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The Role of Lay Health Advisors in Cardiovascular Risk Reduction: A Review

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Abstract Interventions are needed to reduce the negative impact of cardiovascular disease. The combination of health risks for disease, disability, and mortality, particularly among underserved populations, might be best addressed with programs designed to enhance awareness and development of resources within a context of community support. The objectives of this review were to: (1) provide a comprehensive review and evaluation of the roles, evaluation, and effectiveness of LHA in community-based programs with an emphasis on cardiovascular risk reduction; and (2) provide recommendations for future research involving LHA in such programs. Computer and manual searches were conducted of articles in the English-language literature from 1980 to 2007. Twenty articles were evaluated, which emphasized the role of the LHA in cardiovascular risk reduction. A review of research literature provides a starting point for determining salient approaches for intervention and evaluation, issues related to program implementation and sustainability, and strengths and limitations of existing approaches.

Keywords Lay health advisors · Cardiovascular risk reduction · Community-based interventions

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Introduction

Cardiovascular disease (CVD) is the leading cause of death and disability in the United States and most industrialized countries (American Heart Association 2006). Mortality rates from CVD are particularly high among lower socio-economic groups and ethnic minorities (American Heart Association 2006). Clearly, interventions are needed to reduce the negative impact of CHD, particularly among vulnerable and minority populations.

The combination of health risks for disease, disability, and mortality, particularly among underserved populations, might be best addressed via programs designed to enhance awareness and develop resources within a context of community support (Minkler and Wallerstein 1997). Community-based interventions which address social and cultural resources offer important opportunities to decrease premature morbidity, disability, and enhance the health status of underserved populations. Andrews et al. (2004) and DeBate and Plescia (2005) note that traditional community-based initiatives may underestimate the complexity of the formal and informal community structures and contextual resources that impact health promoting behaviors. Integrative designs for community-based interventions have been recommended, including interventions which incorporate social network support and the development of sustainable resources.

Lay Health Advisor (LHA) interventions have garnered increasing recognition as an influential health promotion and disease prevention strategy (Walker and Jan 2005). The involvement of Lay Health Advisors or "natural helpers" in the design, implementation and evaluation of health promoting interventions has been proposed as a mechanism to ensure that preventive programs address issues of importance to the community and promote

sustainable, community-wide change (Eng and Young 1992; Eng et al. 1997; Marin et al. 1995; Roman et al. 1999). Eng and Young 1992 and Eng et al. (1997) have characterized a LHA as a member of the community who is turned to for care, advice, information, support, and to overcome barriers inherent to risk reduction. LHA interventions are conceptualized as culturally-relevant approaches to health promotion which build on community strengths and resources, and foster the impact of naturally existing sources of social and community support. Several aspects of LHA interventions have been proposed as relevant for health behavior and health education practice, including the potential for enhancing a community's problem-solving capacity. First, as a social network strategy (Kim et al. 2005), LHA approaches are guided by the assumption that individual's behavior is influenced by the social groups to which they belong, and from which they derive their "social identity" (Eng and Young 1992; Eng et al. 1997). Thus, LHA interventions are thought to offer a powerful means of addressing health-related attitudes, beliefs, and social norms at the social network and community levels (McQuiston et al. 2001). Second, because the LHA role has been designed to provide comfort to people who know and trust them, they may function as a unique "community-based system of care and social support" that complements formal systems of care. Finally, because LHAs typically share program participants' language, religious beliefs, and/or social and ethnic characteristics, they have the potential to serve as "cultural brokers" for underserved, hard to access, and minority populations. In this capacity, LHA can transcend their social networks, mediating the relationship between communities and local agencies, negotiating services for people in need, and organizing community groups to improve and broaden the scope of available services.

