	NSP; Sex risk behavior; UPS	Provider intervention for assessing sexual risk behavior with PLWH and delivering risk-reduction oriented prevention messages
Rosenberg 2011 [173]	Female enrollees of microfinance programs	2009	Limbe, Haiti	Latin America & Caribbean						SDH-S		After only, two groups	Sex risk behavior	Microfinance program to help reduce HIV risk behavior in Haitian women
Ross 2004 [174]	Urban African Americans	1998–2000	Houston, TX	US				MM-SM			A-Cdm	Cluster QE	CU	Syphilis prevention media campaign in 2 urban African American communities
Ross 2007 [175]	Adolescents in rural area	NR	Mwanza, Tanzania	East Africa							A-Cdm; A-STI	RCT	STI; HIV infection; CU	Adolescent sexual health intervention in Tanzania

Table 6 (continued)

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Rosser 1991 [176]	MSM	NR	Australia	Australia				MM-SM				QE	CU; Sex risk behavior	General public education campaign on behavior of homosexually active men using violence and fear to raise awareness
Sakondhavat 2000 [177]	Rural families	NR	Khon Kaen Province, Thailand	Southeast Asia				MM-SM				Cluster QE	CU	AIDS Prevention Strategies (e.g., training workshops, AIDS educational medial, women's empowerment) in Northeastern Thailand
Sakondhavat 1997 [178]	FSW	NR	Khon Kaen City, Thailand	Southeast Asia	PP-G		CB-PT				A-Cdm	B/A one group	CU; STI; HIV infection	Policy for 100% condom use at brothels
Schuster 1998 [179]	High school students; Urban/inner city	1992–1993	Los Angeles, CA	US	PP-I						A-Cdm	B/A one group	CU; UPS; Sex initiation	Condom availability in Los Angeles high schools
Scott 2009 [180]	Emergency department patients; Hospital in-patients; Outpatient HIV testing patients; Urban/inner city	2006–2007	Washington DC	US	PP-I						A-HT	B/A one group	HIV testing	Hospital-wide routine HIV screening with confirmatory testing and referral to care for persons testing positive for HIV

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Sellers 1994 [181]	Latino youth at high risk	1990–1991	Boston, MA	US				MM-SM			A-Cdm	QE	NSP	Community based AIDS prevention program included promotion and distribution of condoms and social media campaign to promote CU
Servegev 1999 [182]	PWID	1996–1998	Yaroslavl, Russia	Europe		PS-NPS; PS-NTS					A-SIE	B/A one group	IDU; SIE; CU; UPS	Harm reduction for PWID
Shagufta 2007 [183]	Genitourinary clinic patients	2006	UK	Europe	PP-I	PS-IS					A-HT	B/A one group	HIV Testing	Opt-out testing policy genitourinary clinics
Sherer 2008 [184]	Chinese physicians	2004–2006	Hubei, China	East Asia	PP-G		CB-PT				A-HC	B/A one group	AIDS mortality	Provider training to increase competence in HIV care
Sikkema 2000 [185]	Women in high risk areas	1994–1996	NY OH VA WA WI	US					CM			Cluster RCT	CU	Opinion leaders were recruited to provide input on risk reduction workshop and to host community events
Sikkema 2007 [186]	Persons with severe mental illness	NR	2 Northeast cities, US	US			CB-PT					B/A one group	CU; NSP	HIV prevention intervention for persons with severe mental illness living in supportive house programs

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Silva 2007 [187]	Emergency department patients; HIV-negatives; Urban/inner city	2003–2004	Chicago, IL	US	PP-I	PS-IS					A-HT	B/A one group	HIV testing; Linkage to care	Routine rapid HIV testing for emergency department patients and referral to service for HIV-positive patients
Sirotin 2010 [188]	FSW	2004–2006	Tijuana, Mexico	Latin America & Caribbean	PP-G						A-HT; A-STI	Prospective cohort; After only, two groups	UPS	Government registration and HIV/STI testing of FSW
Sitapati 2012 [189]	HIV-positive clinic patients; Urban/inner city	2010	San Diego, CA	US			CB-PT; CB-T					B/A one group	Retention in care	Patient-centered medical home quality improvement retention project
Smith 1996 [190]	HIV-positive patients in outpatient clinics	1992–1995	London, UK	Europe	PP-I		CB-T					B/A one group	Engaged in care; Retention in care	Combining specialist and primary health care teams for HIV-positive patients
Sood 2004 [191]	People in underserved communities	2000–2002	Uttar Pradesh, India	South Asia				MM-SM				B/A x-sect	CU	Community Media Initiative (CMI) project for underserved communities to improve knowledge, communication, and practices related to HIV/AIDS and STIs

