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# Outcome effectiveness of the lay health advisor model among Latinos in the United States: an examination by role

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## Abstract

The objective of this study was to examine lay health advisor (LHA) programs designed to promote health among US Latinos and the extent to which educator-only versus educator-plus-bridge programs differed in designs and outcomes achieved. Two independent coders reviewed 128 published articles on LHAs yielding information at two levels: (i) study design and participant and LHA characteristics from 61 studies that broadly compared educator-only versus educator-plus-bridge programs and (ii) implementation features and outcomes from 17 randomized controlled trials or quasi-experimental studies with outcome data. LHA programs have been widely used with Latinos in certain US regions; our findings indicate that LHAs are effective intervention agents. We identified differences between educator-only and educator-plus-bridge LHA programs, although the small number of educator-plus-bridge programs with outcome data limited comparisons. Major gaps remain in research targeting Latino subgroups other than Mexican immigrants/Mexican Americans. Sufficient research has evaluated LHA programs among Latinos on their ability to achieve health behavior and/or health status changes. In the future, more of a focus on organizational and policy changes is

warranted. Questions remain about diversity in LHAs' characteristics and roles, which influence not only outcomes but also program sustainability and dissemination.

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## Introduction

In 2002, Latinos became the largest minority population and the fastest growing subgroup in the United States. Current estimates place the US Latino population at 44.3 million; Latino growth rate in the United States is three times that of the total population [1]. With this population surge, health care systems are faced with the challenge of finding the most effective methods for addressing Latino health needs, especially access to health care services. Citizenship and language barriers limit access for Latinos to the health care safety net [2]. Approximately 30% of Latinos report having had a problem communicating with health providers over the past year [3]. In addition, a Kaiser Family Foundation study found that 36% of Latinos have no health insurance—the highest percentage of any US subpopulation. Among low-wage workers, 63% of Latino non-US citizens and 36% of Latino US citizens are uninsured.

Language and cultural difference, and lack of familiarity with American health care delivery models require innovative strategies to increase

Latinos' access to health care. Compounding these challenges are barriers imposed by the structure of health care organizations that often fail to include adequate systems for reaching vulnerable populations [4]. Lay health advisors (LHAs) have emerged as a potentially effective approach for improving Latinos' access to care, health outcomes, and health behaviors. The LHA approach trains community members who are similar to the target population and, in some cases, known and trusted members of the community. LHAs are known by many other names, including *promotoras(es)*, community health workers (CHWs), community health advisors, community health aides, natural helpers, peer educators, and peer outreach workers. (In Spanish, *promoter* is masculine and *promotora* feminine/singular; *promotoras* is feminine/plural and *promotores* masculine or mixed gender/plural.) [5]. In January 2009, the Office of Management and Budget formally recognized CHW as an occupational classification and it is now listed in the 2010 Standard Occupation Classifications. Regardless of the term used, these individuals, once trained, serve to bridge the gap between their communities' needs and the delivery of health services [6–10].

The LHA movement worldwide accelerated following the Alma Ata Declaration in 1978 [11]; the Declaration defined health holistically as a state of 'physical, mental and social well-being, and not just the absence of disease' [11]. This broad definition of health spurred the role development of LHAs as a necessary link between primary health care delivery systems and communities in need of better health services. LHAs were envisioned as integral members of national health care teams, working hand in hand with professional staff to serve the 'unmet curative, preventive and promotive needs of village communities' [10].

The range of activities and issues addressed by LHAs is broad and their geographic reach wide [12]. In Latin America, the work of the Brazilian educator Paulo Freire and others in the popular education movement in the 1960s and 1970s catalyzed this approach, leading to the creation of a formalized role for LHAs across the continent. Examples are numerous, including the following:

Guatemala, where indigenous LHAs have been trained to deliver messages to rural men on reproductive health as a method to increase rates of vasectomies [13]; Mexico, where LHAs provided breastfeeding education and support to mothers [14]; and Brazil, where CHWs were successfully trained to promote oral health [15]. LHAs often have other primary responsibilities, such as in Bolivia, where soldiers are trained as LHAs to provide nutrition and childhood illness information to their communities when they return home following military duty [12].

In the United States, the LHA model began receiving attention in the 1960s with the passage of the Migrant Act of 1962 and the creation of the Indian Health Service's Community Health Representative Program in 1968. In the late 1960s and early 1970s, a Great Society program known as 'New Careers' pursued the creation of LHA jobs as entry-level positions for career development. Interest in the LHA model for spreading clinical services and bridging primary health care delivery and communities reemerged in the 1990s with initiatives by the Centers for Disease Control and Prevention [16] as well as by the Health Resources and Services Administration [17]. Since the 1960s, when the US federal government first endorsed the use of LHAs to help expand access to health care for underserved populations [18], LHAs have been increasingly used to reach marginalized and otherwise hard-to-reach populations in the United States [5, 7, 19, 20].

The role of LHAs in the United States can range from information dissemination and health education to policy and community advocacy, and from negotiating agency services to providing preventive and curative care [7, 10, 21]. In a 1994 report, the US Centers for Disease Control and Prevention defined the LHA's role as providing informal, community-based, health-related services and establishing vital links between health providers and persons in the community [22]. The National Community Health Advisor Study, published in 1998, went further, identifying seven core roles of LHAs, among them: cultural mediation, informal counseling and support, health education, advocacy

and service provision [20]. Other LHA intervention studies identified these same core roles [8, 18, 23] and former LHA managers endorsed the role as diverse and expansive [24]. Without this knowledge, practitioners wishing to initiate or improve LHA outreach lack an informed basis from which to move forward.

### Present study

We conducted a systematic review of the LHA model in US Latino communities to examine differences between research on programs in which LHAs served primarily in an educator role and research on programs that formally extended the LHA role to include serving as a bridge to other services (educator plus bridge). This extension has ramifications for program design, including LHA recruitment, training needs, support and evaluation. For the purpose of this analysis, the educator-only role was defined as providing one-on-one or group contact with the target audience, whereas the educator-plus-bridge role was defined as providing education plus informational and instrumental support for groups accessing health care services. This role comparison was driven, in part, by our experience developing LHA interventions in new and established Latino immigrant-receiving communities [25]. To illustrate, one could consider the experience of a Spanish-language-dominant immigrant attempting to access health care services in a new immigrant-receiving community compared with an established one. New immigrant-receiving communities are those with little to no Latino migration prior to 1990 such as those found in Georgia and North Carolina. In contrast, established immigrant-receiving communities are those with a long history and tradition of serving as an immigrant gateway into the United States such as those found in the Southwest region of the United States [26]. Given language differences and other cultural barriers, Spanish-language-dominant immigrants living in new immigrant-receiving communities may need LHAs to serve as a bridge by acting as cultural brokers or intermediaries between the predominantly English-speaking service organizations and their Spanish-speaking clients. Latinos living in tra-

ditional immigrant-receiving communities may not need this type of bridging support. This led us to consider differences between LHA models in which the LHA was primarily tasked with providing health education via one-on-one or group contact versus those in which the LHA was given the additional responsibility of bridging to other services and systems. Using all studies identified, we examined two initial research questions:

- (i) To what extent do educator-only versus educator-plus-bridge programs differ on study design and participant characteristics?
- (ii) To what extent do educator-only versus educator-plus-bridge programs differ on LHA characteristics?

Using a subset of studies employing rigorous study designs and reporting outcome data, we examined two additional questions:

- (iii) To what extent do educator-only versus educator-plus-bridge programs differ on implementation features important for program replication, dissemination and sustainability?
- (iv) To what extent do educator-only versus educator-plus-bridge programs differ on outcomes targeted and achieved?