A number of health promotion interventions and community-based programs have utilized LHA to address the specific health needs of priority populations (Andrews et al. 2004; Farquhar and Michael 2004; Fedder et al. 2003; Martin et al. 2006; Navarro et al. 2000; Reinschmidt et al. 2006; Woodruff et al. 2002). Many of the programs established thus far have focused on the role of LHA in HIV/AIDS and other sexually transmitted disease prevention (Martijn et al. 2004; McQuiston et al. 2001), mammography for women (Earp et al. 1997), cancer detection (Lopez and Castro 2006; Perez-Stable et al. 1996), and perinatal education (Warrick et al. 1992). Integrative reviews have examined LHA effectiveness in research ethnic minority women (Andrews et al. 2004), LHA effectiveness in community-health promotion and disease prevention (Swider 2002), and LHA effectiveness in primary and community health care (Lewin et al. 2005). Despite the long history of LHA interventions, limited data exist on the use, roles, and effectiveness of LHA programs related to cardiovascular risk reduction.

Community-based programs and interventions aimed at cardiovascular risk reduction have often been developed without adequate integration of social and contextual factors that affect the problem under consideration (Benjamin et al. 2005), and many have shown limited evidence of differential effects in outcomes. LHA may play a unique role in addressing these social and contextual factors to enhance cardiovascular health outcomes, particularly in underserved communities. Thus, the focus of this review was to assess the roles, evaluation, and effectiveness of cardiovascular risk reduction programs utilizing LHA approaches. The reviewed interventions include an emphasis on risk reduction in the areas of: smoking, hypertension, diabetes management, physical inactivity, and nutrition/dietary intake. The objectives of this review were to: (1) provide a comprehensive review and evaluation of the roles, evaluation, and effectiveness of LHA in community-based programs with an emphasis on cardiovascular risk reduction; and (2) provide recommendations for future research involving LHA in community-based programs with an emphasis on cardiovascular risk reduction A review of the current research literature provides a starting point for determining salient approaches for intervention and evaluation, issues related to program implementation and sustainability, and strengths and limitations of existing approaches.

Methods

Computer and manual searches were conducted of articles in the English-language literature from 1980 to 2007. The following databases were utilized for identification of Lay Health Advisor literature: PsychInfo, PubMed, Medline, Social Science Databases, the Cochrane Review, and manual searches. Only research studies which incorporated LHA intervention as a basis for cardiovascular risk reduction among adults were chosen for review. LHA was defined consistent with the Cochrane Collaboration (2005) definition as any health worker carrying out functions related to health care; trained in some way in the context of the intervention; and having no formal certification as a health care professional. The following key terms were used during all searches: Lay Health Advisor, natural helper, community health worker, peer health educator, *promotora de salud*, community outreach worker, health education, cardiovascular risk, disease management, health promotion and disease prevention, physical activity, diet, nutrition, smoking cessation, and wellness. Article inclusion criteria were based on the following: (1) data-based publications focusing on cardiovascular risk reduction

including smoking cessation, hypertensive management, diabetes management, weight management, dietary modification, modification of blood lipids, and promoting physical activity; (2) LHA-facilitated implementation of health promotion programs; (3) study outcomes delineated beyond a description of the program itself. The variables used in this analysis include target population, specified health behavior change, theoretical perspective, intervention implementation strategies, the role of LHA, LHA training, study outcomes, and documentation of LHA process data.

Results

Twenty studies were identified concerning LHA interventions for cardiovascular risk reduction (Table 1). Four studies focused on smoking cessation (Lacey et al. 1991; Schorling et al. 1997; Voorhees et al. 1996; Woodruff et al. 2002), one on hypertensive management (Smith et al. 1997), four targeted physical activity (Keller and Gonzales 2009; Poston et al. 2001; Tudor-Locke et al. 2000; Whitehorse et al. 1999), one on nutrition (Wiist and Flack 1990), one on diabetes management (Teufel-Shone et al. 2005), one focused on physical activity and cardiovascular education (Hatch et al. 1986), five on a combination of physical activity and nutrition (Campbell et al. 2002; Kanders et al. 1994; Lewis et al. 1993; McNabb et al. 1997; Staten et al. 2005), one on combination of nutrition, physical activity, and hypertensive management (Sutherland et al. 1992), one on a combination of diabetes management, physical activity, and nutrition (Keyserling et al. 2002), and one on a combination of physical activity, nutrition, and maintaining a smoke free environments (Kim et al. 2004).