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Ssali 2005 [192]	Traditional healers	2000–2001	Kiboga District, Uganda	East Africa			CB-PT					B/A one group	CU	HIV prevention and family planning training program for traditional healers
Stoltz 2007 [193]	PWID	2004–2005	Vancouver, BC	Canada		PS-NPS					A-SIE	B/A one group	IDU; SIE	Safer injecting sites
Sturtevant 2009 [194]	TB patients	1991–2006	Alberta	Canada	PP-G						A-HT	Retro cohort; Serial x-sect	HIV testing	Opt-out HIV testing for TB patients
Sundaram 2009 [195]	Primary care providers	2001	Palo Alto, CA	US	PP-I	PS-IS	CB-PT; CB-T				A-HT	Cluster RCT	HIV testing	Computer based reminders with audit and feedback to VA physicians for HIV testing and risk screening in 5 VA primary health clinics
Swaddiwudhipong 1990 [196]	Low socioeconomic FSW working in a semi-rural community	1989	Tak Province, Thailand	Southeast Asia				MM-SM			A-Cdm; A-HT	Time series	CU; Sex risk behavior; STI; HIV infection	Health education program combined with provision of free condoms, regular HIV testing, health education information disseminated publicly through mass media.

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Swendeman 2009 [197]	FSW; Rural	2000–2001	West Bengal, India	South Asia		PS-NPS	CB-PT		CM	SDH-A; SDH-S	A-Cdm	Cluster QE	Sex risk behavior	Replication of Sonagachi Project (multi-faceted intervention with brothel-based FSW in red light district)
Sznitman 2011 [198]	African American youth; High risk area	2006–2009	Macon, GA; Syracuse, NY	US				MM-SM				Cluster RCT	UPS; NSP	Mass media campaign using TV and radio for African American youth
Tambashe 2003 [199]	Truck drivers	1997–2000	Burkina Faso	West Africa				MM-SM				B/A x-sect	CU	Migratoires de l'Afrique de l'Ouest Roulez Protégé mass media HIV/AIDs and CU campaign for truckers
Thielman 2006 [200]	General population	2003	Moshi, Tanzania	East Africa	PP-I	PS-IS		MM-SM			A-HT	B/A one group	HIV testing	Free VCT program and campaign
Topp 2011 [201]	Patients attending primary care outpatient departments; Urban/inner city	2008–2010	Lusaka, Zambia	Central Africa	PP-I	PS-IS					A-HC; A-HT	B/A x-sect	HIV testing; Engaged in care	Routine opt-out provider initiated HIV testing and counseling program in 9 urban primary health-care clinics

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Topp 2012 [202]	HIV-positive patients referred for ART; Patients in HIV clinic and TB clinics; Urban/inner city	2009–2011	Lusaka, Zambia	Central Africa	PP-I	PS-IS					A-HC; A-HT	Prospective cohort	CD4 count; ART uptake; Retention in care	Provider initiated HIV testing and counseling services for identifying clients with early-stage HIV-related disease in 7 urban integrated primary care clinics
Torres 2011 [203]	Emergency department patients	2007–2008	CA DC MI NY OH TX	US	PP-I	PS-IS					A-HT	Cluster QE	HIV testing; Linkage to care	Comparison of HIV screening programs in 6 emergency departments
Tripiboon 2001 [204]	Married women	NR	Chiang Mai province, Thailand	Southeast Asia					CM			RCT	CU	HIV prevention program for married women in rural areas
Tyden 1996 [205]	University students	1989–1994	Uppsala, Sweden	Europe				MM-SM				B/A x-sect	CU; NSP	Campaign in Student Health Center to inform university students about STIs and CU

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Ubaidullah 2004 [206]	Truck drivers	1999–2000	Andhra Pradesh, India	South Asia				MM-NI; MM-SM				B/A one group	CU; NSP	HIV prevention program for truck drivers in Chittoor District of Andhra Pradesh (India) to provide knowledge of HIV/AIDS, change their attitudes to sex, persuade them to increase the use of condoms for safer sex, and bring about changes in their sexual behavior
Underwood 2006 [207]	Adolescents aged 13–19 years	1999–2004	Zambia	Central Africa				MM-SM				B/A one group	CU; Abstinence	The Helping Each other Act Responsibly Together (HEART) campaign for young people ages 13 to 19; provided information about STI, HIV/AIDS transmission and prevention, and promoted abstinence or consistent CU as viable risk-reduction