Examining these features can further our understanding of how to design and evaluate disseminable interventions [27–29]. Our review provides important evidence for future intervention research [30] and organizational policy change [31].

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## Methods

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### Data retrieval process

Using methods developed by Cooper [32], we identified articles published by March 2009 for study inclusion in three ways: database literature searches, searching articles' references meeting inclusion criteria (presented below) and published

bibliography reviews on the topic. Three literature searches were conducted using five databases: Medline, PsychINFO, CINAHL, SocioFile and Web of Science (WOS). The WOS database included literature from the Science Citation Index Expanded, the Social Sciences Citation Index and the Arts and Humanities Citation Index.

A pilot database search using four key terms (lay health advisors, community health workers, *promotores/as* and outreach workers) identified only 24 articles. Subsequently, we expanded our search to the list of key terms in Box 1. We selected these terms either because they were analogous to terms in articles on LHAs or because they were associated with the training and/or work of LHAs [20]. These terms captured the role of the LHAs/CHWs as defined by the World Health Organization [11], the Centers for Disease Control and Prevention [22] and an extensive review conducted by Rosenthal [20].

To answer the first two research questions, we included articles in the review if the model described met our definition of an LHA. We began with the WHO definition: ‘Workers who live in the community they serve, are selected by that community, are accountable to the community they work within, receive a short, defined training, and are not necessarily attached to any formal institution’ [11]. Consistent with the multiple operationalization approach recommended for literature reviews [32], we then broadened this definition during the review process to include workers selected in collaboration with community members by institution personnel (e.g. university, church, clinic) and temporarily

**Box 1. Descriptors of LHAs in the Latino community.**

**Descriptors:** *abuelas*; community health advisors/workers; *consejeras*; family educators; health promoter; home visitors; lay health advisors/educators/workers; natural caregivers/helpers; neighborhood workers; outreach workers; paraprofessionals; peer counselor; peer health educators/leaders; *promotor(es/as)*; volunteers

attached to an institution during the course of the study. We limited our literature searches to those studies conducted with Latinos/Hispanics using the following key terms: Latino/a, Hispanic, Spanish speaking, Chicano/a, Spanish, Mexican American, Puerto Rican, Latin immigrant, Central American and South American. We included only those studies published in peer-reviewed journals between 1965 and the present (1980 to present in WOS), available in Spanish or English, and that addressed a physical health, mental health or quality-of-life issue. Literature searches were downloaded into EndNote to eliminate duplicates and to facilitate the review process. We excluded dissertations or non-peer reviewed publications and manuscripts insufficiently detailed for evaluation purposes. To minimize the potential for bias or errors in the selection of articles, we evaluated on inclusion/exclusion criteria a random sample of 50% of the articles identified during the search process. Figure 1 illustrates decision stages employed and their outcomes in terms of number of articles identified and included.

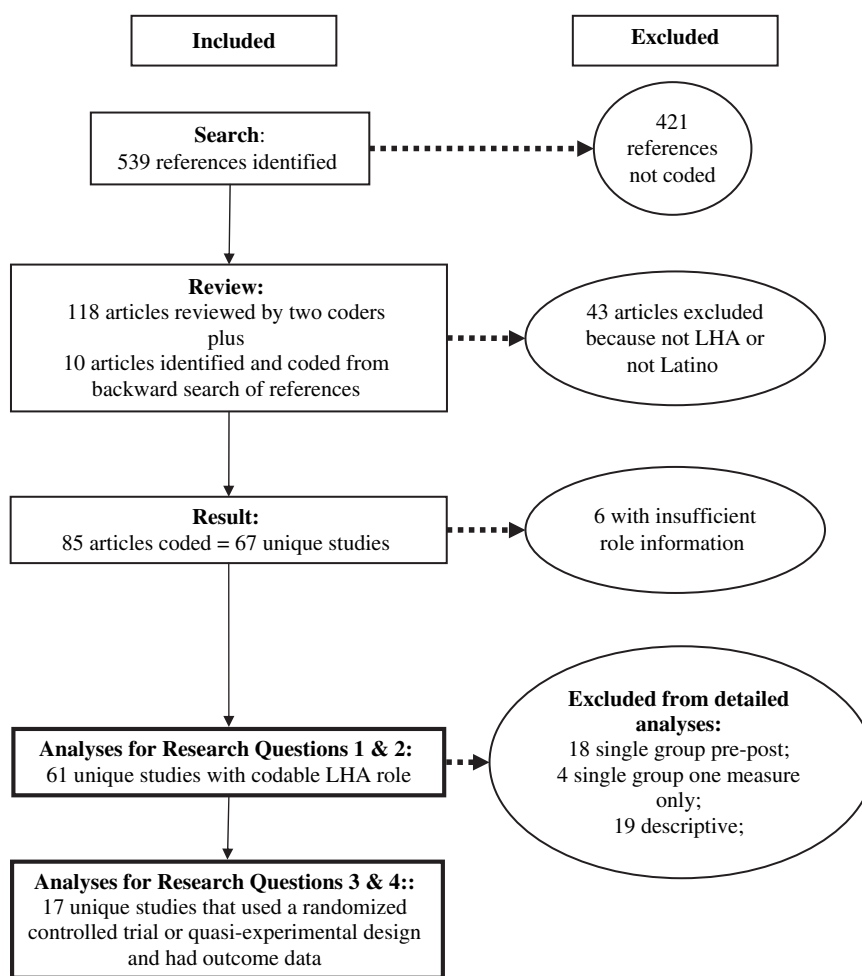
To answer the second two research questions, we retained articles from those identified above that used a rigorous study design (randomized controlled trial or two-group, pre–post quasi-experimental study) and reported participant outcomes (knowledge, psychosocial factors, behaviors, health care use and health status).

**Data coding**

Using Cooper’s ‘Method-Description Approach’ (p. 86) [32], we created a coding sheet to capture pertinent information. Reviewers coded all relevant LHA role information available as well as participant characteristics, other LHA characteristics, implementation features and outcomes.

*LHA role*

The LHA role was captured using descriptions from the articles, as well as any qualitative or quantitative information reported on, such as dose delivered. We conceptualized two roles to answer the research questions. The educator-only role was defined as the LHA providing direct health education,



**Fig. 1.** Literature included during the review process.

behavioral skill development, and/or informational or emotional support. The educator-plus-bridge role included any, or all three, of these activities in addition to activities where the LHA linked participants to agencies, provided referrals or assisted with the coordination of care.

#### *Participant characteristics*

We examined the following variables pertaining to study participants: number of participants recruited, age, gender, education, income, ethnicity, country of origin and acculturation status.

#### *LHA characteristics*

LHAs were classified according to the number reported in each study, their age, gender, education, income, ethnicity, country of origin and acculturation status. We categorized LHAs as either paid staff members or volunteers, with additional information coded on material benefits provided during training or intervention delivery (e.g. food, transportation, child care, graduate certificate, monetary stipend). We also coded the number of hours and structure of the training.

### *Implementation features*

Intervention features included delivery setting (home, community, organization), duration, type of contact, including whether the LHA had individual and/or group contact with the participants as well as whether other professionals were involved and other intervention methods used by the LHAs to promote change, such as print or audiovisual materials, demonstrations, mass media or health fairs. Additional study design characteristics we examined included targeted health issue; research design and unit of randomization, if a randomized controlled trial; geographic location; target audience (adult female, adult male, family or organization); and sampling methods (random sample, convenience sample or LHA identified).