Population and Setting

The majority of studies measured the effect of interventions targeted at vulnerable and underserved populations, including rural dwelling and urban African Americans, African American women, older adults, and lower income women. Seven studies were identified that focused on Hispanic community members (Keller and Gonzales 2009; Kim et al. 2004; Poston et al. 2001; Staten et al. 2005; Teufel-Shone et al. 2005; Whitehorse et al. 1999; Woodruff et al. 2002). The interventions ranged in approach from individually focused to community-oriented and church-based. Rural and urban African American populations were involved primarily in community-focused interventions through Housing Authority Coalitions and community churches. Hispanic populations reflected those residing in border communities and urban settings, accessed through community centers and clinics. Campbell et al. (2002) implemented an LHA model for women working in blue-collar occupations at nine worksites in rural North Carolina.

LHA Role

Across studies, LHA assumed a variety of complementary roles in program design and implementation. The specified roles differed according to the purpose, design, and the intervention focus of each study. The majority of studies incorporated the LHA in intervention recruitment and delivery, specifically strategies such as providing program information as well as support and motivation for ongoing participation, leading educational classes, one-on-one counseling regarding risk behavior, and participation in church and community-based physical activity groups. Sutherland et al. (1992) involved LHA as part of the larger community in the process of problem identification and the development of intervention strategies to promote regular physical activity. Overall few studies focused on the role of LHA in resource identification, development, or the appropriate use of community services. Despite description of intervention components, specific details on LHA contact with participants and role expectations in intervention implementation was limited.

LHA recruitment relevant to their role differed across studies evaluated. In the majority of studies LHA were matched by gender, race, and ethnicity to the target population. Among those studies that described LHA recruitment, individuals were recruited based on their involvement in the community, demonstrated leadership, and interest in health-related issues. In a number of studies LHA were identified by church pastors, congregates, existing coalitions, or community advisory boards. Keyserling et al. (2002) specifically recruited LHA with type 2 diabetes, based on their experience with relevant issues in diabetes management. Few studies addressed LHA attrition, mechanisms for retention, or development of LHA as a sustainable community resource. Among those studies that addressed LHA training, documentation of training for LHA roles varied from 4 to 45 h, and included educational seminars, role playing, and interactive practice sessions targeting education, support, and behavioral change. Kim et al. (2004) also included training on human subject protection in research and strategies for recruitment, data collection techniques, and safety issues.

Implementation Strategy

Strategies for intervention implementation varied widely. In a number of studies, LHA activities were one component of multi-level interventions which involved both individual

Table 1 Summary of LHA interventions in CHD risk reduction

Study	Sample and setting	Behavior targeted	Theoretical perspective	Intervention implementation strategy	Role of LHA	Outcomes/LHA process data	Strengths and limitations
Campbell et al. (2002)	538 Female blue collar workers 9 Blue collar worksites in rural North Carolina	Physical activity, nutrition	Ecological model Social cognitive theory Transtheoretical model Social support	RCT Computer tailored health messages Natural helpers Delayed intervention 18 Months	Facilitated intervention Social support LHA training: bimonthly 18 Months	Flexibility and muscular strength exercises 6 Months ($p < .05$) 18 Months ($p < .01$) Consumption of fruits and vegetables 18 Months ($p < .05$) Consumption of fat 6 months ($p < .05$) LHA process data: exposure to intervention 29%	S: theory-based RCT Formative process LHA training and process L: self-report data Sustainability
Hatch et al. (1986)	14 Female church members African American churches in North Carolina ($N = 6$)	CV education, Physical activity	Not reported	Ministerial workshop Aerobic training Education Skill building Pastor Sermons Testimony support Single group	PA instructors Health advocates Skill building Education leaders Institutionalization LHA training: Not reported	Improved flexibility (85%) Reduced SBP (50%) Decreased body fat (90%) Improved endurance (70%) Improved resting heart rate (40%) LHA process data: Qualitative indicators of community interest	S: multi-level approach Formative process Sustainability L: not theory-based Single group design Limited description LHA training limited description outcome measures
Kanders et al. (1994)	67 African American women Aged 40–64 years	Physical activity, nutrition	Not reported	Single group Group PA Problem solving Goal setting Role playing Education Behavior modification 10 Weeks	Reviewed educational materials, recipes, menu plans for cultural relevance LHA training: Not reported	Weight loss ($p = .0001$) PA ($p < .05$) LHA process data: Not reported	S: Formative process L: Not theory-based Single group design Limited description LHA training and process Limited sustainability