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Uys 2009 [208]	Nurses and PLWH	NR	Lesotho; Malawi; South Africa; Swaziland; Tanzania	Southern and East Africa					CM	SDH-A		B/A one group	Stigma; HIV testing	HIV stigma intervention in five African health care settings developed a stigma reduction intervention that included information and empowerment components
Van der Bij 2008 [209]	Heterosexual; STI Clinic patients	1994–2004	Netherlands	Europe	PP-G						A-HT	Time series	HIV testing; Serostatus awareness	Change in national HIV testing policy in Holland
Van Rossem 2000 [210]	Community leaders; Parents of youth; Urban youth; Teachers; Young adults	1996–1997	Edéa, Cameroon	Central Africa			CB-PT	MM-SM	CM		A-Cdm	QE	CU	Social marketing intervention to promote adolescent and young adult reproductive health
Vaughan 2000 [211]	Not specified	1995–1997	Tanzania	East Africa				MM-NI				B/A x-sect; QE	CU; NSP; SIE	Entertainment-education radio soap opera on knowledge, attitudes and adoption of HIV/AIDS prevention behaviors

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Vernon 1990 [212]	High risk groups including MSM, FSW, soldiers, and prison inmates	1988–1989	Colombia	Latin America & Caribbean				MM-SM			A-Cdm	QE	CU	Three month radio campaign on condom's role in preventing AIDS, condom distribution posts in meeting places of targeted groups; informative talks to general public
Virga 2012 [213]	HIV-positive clinic patients	2008–2010	Paterson, NJ	US			CB-T					Serial x-sect	CD4 count; Viral load; ART uptake; Retention in care	Web-based health information support system to facilitate quality improvement in HIV care and treatment in health centers
Visrutaratna 1995 [214]	FSW; Urban/Inner city	1989–1992	Chiang Mai, Thailand	Southeast Asia	PP-I				CM		A-Cdm	B/A x-sect	CU	Multifaceted condom use program in brothels
Visser 2004 [215]	Students in secondary schools	NR	South Africa	Southern Africa			CB-PT					B/A one group	NSP; CU	HIV/AIDS prevention program in educational setting
Vu Thuong 2007 [216]	FSW	2002–2004	Vietnam	Southeast Asia		PS-NPS; PS-NTS		MM-SM			A-Cdm; A-STI	B/A x-sect	STI; CU; UPS	HIV prevention intervention and STI services for FSW using mobile teams operating at multiple sites in five border provinces

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Wackett 1998 [217]	Young adults (aged 15–29 years)	1997–1998	Yukon	Canada			CB-T	MM-SM			A-Cdm	B/A x-sect	CU; Abstinence; NSP	"Style: doing the right thing" social marketing chlamydia education and prevention campaign for young adults in the Yukon
Walton 2004 [218]	High risk area; Low income/ Indigent	1999–2002	LasCahobas, Haiti	Latin America & Caribbean		PS-IS					A-HC; A-STI	B/A one group	HIV testing	Integration of HIV prevention and care services
Wang 2009 [219]	Physicians	NR	Anhui, China	East Asia			CB-PT					B/A one group	HIV testing; Stigma; CU	Intervention to train physicians in rural China on knowledge of HIV/STI prevention, diagnosis, treatment options, and HIV/STI behavioral risk reduction counseling
Wang 2012 [220]	FSW	2009–2011	South China	East Asia		PS-NTS		MM-SM			A-STI	Cluster QE	HIV infection; STI	Comprehensive sexually transmitted infection services for FSW at clinics

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Warner 2008 [221]	STI clinic patients	2003–2005	Denver, CO; Long Beach, CA; San Francisco, CA	US				MM-NI				Other-Alternating comparison trial	STI	Narrative drama video shown in STI clinic
Watters 1994 [222]	PWID; Urban/Inner city	1986–1992	San Francisco, CA	US							A-SIE	B/A x-sect	IDU; SIE	Needle exchange program
Waxman 2007 [223]	Emergency department patients; High risk area	2006	Eldoret, Kenya	East Africa	PP-I						A-HT	B/A one group	HIV testing; Linkage to care	Emergency department rapid HIV testing and referral program
Weaver 2008 [224]	Health care providers (nurse, nurse midwives and medical officers)	2004	Lobatse, Botswana	Southern Africa	PP-G	PS-IS	CB-PT				A-HT; A-STI	Cluster QE	HIV testing	Training program for providers based on new protocols and new national policy for syndromic management of STI
Wechsberg 1992 [225]	African Americans; drug users out of treatment; PWID; Sex partners of PWID; Urban/Inner city	NR	NC	US			CB-PT				A-DT	B/A x-sect	SIE; Sex risk behavior	Inner-city outreach program for injecting drug users and public housing community
Whiters 2010 [226]	High risk inner-city substance users	2004–2005	Atlanta, GA	US		PS-NTS					A-HT	B/A one group	HIV Testing	Federally funded faith-based rapid HIV testing initiative