### *Efficacy*

To examine these studies' efficacy and effectiveness, we coded information on types of outcomes targeted and outcome and process evaluation results achieved. Outcomes were categorized into five groups: (i) knowledge, (ii) psychosocial (e.g. health beliefs, attitudes, self-efficacy), (iii) behavioral (e.g. dietary intake, i.v. drug use, use of protective eye-wear), (iv) health care use (e.g. cancer screening, prenatal visits) and (v) health status (e.g. depression, body mass index, hemoglobin A1c).

### **Review process**

Several strategies were used to ensure accurate coding of information. First, three reviewers were trained on coding definitions and the appropriate use of the coding sheet. This training included discussions about each variable; testing the coding sheet with several articles; comparing results, addressing discrepancies and revising the coding sheet as needed; testing the coding sheet with additional articles (two articles per testing period) until adequate interrater reliability estimates were obtained between raters; and double coding all articles for verification purposes, with discrepancies addressed using a consensus approach [32].

All articles were reviewed by two reviewers and discrepancies were resolved by a third. Interrater

reliability estimates obtained during the review process ranged from 0.73 to 0.99, with more errors observed on coding of LHA's payment status and fewer errors observed on coding study design characteristics. Data were then entered into SPSS 11.0 using a double data-entry verification process.

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## **Results**

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Results of the literature search are outlined in Fig. 1. A total of 128 articles were identified and coded. Of these, 43 were excluded after the coding process primarily because they either did not describe an LHA program or did not include Latinos. This yielded a sample of 85 articles, or 67 unique studies, of which 6 were excluded at the analysis stage because insufficient data were available to classify LHA role [33–38]. The process yielded a final sample size of 61 studies. These studies are presented by study design: participant and LHA characteristics in Tables I and II, health target in Fig. 2 and geographic region in Fig. 3. Of the 61 studies with LHA role information, 17 studies met our final inclusion criteria of employing a rigorous study design (randomized controlled trial or two-group, pre–post quasi-experimental study) and reporting outcomes. These studies are described further in Tables III (implementation) and IV (efficacy). The tables are organized by role type (educator only or educator plus bridge).

### **LHA roles**

Educator-only programs represented over half of the 61 studies. Targeted health issues were collapsed into 11 categories: chronic disease management (diabetes, asthma), lifestyle behaviors (diet, physical activity, smoking cessation and multiple risk behaviors), cancer screening, prenatal care, HIV/STD/AIDS prevention, access to health care, injury prevention (food safety, eye safety, child passenger safety), environmental health, mental health, chronic disease risk factors and oral health. The most commonly targeted health issues were chronic disease management (18%), cancer screening (18%), lifestyle behaviors (11%), chronic

**Table I.** Study design and participant characteristics by LHA role from earliest to latest studies published (*N* = 61; 33 educator only and 28 educator plus bridge)

Study	Study design	Health issue targeted	Participants				
			<i>n</i>	Mean age (years)	% Female	% <high school	% Latino; % country of birth; acculturation
Educator	Brand [47]	Program description				100	
	Pilisuk <i>et al.</i> [48]	Program description	16				
	Tiernan [49]	Program description					
	Amezcuca <i>et al.</i> [50]	Not codable					
	Brownstein <i>et al.</i> [51]	Not codable		≥35	100		NR; Mexican American and Yaqui; NR
	Watkins <i>et al.</i> [52, 53]*	Quasi-experimental	470		100		100%; NR; Spanish speaking
	May <i>et al.</i> [54]	RCT: community	42	47	90		NR; NR; Spanish speaking
	Navarro <i>et al.</i> [55–57]*	RCT: LHA	512	34	100	Median = 7 years	100%; 92% Mexican born; 2.00 <sup>a</sup>
	Ramirez <i>et al.</i> [58]	Not codable				100	
	Wiist <i>et al.</i> [59]	RCT: community	1887	10–13		6th graders	
	Hanson [60]*	RCT: county	303		92	23	
	Alcalay <i>et al.</i> [61];	Program description	344	18–54	50	‘Low’	100%; NR; NR
	Balcazar <i>et al.</i> [62, 63]						
	Bell <i>et al.</i> [64]*	Quasi-experimental	165				‘Hispanic residents’; NR; NR
	Buller <i>et al.</i> [65];	RCT: social network	905 <sup>b</sup>	42	25	17	42%; NR; 2.05 (0.93) <sup>a</sup>
	Larkey <i>et al.</i> [66]*						
	Whitehorse <i>et al.</i> [67]	1 group pre–post	487	51%, 18–59	97	63	92%; 81% foreign born; 84% Spanish speaking
	Cravey <i>et al.</i> [68]	Program description					
	Taylor <i>et al.</i> [69, 70]	1 group pre–post	337	<20 to >60	98	26	98%; NR; 46% Spanish speaking
	Ramos <i>et al.</i> [71]	1 group pre–post					100%; 65% US born; NR
	Watson <i>et al.</i> [72]	Program description					
	Woodruff <i>et al.</i> [73]*	RCT: individual	313	42	51	Median = 9–11 years	100%; 78% Mexican born; 2.13 (0.84) <sup>a</sup>
	Kim <i>et al.</i> [74]	1 group pre–post	272	38	98	Mean = 9 years	100%; NR; NR
	Conway <i>et al.</i> [75];	RCT: family	143	4	55	100	100%; 85% Mexican born; 2.00 <sup>a</sup>
	Rodriguez <i>et al.</i> [76];						
	Woodruff <i>et al.</i> [77]*						

Table I. *Continued*

Study	Study design	Health issue targeted	Participants				
			<i>n</i>	Mean age (years)	% Female	% <high school	% Latino; % country of birth; acculturation
Forst <i>et al.</i> [78]*	Quasi-experimental	Eye safety	786	33	19	75	100%; Mexican <sup>c</sup> ; 100% Spanish speaking
Elder <i>et al.</i> [43, 44, 79]*	RCT: individual	Diet	357	40	100	52	100%; 95% Mexican born; -1.86 (.90) <sup>d</sup>
Staten <i>et al.</i> [80]	1 group pre-post	Chronic disease risk	248	49	92 <sup>e</sup>	88	100%; 92% Mexican born <sup>e</sup> ; 90% Spanish speaking <sup>e</sup>
Teufel-Shone <i>et al.</i> [81]	1 group pre-post	Diabetes	249	75%, >18	66		100%; Mexican American; NR
Larkey [82]	1 group pre-post	Cancer screening	457		100	72	100%; NR; 100% Spanish survey
Martin <i>et al.</i> [83]*	Quasi-experimental	Child passenger safety	90	31		58	100%; 87% Mexican born; 1.5 <sup>a</sup>
Culica <i>et al.</i> [84]	1 group pre-post	Diabetes	162	48	64		78%; Mexican American; 73% Spanish speaking
Joshu <i>et al.</i> [85]	1 group pre-post	Diabetes	301	60	73	39	100%; NR; NR
Lujan <i>et al.</i> [86]*	RCT: individual	Diabetes	150	58	80	95	100%; Mexican American; 87% <2.00 on 4-point scale
Sauaia <i>et al.</i> [87]; Welsh <i>et al.</i> [88]*	Quasi-experimental	Cancer screening	6696 <sup>f</sup>	50-64	100		22%; NR; NR
Vincent <i>et al.</i> [89]*	Quasi-experimental	Diabetes	20	56	71	Mean = 10	100%; Mexican American; 1.73 (0.60) <sup>a</sup>
Bridge Carrillo <i>et al.</i> [90]	1 group, 1 measure	Prenatal care	274	25	100	80	100%; NR; NR
McElmurry <i>et al.</i> [91]	Program description	Access to care					
Dawson & Robinson [92]*	RCT: individual	Prenatal care	172	21	100	Median = 11	25%; NR; NR
Meister <i>et al.</i> [93]; Warrick <i>et al.</i> [94]	1 group, 1 measure	Prenatal care	147	25	100	'Little formal education'	100%; 80% Mexican born; 'culturally traditional'
Birkel <i>et al.</i> [95]	1 group pre-post	HIV/STD/AIDS prevention	2624	32	22	9-11	88%; Mexican & Puerto Rican; NR
Morris <i>et al.</i> [96]	1 group pre-post	Cancer screening	432	54	100	Mean = 6	97%; NR; NR
McFarlane <i>et al.</i> [97]; McFarlane & Fehir [98]; Mahon <i>et al.</i> [99]	Program description	Prenatal care				100	100%; Mexican & Central American; NR
Bray & Edwards [100]	1 group pre-post	Prenatal care				100	100%; NR; NR