Table 1 continued

Study	Sample and setting	Behavior targeted	Theoretical perspective	Intervention implementation strategy	Role of LHA	Outcomes/LHA process data	Strengths and limitations
Keller and Gonzales (2009)	18 Hispanic women Postmenopausal Obese Sedentary	Physical activity	Not reported	RCT 3 Day walking 5 Day walking 36 Weeks	Recruitment Group walking Education Social support LHA Training: Not reported	BMI ($p = .001$) BI ($p < .05$) Weight ($p < .05$)	S: RCT Formative process L: not theory-based Limited description of LHA training and process
Keyserling et al. (2002)	200 African American women Type 2 DM 7 Primary care practices in North Carolina Clinic and community ($N = 67$) Clinic ($N = 66$) Minimal ($N = 67$)	Diabetes management, physical activity, nutrition	Behavior change theory	RCT Clinic and community Clinic Minimal Clinic and community (12 months): Individualized counseling Group sessions monthly calls LHA Clinic (6 months): individualized counseling Minimal (6 months): Mailed educational pamphlets	Social support Reinforce goals Assist with group sessions Monthly phone calls LHA Training: 4 h	Age adjusted PA ($p = .0055$) Diabetes knowledge ($p = .037$) LHA process data: # of phone calls to participants	S: theory-based RCT Formative process L: limited description LHA training Limited sustainability
Kim et al. (2004)	256 Community residents Underserved Latinos	Nutrition, physical activity, smoke free environment	Community empowerment	Community-based participatory research Single group design 3 Classes, 6 weeks	Led health education classes Program recruitment Data collection LHA training: 45 h	Significant improvements: Lifestyle behaviors ($t = 13.40$, $p < .001$); Nutrition ($t = -10.97$, $p < .001$); Physical activity ($t = -12.46$, $p < .001$); Smoke-free behavior ($t = -2.61$, $p < .05$) LHA process data: Effectiveness in recruitment Conduct of health promotion programs Outreach classes	S: Formative process LHA training and process L: single group design Self-report data

Table 1 continued

Study	Sample and setting	Behavior targeted	Theoretical perspective	Intervention implementation strategy	Role of LHA	Outcomes/LHA process data	Strengths and limitations
Lacey et al. (1991)	235 Female African American smokers 4 Chicago housing authority developments	Smoking cessation	Health Communication Behavior Change model	2 Group design Intervention: 20-day televised smoking cessation program Classes (6) Comparison: Reminder visits (3 visits)	Recruitment Program promotion Led smoking cessation classes Provided reminder visits LHA training: Not reported	11% Intervention group quit smoking No participants in comparison group quit LHA process data: delivered over 14,000 flyers 200 Pamphlets recruited 235 people	S: theory-based L: limited description of LHA training and process Limited formative process Limited sustainability
Lewis et al. (1993)	Low income rental housing units African American Housing authority of Birmingham communities	Physical activity, nutrition	Not reported	RCT Intervention Wait-list Control Community-based PA Behavioral support goal setting education 12 Months	PA support Education Led PA groups Program sustainability LHA training: length not specified	Attendance at group exercise ($p < .05$) PA higher in control community ($p < .001$) LHA process data: not reported	S: formative process L: not theory-based Limited LHA process data Limited sustainability
McNabb et al. (1997)	39 African American women 3 African American churches intervention ($N = 19$) control ($N = 20$)	Physical activity, nutrition	Not reported	RCT Intervention Wait-list control culturally-relevant education individualized Behavior change Group problem solving 14 Weeks	Education Support LHA training: 9 h Regular feedback	Weight loss ($p < .0001$) Reduction in BMI ($p < .0001$) Waist circumference ($p < .02$) Decrease in high fat food ($p < .05$) increase in positive eating behaviors ($p < .002$) LHA process data: not reported	S: RCT L: not theory-based Limited formative process Limited LHA process data Limited sustainability