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Williams 2003 [227]	Miners, adults in township, and FSW	1998–2000	Carletonville, South Africa	Southern Africa			CB-PT				A-Cdm; A-HT; A-STI	B/A cross sectional	STI; HIV infection; CU	HIV intervention project for South African gold mining community that included community-based peer education, condom distribution, syndromic management of STIs, and presumptive STI treatment for FSW
Wolitski 2010 [228]	Homeless PLWH	2004–2007	Baltimore, MD; Chicago, IL; Los Angeles, CA	US						SDH-S		RCT	Engaged in care; ART adherence; Sex risk behavior	Housing rental assistance for PLWH
Wood 2006 [229]	PWID	2003–2005	Vancouver, BC	Canada		PS-NPS					A-SIE	Prospective cohort; After only, two groups	IDU; SIE	Safer injecting sites
Wu 2002 [230]	Health professionals and villagers	1998–1999	Fuyang, China	East Asia			CB-PT					B/A x-sect	CU	Training-of-trainers workshop to increase HIV/AIDS knowledge and improve HIV testing attitudes, and CU among health professionals and villagers

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Wu 2010 [231]	Farmers in rural communities	2005–2008	Yunnan, China	East Asia					CM	SDH-A	A-Cdm	B/A x-sect	CU; Stigma	Community-based HIV/AIDS health education and behavioral intervention carried out by monks or women
Xiaoming 2000 [232]	Semirural young adults age 18–30	1996–1997	China	East Asia				MM-SM				QE	CU	Community-based AIDS prevention intervention that included videos, radio programs, written materials, small group discussions, home visits, individual counseling and a free supply of condoms
Yoder 1996 [233]	Bemba speakers in Northern Zambia	1991–1992	Zambia	Central Africa				MM-NI				B/A x-sect	CU; NSP	Radio drama to disseminate AIDS information. Church leaders were asked to tell their congregations about the program
Zetola 2008 [234]	Clinic patients	2003–2007	San Francisco, CA	US	PP-I						A-HT	Time series	HIV testing	Elimination of written patient consent for HIV testing in San Francisco General Hospital Medical Center

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Zhongdan 2008 [235]	FSW	2001–2003	Wuhan, China	East Asia				MM-SM			A-Cdm; A-STI	B/A x-sect	CU; STI	100% CU Program: Condom availability and use policies in entertainment establishments, STI services, educational sessions
Zimmerman [236]	Gay men	NR	Mexico	Latin America & Caribbean					CM			QE	CU; NSP	Participants design and implement an HIV/AIDS prevention project with group discussion, outreach, referral to counseling, testing, and other medical and social services. The group organized community activities focused on community change and referral to social services

Table 6 (continued)

Author and year	Target population[a]	Study years	Location[b]	Region[b]	PP[c]	PS[d]	CB[e]	MM[f]	CM[g]	SDH[h]	A[i]	Study design[j]	Outcomes[k]	Intervention
Zimmerman 1997 [237]	Heterosexual young adults	2003	Knoxville, TN; Lexington, KY	US				MM-SM				Time series	CU	Televised safer sex mass media campaign in two southeastern cities

[a] *FSW* female sex workers

[b] *AZ* Arizona, *BC* British Columbia, *CA* California, *CO* Colorado, *CT* Connecticut, *DC* District of Columbia, *FL* Florida, *GA* Georgia, *IL* Illinois, *KY* Kentucky, *LA* Louisiana, *MA* Massachusetts, *MD* Maryland, *MI* Michigan, *MS* Mississippi, *MO* Missouri, *NC* North Carolina, *NJ* New Jersey, *NM* New Mexico, *NV* Nevada, *NY* New York, *OH* Ohio, *OR* Oregon, *PA* Pennsylvania, *PR* Puerto Rico, *SC* South Carolina, *TN* Tennessee, *TX* Texas, *UK* United Kingdom, *US* United States, *VA* Virginia, *WA* Washington, *WI* Wisconsin

[c] *PP* policy/procedure, *PP-I* policy/procedure-institutional, *PP-G* policy/procedure-governmental

[d] *PS* physical structure, *PS-IS* physical structure-integration of services, *PS-NPS* physical structure-new physical structure, *PS-NTS* physical structure-service provided in non-traditional setting

[e] *CB* capacity building, *CB-H* capacity building-hiring/funding, *CB-PT* capacity building-provider/supervisor training, *CB-T* capacity building-technology

[f] *MM* mass media, *MM-NI* mass media-narrative intervention, *MM-SM* mass media-social marketing

[g] *CM* community mobilization

[h] *SDH* social determinants of health, *SDH-A* social determinants of health-acceptance and respect, *SDH-S* social determinants of health-survival

[i] *A* Access, *A-Cdm* Access-condoms, *A-HT* Access-HIV testing, *A-STI* Access-STI testing, *A-SIE* Access-sterile injection equipment, *A-DT* Access-drug treatment, *A-HC* Access-HIV health care

[j] *B/A* before/after, *x-sect* cross-sectional, *Retro cohort* retrospective cohort, *Rx* prescriptions

[k] *UPS* unprotected sex, *CU* condom use, *QE* quasi-experimental (non-randomized comparison trial), *NSP* number of sex partners

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