Table I. Continued

Study	Study design	Health issue targeted	Participants				
			n	Mean age (years)	% Female	% <high school	% Latino; % country of birth; acculturation
Nyamathi <i>et al.</i> [101]*	RCT: site	HIV/STD/AIDS prevention	233	31	100	Mean = 10	100%; 44% Mexican born; 56% high Marin scale <sup>e</sup>
Brown & Hanis [102]	1 group pre–post	Diabetes	7	61	60		100%; NR; NR
Castro <i>et al.</i> [103]	RCT: church	Cancer screening	668	31–51	100		100%; NR; 2.28–3.68 <sup>a</sup>
Bird <i>et al.</i> [104]; Pérez-Stable [105]	Program description	Cancer screening	1601	42	100	Mean = 10	100%; 35% Mexican & 28% Central American; 75% low Marin scale <sup>e</sup>
Singer & Marxuach-Rodriguez [106]	1 group pre–post	HIV/STD/AIDS prevention	24	25	0	25	100%; 62% Puerto Rican; 33% Spanish speaking
Baker <i>et al.</i> [107]	Program description	Access to care	610	18–81		'Most'	100%; NR; NR
Booker <i>et al.</i> [108]	Program description	Access to care					
Corkery <i>et al.</i> [109]*	RCT: individual	Diabetes	64	53	74	80	NR; 75% Puerto Rican; 25% Spanish speaking
Warren [110]	Program description	HIV/STD/AIDS prevention	357	32			20%; NR; NR
Flaskerud & Nyamathi [111]	1 group pre–post	HIV/STD/AIDS prevention	508		100		100%; NR; NR
McQuiston & Uribe [112]; McQuiston & Flaskerud [113]; McQuiston <i>et al.</i> [114]	Program description	HIV/STD/AIDS prevention					
Hiatt <i>et al.</i> [115]	2 groups pre–post	Cancer screening	1599	40–75	100	33	14%; NR; NR
McElmurry <i>et al.</i> [116]	Program description	Access to care					100%; NR; NR
Hunter <i>et al.</i> [39]*	RCT: individual	Comprehensive preventive care	101	50	100	77	96%; 86% Mexican born; NR
Mayo <i>et al.</i> [117]	1 group, 1 measure	Cancer screening	89	53	100	44	NR; 79% US born; 79% English speaking
Hansen <i>et al.</i> [118]	1 group, 1 measure	Cancer screening	141	22–69	100		100%; NR; NR
Martin <i>et al.</i> [119]	1 group pre–post	Asthma	103	42	70	79	100%; 77% Mexican born; 1.9 <sup>a</sup>
Reinschmidt <i>et al.</i> [120]	RCT: individual	Chronic disease risk			100		
Ingram <i>et al.</i> [121]	1 group pre–post	Diabetes	70	61	77		100%; 86% Mexican born; NR
Thompson <i>et al.</i> [122]	1 group pre–post	Diabetes	365	57	66		100%; Mexican American; NR

NR or empty cell = not reported/missing; RCT = randomized controlled trial; asterisks denote articles with outcomes.

<sup>a</sup>Mean ethnic identity and acculturation measured on a 5-point scale from 1 = very Anglo/low to 5 = very ethnic/high; Woodruff and Conway studies used the modified Cuellar *et al.* [123] scale; Navarro used the short Marin *et al.* [124] scale.

<sup>b</sup>Initially recruited 2091 to participate in a community intervention; 905 were randomly assigned to peer support or no peer support.

<sup>c</sup>Prior work in community indicated that 90% of the Latino farmworkers were Mexican.

<sup>d</sup>Bidirectional acculturation measured using the bidirectional Cuéllar *et al.* [125] scale where negative responses are indicative of being more traditional.

<sup>e</sup>Percentages were reported incorrectly in the paper. These percentages are based on a recalculation using the reported numerator and denominator.

<sup>f</sup>Analytic sample of women enrolled in Medicaid fee-for-service longer than 18 months.

<sup>g</sup>Women were classified as high ( $\geq 28$ ) or low ( $< 28$ ) on an acculturation scale with a possible range of 12–48 [124].

disease risk factor reduction (11%), prenatal care (10%) and HIV/STD/AIDS prevention (10%) (Fig. 2).

Figure 3 depicts the geographic distribution of LHA programs in the United States. More of the programs took place in the Southwest region of the United States (66%). In addition, proportionally more LHA programs in the Southwest adopted an educator-only approach compared with those conducted in the Central and Northeast regions. Three studies represented multisite initiatives.

### **Participant characteristics**

Data were not reported on a number of characteristics as depicted by the empty cells in tables. Income was the least reported of participant characteristics examined, and therefore, we omitted it. The number of participants reached ranged from 7 to 6696, with a median of 3365 in educator-only programs and 485 in educator-plus-bridge programs. Nearly all the studies that reported the participants' gender indicated that programs reached mostly women (92%; 45 of 49); 31% (8) reached only women in the educator-only programs compared with 65% (15) in the educator-plus-bridge programs. Nearly half the studies (49%; 30) did not report on participants' educational status; among those that did, participants generally had less than a high school education. One notable finding was the dearth of studies conducted with Latino subgroups other than less acculturated Mexican immigrants/Mexican Americans. Only 5 of the 61 programs targeted Puerto Ricans (3 programs) and Central Americans (2 programs); all of them educator-plus-bridge programs.

### **LHA characteristics**

Despite our attempts to code a variety of information about the LHAs, the characteristics most frequently reported in these articles were limited to the number of LHAs involved in the intervention, and their gender and ethnicity (Table II). Few studies reported on the LHAs' age, educational level, income level, country of origin or level of acculturation. Similar to study participants, educator-only programs tended to involve more LHAs

(mean = 43) than did educator-plus-bridge programs (mean = 15). In addition, LHAs in 70% of educator-only programs and 80% of educator-plus-bridge programs were all female. Across both types of programs, the majority of LHAs was Latina/Hispanic; all but one educator-plus-bridge program involved only Latinos.

Half of all LHAs in educator-only programs for which data were available were volunteers; in some cases, LHAs received other material incentives such as mileage reimbursements, child care, certificates or other recognitions. The other half were paid staff. For educator-plus-bridge programs, only 33% used volunteers, while the remaining 67% involved paid staff. Few studies reported on the number of training hours; in educator-only programs, training hours ranged from one session to 60 hours. For educator-plus bridge programs, hours ranged from 8 to 160.

### **Detailed analyses**

Further analyses were limited to 17 randomized controlled/quasi-experimental studies with outcome data. We excluded 22 single-group-only studies, 19 descriptive studies and 3 with insufficient information (Fig. 1). The exclusions created a significant imbalance in the number of educator-plus-bridge programs available for review. Initially, 46% (28 of 61) described educator-plus-bridge programs; after these exclusions, only 25% (4 of 17) were educator-plus-bridge programs.

### *Intervention design characteristics*

LHAs in the 17 studies worked with a variety of participants including adult females, adult males and entire families. Similar percentages of educator-only versus educator-plus-bridge programs involved a convenience sample of participants (70% versus 75%). LHAs, however, were involved in recruitment in 40% of the educator-only programs but none of the educator-plus-bridge programs. Intervention activities took place in participants' homes, within organizations and within communities; two-thirds (61%) of educator-only programs versus 100% of educator-plus-bridge programs occurred in an

**Table II.** LHA characteristics by LHA role from earliest to latest studies published ( $N = 61$ ; 33 educator only and 28 educator plus bridge)

Study	No. of LHAs	LHA mean age (years)	% LHA female	% LHA Latino	Training length	Volunteer (V) or paid (P)	Other incentives
Educator							
Brand [47]	364	42	100	11		P	
Pilisuk <i>et al.</i> [48]	9				0	V	
Tiernan [49]	50				45 hours	V	
Amezcuca <i>et al.</i> [50]						V	Certificate
Brownstein <i>et al.</i> [51]			100				
Watkins <i>et al.</i> [52, 53]*	40	15–52	100	100	24 hours	V	Mileage and other reimbursement, child care
May <i>et al.</i> [54]	4		100	100		P	
Navarro <i>et al.</i> [55–57]*	36		100	100	12 weeks		
Ramirez <i>et al.</i> [58]	85	49	97			V	Certificates, recognition
Wiist <i>et al.</i> [59]	305	10–13	53	52	29 hours	V	Field trips
Hanson [60]*						P (per visit)	
Alcalay <i>et al.</i> [61];	29–33	41	100	100	18 hours + 2 days	P	
Balcazar <i>et al.</i> [62, 63]							
Bell <i>et al.</i> [64]*	15	‘Older’	100	100	1 session	V	
Buller <i>et al.</i> [65];	41	41	29	56	16 hours	V	\$1800 total + gifts
Larkey <i>et al.</i> [66]*							
Whitehorse <i>et al.</i> [67]	20			92	9 hours		
Cravey <i>et al.</i> [68]	66			100		V	Baseball hats
Taylor <i>et al.</i> [69, 70]	36	78%, 31–60	97	97	16 hours	V	Certificates, \$100
Ramos <i>et al.</i> [71]			100	100			
Watson <i>et al.</i> [72]	7	Youth				V	Food, certificates
Woodruff <i>et al.</i> [73]*	16	41	88	94	25 hours	V	‘Modest stipend’
Kim <i>et al.</i> [74]	12		92	100	39 hours	P (per class)	Mileage reimbursement
Conway <i>et al.</i> [75]; Rodriguez <i>et al.</i> [76]; Woodruff <i>et al.</i> [77]*	11	45	100	100	20 hours	V	Monetary incentives and mileage reimbursement
Forst <i>et al.</i> [78]*	16			100	20 hours		
Elder <i>et al.</i> [43, 44, 79]*	4	55	100	100	12 sessions	P	\$200 for training + certificate, \$144 per participant, mileage and other reimbursement
Staten <i>et al.</i> [80]	11		91		6 hours	P	
Teufel-Shone <i>et al.</i> [81]	4		100	100	1 day		
Larkey [82]	3		100	100			

Table II. *Continued*

Study	No. of LHAs	LHA mean age (years)	% LHA female	% LHA Latino	Training length	Volunteer (V) or paid (P)	Other incentives
Martin <i>et al.</i> [83]*	16			88		P and V	All received \$40 gift certificate
Culica <i>et al.</i> [84]	1				27 hours	P	
Joshu <i>et al.</i> [85]			100			P	
Lujan <i>et al.</i> [86]*	2		100		60 hours	P	
Sauaia <i>et al.</i> [87]; Welsh <i>et al.</i> [88]*	4		100	100		P	
Vincent <i>et al.</i> [89]*	1		100	100		P	
Carrillo <i>et al.</i> [90]						V	
McElmurry <i>et al.</i> [91]	30	18	93	33	160 hours	P	Training mileage reimbursement
Dawson & Robinson [92]*			100		30 hours		P
Meister <i>et al.</i> [93]; Warrick <i>et al.</i> [94]	9		100	100	34 hours+	8 P, 1 V	Benefits, certificate, ESL classes
Birkel <i>et al.</i> [95]						P	
Morris <i>et al.</i> [96]	4	35–65	100	100	Weekly staff meeting	P	
McFarlane <i>et al.</i> [97]; McFarlane & Fehir [98]; Mahon <i>et al.</i> [99]	14	19–68	100	100	8 hours	V	Tote bag
Bray & Edwards [100]	3		100	100	3 weeks	P	
Nyamathi <i>et al.</i> [101]*			100	100		P	
Brown & Hanis [102]	1		100	100		P	
Castro <i>et al.</i> [103]	1–3 in 14 churches	27–67	100	100		V	\$500/year
Bird <i>et al.</i> [104]; Pérez-Stable [105]	78		Some husbands active	100	18 hours	V	Child care, \$500 after 5 months volunteer work, certificate
Singer & Marxuach-Rodriguez [106]	6		0	100		V	
Baker <i>et al.</i> [107]	2			100		P	
Booker <i>et al.</i> [108]	33	32	50		20 hours	P	
Corkery <i>et al.</i> [109]*	1		100	100			
Warren [110]							
Flaskerud & Nyamathi [111]			100	100		P	
McQuiston & Uribe [112]; McQuiston & Flaskerud [113]; McQuiston <i>et al.</i> [114]	18	19–39	83	100	21 hours	V	Incentive, mileage reimbursement, child care

Table II. Continued

Study	No. of LHAs	LHA mean age (years)	% LHA female	% LHA Latino	Training length	Volunteer (V) or paid (P)	Other incentives
Hiatt <i>et al.</i> [115]	7		100			P	
McElmurry <i>et al.</i> [116]					170 hours	P	
Hunter <i>et al.</i> [39]*	1		100	100			
Mayo <i>et al.</i> [117]	45		100			V	
Hansen <i>et al.</i> [118]	4	40–57 yo	100	100	20 hours	V	Mileage reimbursement, child care
Martin <i>et al.</i> [119]	11			100	15 weeks + 12 hours	P	
Reinschmidt <i>et al.</i> [120]	1	40	100	100			
Ingram <i>et al.</i> [121]			100	100		P	
Thompson <i>et al.</i> [122]	Minimum of 10 at any time		100	100	10 sessions + 42 hours	P	

ESL = English as a second language; NR or empty cell = not reported/missing; asterisks denote articles with outcomes.

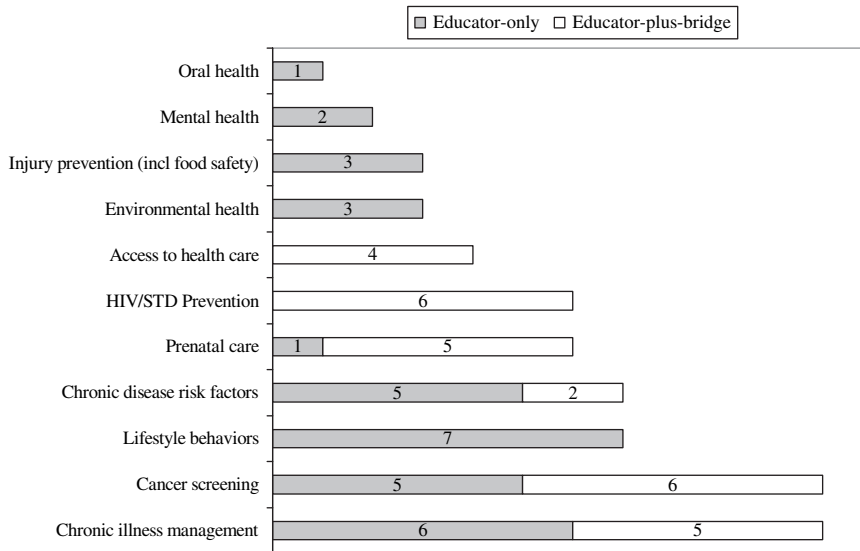
organizational setting. The intervention delivery modality in educator-only programs usually involved several home visits and/or group classes, whereas educator-plus-bridge programs generally consisted of one or two individual contacts in a participant's home or at the clinic. Finally, educator-only programs were generally much longer in duration than educator-plus-bridge programs.

### Outcome evaluation

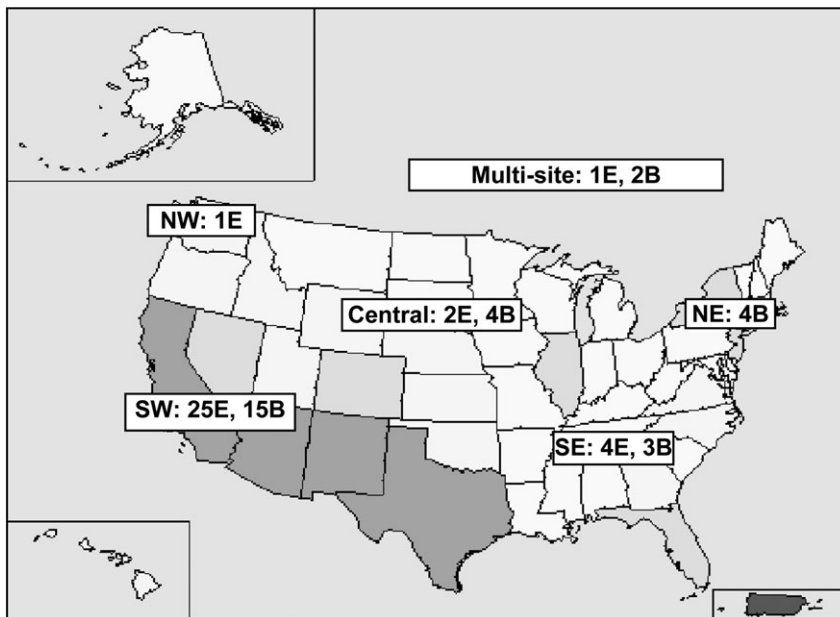
A third of the educator-only programs versus half of the educator-plus-bridge programs assessed changes in health status; a similar proportion of educator-only and educator-plus-bridge programs assessed changes in health care use (25% versus 23%, respectively). The most common variables assessed in both programs were psychosocial (54% and 50%, respectively) and behavioral outcomes (69% and 75%, respectively). The follow-up time points were much longer in educator-only programs versus the educator-plus-bridge programs, although retention rates in both types of programs were generally high and fairly similar. Together, these latter two findings indicate high participant retention rates of up to 24 months of follow-up.

From this review, it appears that LHA programs can achieve significant changes in a variety of health-related factors for Latino populations. In all but one educator-only program, we observed significant improvements in health behaviors, irrespective of health target. Educator-only programs were also effective at improving health status in three of the five studies assessed. Changes in psychosocial variables were less evident and found only in studies in which lifestyle behavior change was targeted. Two of three educator-only programs reported significant changes in several health care use variables, although results were inconsistent. Among the four educator-plus-bridge programs, only one achieved significant improvements in health care use [39].

Process evaluation activities assessed indicated that educator-only LHA programs were the only ones reporting changes in the LHAs themselves, with increases in knowledge and behaviors observed.



**Fig. 2.** Latino LHA studies by health outcome and LHA role ( $N = 61$ ).



**Fig. 3.** Geographic distribution of 61 LHA studies, with darker map zones depicting greater concentrations of Latinos/Hispanics (E = educator only, B = educator plus bridge).

**Table III.** Intervention and study design characteristics of rigorously evaluated programs ( $n = 17$ ; 13 educator only and 4 educator plus bridge)

Study	Recruitment	Intervention and study design characteristics			
		Target	Setting	Time in months	LHA delivery modes
Educator Watkins <i>et al.</i> [52, 53]	Convenience, LHA	Mother/child	Home, organization		Individual contact with LHA; dose and frequency not specified
Navarro <i>et al.</i> [55–57]	LHA	Female	Organization, community	3	Twelve weekly LHA-led group classes with demonstrations
Hanson [60]	Convenience	Family	Home, organization	24	LHA-led 1- to 2-hour home visits at day 3 or 4 of intervention phase, and 2, 4, 8, 14 and 20 months
Bell <i>et al.</i> [64]	LHA			9	LHA-led food preparation demonstrations
Buller <i>et al.</i> [65]; Larkey <i>et al.</i> [66]	Convenience	Female, male	Organization	9	Two hours a week; LHA used various communication and demonstration strategies to deliver messages individually and in groups
Woodruff <i>et al.</i> [73]	Convenience	Female, male, family	Home	3	Four 1- to 2-hour LHA home visits and three 15- to 30-min telephone calls tapered over intervention period
Conway <i>et al.</i> [75]; Rodriguez <i>et al.</i> [76]; Woodruff <i>et al.</i> [77]	Convenience	Family	Home	4	Six home visits or telephone calls
Forst <i>et al.</i> [78]	LHA	Female, male	Other	4	One individual and one group LHA-led session
Elder <i>et al.</i> [43, 44, 79]	Random	Female	Home	3	Twelve weekly LHA home visits (or telephone calls if visit not possible) and 12 weekly tailored newsletters
Martin <i>et al.</i> [83]	Convenience	Family	Organization	1 hour	One-hour-long session on car seat safety with demonstrations
Lujan <i>et al.</i> [86]	Convenience	Female, male	Organization	6	Eight weekly 2-hour LHA-led group classes with demonstrations plus biweekly telephone calls, followed by 16 weeks of biweekly postcards
Sauaia <i>et al.</i> [87]; Welsh <i>et al.</i> [88]	Convenience	Female, community	Home, organization	60	At least bimonthly LHA outreach visits to assigned church to meet with individuals and conduct groups, plus 1–3 group discussions in homes
Vincent <i>et al.</i> [89] <sup>a</sup>	Convenience, LHA	Female, male	Organization	2	Eight weekly 2-hour group classes with demonstrations and modeling by LHA and weekly LHA telephone calls

**Table III.** *Continued*

Study	Recruitment	Intervention and study design characteristics		
		Target	Setting	Time in months LHA delivery modes
Bridge	Dawson & Robinson. [92]	Mother/child	Home, organization, community	16
	Nyamathi <i>et al.</i> [101]	Female	Organization	2 hours
	Corkery <i>et al.</i> [109]	Female, male	Organization	3.4
	Hunter <i>et al.</i> [39]	Female	Home, organization	2

<sup>a</sup>Information reported in this article was inconsistent between the text and the tables. Information reported here is from the table.

## Discussion

In this systematic review of LHA studies targeting US Latinos, our aim was to better understand differences in study design features between educator-only and educator-plus-bridge programs, as well as determine whether those employing a rigorous study design differed on implementation features and study outcomes. Our larger goal was to provide insights on how these two types of programs differed in addressing the health care needs of US Latinos. What we found, however, was that information on most dimensions we examined was seldom reported alongside outcome data in rigorously designed studies, limiting the conclusions that we could draw about key differences that may have been responsible for the outcomes.

### Summary of findings

Reflecting on our first two research questions, analyses indicated that educator-only programs, on average, reached significantly more participants than educator-plus-bridge programs. A second important finding was that educator-only programs involved more volunteers than educator-plus-bridge programs; 50% of educator-only versus 33% of educator-plus-bridge programs engaged LHAs as volunteers. Equally interesting was the observation that since 2004, almost all published studies on educator-only programs employed LHAs as paid staff members. Such a trend was not observed in the educator-plus-bridge programs. This may be explained by the greater number of chronic disease management programs published in the last few years and LHAs' more formal integration in the health care system [40].

Reflecting on our second two research questions, we examined whether educator-only versus educator-plus-bridge programs differed in their intervention delivery modalities so as to suggest differences in feasibility of implementation, and potential to replicate, disseminate and sustain the programs. In this area, we observed few differences by role. Fewer of the educator-only programs involved the direct participation of an organization compared with 100% of the educator-plus-bridge



**Table IV.** Study outcome characteristics of rigorously evaluated programs ( $n = 17$ ; 13 educator only and 4 educator plus bridge)

Study	Comparison group(s)	Retention at each follow-up	Assessment type	Outcomes	Process evaluation	
Educator	Watkins <i>et al.</i> [52, 53]	Standard care	NR: 68 (14%)	1, 4, 5	NR: LHA $\uparrow$ knowledge ( $P \leq 0.001$ ) and sick child visits ( $P \leq 0.05$ ). No change in health status (e.g. child birth weight) and prenatal visits based on medical records	LHA knowledge $\uparrow$ ( $P \leq 0.05$ ); 66% of clinic visitors had some contact with LHAs
	Navarro <i>et al.</i> [55–57]	LHA in community living skills	3 months: 361 (71%); 12 months: NR; 24 months: NR	3, 4	3 months: cancer-specific LHA $\uparrow$ self-reported monthly BSE ( $P \leq 0.001$ ) and mammograms ( $P \leq 0.05$ ) compared with control, and approached significance for Pap tests ( $P \leq 0.10$ ). No effect on clinical breast exam. 12 and 24 months: NR	88% of women who completed pre- and post-test attended at least half of the sessions
	Hanson [60]	Standard nurse-delivered asthma care	6 months: NR; 12 months: 193 (64%); 24 months: 188 (62%)	2, 3	6 months: $\uparrow$ self-efficacy in both groups ( $P \leq 0.001$ ), but no group-by-time effects. 12 and 24 months: $\uparrow$ observed in self-efficacy from baseline was retained at 12 and 24 months in both groups ( $P \leq 0.001$ ), but no group-by-time effects on self-reported asthma management and self-efficacy	51% of home visits completed
	Bell <i>et al.</i> [64]	No treatment following a media and physician campaign	Immediate: 165 (100%); 6 months: 47 (28%)	2, 3, 5	Immediate: LHA $\uparrow$ use of pasteurized milk ( $P \leq 0.01$ ) and improved attitudes toward pasteurized milk ( $P < 0.01$ ) compared with control. No changes in outcome expectations. 6 months: LHA improvements observed at immediate post-intervention maintained ( $P \leq 0.01$ ). Decreases in incidence of Salmonella	Similar changes observed in LHAs; LHAs increased requests of pamphlets; control condition improved residents' knowledge

Table IV. *Continued*

Study	Comparison group(s)	Retention at each follow-up	Assessment type	Outcomes	Process evaluation
Buller <i>et al.</i> [65]; Larkey <i>et al.</i> [66]	No treatment following a work site wellness program	18 months: 664 (73%); 24 months: 559 (62%)	2, 3	18 months: LHA ↑ daily servings of fruits and vegetables based on diet recall ( $P \leq 0.001$ ) and Food Frequency Questionnaire ( $P \leq 0.01$ ), ↑ awareness of 5-a-day program, and improved 4 of 5 attitudes ( $P$ s ranged from $<0.05$ to $0.001$ ) compared with control. 24 months: ↑ observed in fruits and vegetables intake maintained on diet recall ( $P \leq 0.05$ ) but not Food Frequency Questionnaire, on awareness ( $P \leq 0.001$ ); and on 3 of 5 attitudes ( $P$ s ranged from $<0.05$ to $0.001$ ).	LHA used encouragement and listening communication strategies with individuals, and modeling and creating context with groups
Woodruff <i>et al.</i> [73]	Referral to quit line	3 months: 282 (90%)	3	3 months: LHA improved 2 abstinence measures compared with control: self-report ( $P \leq 0.05$ ) and physiological ( $P \leq 0.01$ )	Abstainers more involved in intervention than non-abstainers, $P \leq 0.05$
Conway <i>et al.</i> [75]; Rodriguez <i>et al.</i> [76]; Woodruff <i>et al.</i> [77]	No treatment	4 months: 132 (92%); 7 months: 132 (92%); 16 months: 127 (89%)	3	4, 7, 16 months: ↓ in ETS exposure over time in both groups on self-report ( $P \leq 0.001$ ) and physiological measures ( $P \leq 0.05$ ), but no group-by-time effects	Cost of LHA component was \$400/household
Forst <i>et al.</i> [78]	Two groups: LHA distributed protective eyewear but no training and staff distributed protective eyewear	1–4 months: 703 (89%)	1, 2, 3	4 months: improvements in all 3 groups on self-reported use of protective eyewear ( $P \leq 0.001$ ), with LHA training showing greater improvements than LHA distribution alone ( $P \leq 0.001$ ) or staff distribution ( $P \leq 0.05$ ); LHA training improved knowledge compared with 2 other groups (no $P$ value reported). No improvements in risk beliefs	

Table IV. Continued

Study	Comparison group(s)	Retention at each follow-up	Assessment type	Outcomes	Process evaluation
Elder <i>et al.</i> [43, 44, 79]	Two groups: tailored and targeted communication conditions	3 months: 313 (88%); 9 months: 272 (76%); 15 months: 281 (79%)	2, 3	3 months: LHA improved 4 of 11 diet outcomes compared with tailored, and 2 of 11 measures of diet compared with targeted (all $P$ s $\leq$ 0.05); LHA improved behavioral strategies to $\downarrow$ fat and $\uparrow$ fiber compared with tailored and targeted conditions (both $P$ s $\leq$ 0.05). 9 months: LHA versus tailored improved family interactions ( $P \leq$ 0.05), but tailored versus LHA $\downarrow$ barriers for produce consumption ( $P \leq$ 0.01). No time or group-by-time effects on behavioral strategies to $\downarrow$ fat and $\uparrow$ fiber, outcome expectations, barriers to low fat and family support. 9 and 15 months: 3 months effects on diet not maintained	Cost of LHA intervention was \$135 compared with \$45 tailored materials and \$9.30 targeted materials. LHA participants more involved in intervention based on home work assignments completed
Martin <i>et al.</i> [83]	No treatment control group	NR: 78 (87%)	3, 5	NR months: among rear-facing car seats, LHA $\uparrow$ 3 of 11 dimensions of proper car seat placement (all $P$ s $\leq$ 0.05). Among front-facing car seats, LHA $\uparrow$ adherence to safety standards ( $P \leq$ 0.05), $\uparrow$ 6 of 11 dimensions of proper car seat placement (all $P$ s $<$ 0.05) and $\downarrow$ crashes (no $P$ value reported)	
Lujan <i>et al.</i> [86]	Usual care	3 months: 144 (96%); 6 months: 135 (90%)	1, 2, 5	3 months: no time or group-by-time effects on hemoglobin A1c (HbA1c) and diabetes knowledge and health beliefs. 6 months: LHA improved diabetes control (HbA1c; $P <$ 0.001), $\uparrow$ diabetes knowledge ( $P \leq$ 0.01) and worsened diabetes health beliefs ( $P \leq$ 0.01)	

Table IV. *Continued*

Study	Comparison group(s)	Retention at each follow-up	Assessment type	Outcomes	Process evaluation
Sauaia <i>et al.</i> [87]; Welsh <i>et al.</i> [88]	Educational print materials	24 months: registrants	4	24 months: no significant change in mammography rates, although results approached significance ( $P = 0.07$ ). After adjusting for insurance group, age, income, urbanicity and disability, LHA ↑ screening rates ( $P \leq 0.05$ )	Latinas receiving LHA intervention were younger ( $P = 0.06$ ) and poorer ( $P \leq 0.001$ )
Vincent <i>et al.</i> [89] <sup>a</sup>	Usual care	2 months: 18 (90%); 3 months: 17 (85%)	1, 2, 5	2, 3 months: no group-by-time effects for diabetes knowledge, self-efficacy, weight, body mass index and HbA1c	Weekly <i>promotora</i> telephone calls ... seemed to be a successful retention strategy
Bridge Dawson & Robinson [92]	Routine maternity and pediatric care	4 months: 146 (85%)	2, 3	4 months: no time or group-by-time effects on observed feeding styles and self-reported attitudes	Moms receiving LHA contact kept more appointments
Nyamathi <i>et al.</i> [101]	Education only with nurse and LHA; no skill-building enhancements	0.5 months: 213 (91%)	1, 2, 3, 5	0.5 months: enhanced LHA condition ↑ self-reported concern ( $P \leq 0.01$ ). Changes in both groups on self-reported emotion-focused coping, appraisal, attitudes toward AIDS, knowledge, multiple partners, use of i.v. drugs, use of non-i.v. drugs, depression and distress (all $P$ s $\leq 0.001$ ). No time or group-by-time effects on problem-focused coping	60 women who were enrolled in the study refused to participate due to lack of time
Corkery <i>et al.</i> [109]	American Diabetes Association guideline nurse-delivered care	3.4 months: 40 (63%); 7.7 months: NR	1, 3, 5	3.4, 7.7 months: no group-by-time effects on any measures. Among program completers, changes over time were observed on knowledge ( $P \leq 0.001$ ), following a meal plan ( $P \leq 0.01$ ), carrying fast-acting sugar ( $P \leq 0.001$ ), performing daily foot care ( $P \leq 0.001$ ) and measured glycol hemoglobin ( $P \leq 0.001$ )	LHA ↑ participant completion of the program ( $P \leq 0.01$ )
Hunter <i>et al.</i> [39]	Postcard reminders	NR months: 98 (97%)	4	NR months: LHA ↑ self-reported health care utilization over control ( $P \leq 0.05$ )	

NR or empty cell = not reported/missing; BSE = breast self-examination; ETS = environmental tobacco smoke; ↑ = increase; ↓ = decrease.

Key to assessment type column: 1 = knowledge; 2 = psychosocial; 3 = behavioral; 4 = health care use; 5 = health status.

<sup>a</sup>Information reported in this article was inconsistent between the text and the tables. Information reported here is from the table.

programs that did. Organizational participation may help sustain a program [29]. Educator-plus-bridge programs, however, were more likely to involve one-on-one LHA contact versus group contact and may require more resources to implement. Importantly, we found no differences by role in number of outcomes targeted or achieved.

### Unexpected results

An unexpected result of our analysis involving all 61 studies was the greater number of educator-plus-bridge programs conducted in Central and Northeast regions of the United States. This imbalance may reflect geographic differences in the proportion of bilingual/bicultural providers in those regions and, more generally, differences in immigrant-receiving status in those regions [2]. Newer immigrant-receiving communities, perhaps less familiar with the language and cultural needs of non-native-born peoples [26], may make the bridge role of the LHA critical for these groups' access to health care. But this operationalization of bridging is limited and does not reflect the reciprocal nature of people and the places in which they live. Bridging interventions may be equally important in communities where language is not a barrier because they target multiple levels of the socio-ecologic framework [41], from the individual to the organization or community. Bridging LHA interventions may better contextualize health behaviors and force program developers to consider the multiple levels of influence on health behavior change.

A second unexpected finding was that most of the 61 studies reached a predominantly Mexican immigrant/Mexican American community. Only five educator-plus-bridge programs involved communities other than this Latino subgroup. Research and practitioners seeking to intervene with other Latino subgroups may need to consider the potential generalizability of current evidenced-based approaches.

### Limitations

Conclusions can be difficult to draw from any systematic review given differences in how study

information is reported, if at all. By dichotomizing the LHA role, we may have misclassified activities that we were forced to place under one category or the other and, by inference, the value LHAs place on these various activities [42]. We may not fully understand the range of roles that LHAs play. For those studies reviewed, we note the large number of cases with missing data and the limitations that missing data present for drawing meaningful conclusions. The most notable limitation was the lack of available educator-plus-bridge programs to draw from and as a consequence the limited characterization of bridging represented by this research. This limitation highlights where research is clearly lacking. Only one-quarter of the studies with outcome data involved educator-plus-bridge programs, compared with almost 50% of all studies originally included in our review, possibly indicating that educator-plus-bridge programs are more likely to be service delivery programs lacking an efficacy evaluation. Another limitation is that few, if any, studies examined the effect of the intervention on the LHAs themselves. As members of the communities being targeted, their roles and responsibilities may have had significant impact on their lives, which in turn may affect the program's reach and sustainability. Very few studies examined this dimension.

Errors can occur at many stages of a review process, from failing to identify published studies to incorrectly abstracting information from the studies selected [32]. The latter limitation was tempered by the double-verification approach we used at nearly all possible points of comparison, from identifying the literature to abstracting information from the database. As reported, interrater reliabilities supported the validity of the conclusions we drew. They also suggested where improvements in reporting guidelines are needed. For example, where multiple sources of the same study were used to summarize study findings, we identified inconsistencies in the information reported, including from our own research. In one of our own articles, we reported training five *promotoras* at baseline [43] but, when describing our intervention effects, we reported on only four *promotoras* who actually

delivered the intervention [44]. Both statements are correct but these types of inconsistencies add another layer of complexity when the objective is to examine the application of an intervention approach across a heterogeneous field. With better reporting guidelines for intervention studies, we would be in a stronger position to build the science around peer support interventions in a more systematic efficient manner.

### Specific recommendation for future research

What is clear from this review is that future studies need to employ rigorous experimental methods, report on all outcomes and examine the association between intervention methods and their outcomes. This latter research question is best informed by details on program implementation, such as LHA recruitment, training and retention strategies [24]. For example, comparisons of volunteer and paid models [24] may contribute to the design of programs that include both giving LHAs the opportunity to move up a professional ladder and improve their economic situation [24]. Efforts to replicate, disseminate and sustain these types of programs require information on efficacy and implementation.

### Conclusions

This review comes on the heels of several recently published studies that complement our findings [45, 46]. Consistent with our categorization scheme, the 200 respondents of the *Promovision promotoras*' survey [42] identified several different roles played by HIV prevention *promotoras* but did not specify how those roles were linked to outcomes. As a first step toward improving this line of research, additional characteristics of the LHAs, their roles and the interventions themselves need to be documented alongside outcomes to determine what roles LHAs are best suited for and which achieve more successful outcomes. Disentangling the most important dimensions of LHA programs will inform a burgeoning area of public health practice and can lead to a cumulative science of public health practice, as well as begin to address recent calls for

comparative effectiveness studies (see [http://grants.nih.gov/grants/funding/challenge\\_award/](http://grants.nih.gov/grants/funding/challenge_award/)).

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