Table 1 continued

Study	Sample and setting	Behavior targeted	Theoretical perspective	Intervention implementation strategy	Role of LHA	Outcomes/LHA process data	Strengths and limitations
Poston et al. (2001)	379 Mexican American women BMI 25–40 Nondiabetic	Physical activity	Social cognitive theory	RCT Block design Intervention Wait-list control Culturally-relevant support Manage negative influences Restructure environment 12 Months	Support Social reinforcement Walking clubs LHA training: Not reported	No significant findings LHA process data: not reported	S: RCT Theory-based L: limited formative process Limited description of LHA training and process Limited sustainability
Schorling et al. (1997)	652 African American smokers Two Virginia counties	Smoking cessation	Transtheoretical model Community empowerment	2 Group design Intervention county Control county Personal counseling Community-wide activities Smoking cessation contest Information dissemination 18 Months	Personal counseling Presentation to congregation LHA training: 8 h	Coalition targeting smoking cessation Cessation rate 18 months (9.6%) versus (6.2%) LHA process data: exposure to intervention (15.4%)	S: theory-based Multi-level approach Formative process Sustainability L: self-report data
Smith et al. (1997)	97 African Americans with HTN	HTN management	Social support Crisis of physical illness	Single group design Church-based education Health committee 8 Weeks	Social support Education Program planning Institutionalization Dissemination LHA training: 24 h	Knowledge ($p < .0001$) 3 Months SBP ($p < .001$) 3 months MAP ($p < .0001$) 3 months DBP ($p = .0008$) 8 weeks LHA process data: qualitative self-assessment	S: theory-based LHA training L: Single group Limited formative process Limited sustainability

Table 1 continued

Study	Sample and setting	Behavior targeted	Theoretical perspective	Intervention implementation strategy	Role of LHA	Outcomes/LHA process data	Strengths and limitations
Staten et al. (2005)	216 Hispanic community members Border counties	Physical activity, nutrition	Social support	Single group design Education Community advocacy Walking clubs 12 Weeks	Curriculum design Dissemination LHA training: 6 h	Fast walking ($p = .002$) Moderate walking ($p < .001$) Fruit intake ($p < .001$) Vegetable intake ($p < .001$) Program integration to community Coalitions LHA process data: observational data community behavioral change	S: theory-based Multi-level approach Formative process Sustainability L: single group design Self-report data
Sutherland et al. (1992)	Southern rural African American churches ($N = 6$) Rural Florida	Physical activity, nutrition, HTN management	Not reported	Single group design Community awareness Education Social change Health screen	Problem identification developed intervention strategies LHA training: 8 weeks	Reduction in BP Weight loss increase number and duration of PA Changes in community values LHA process data: none reported	S: formative process Sustainability L: not theory-based Single group design Limited description of measures
Tudor-Locke et al. (2000)	Individuals with DM ($N = 12$) Canada clinics and hospitals	Physical activity Program formative evaluation	Social cognitive theory	Single group design Pedometer-based PA Group education Motivation Goal setting Self-monitorin g 8 Weeks	Led PA LHA training: 4 h	Program was acceptable and feasible LHA process data: Qualitative evaluation	S: formative process L: limited description of measures Limited sustainability
Teufel-Shone et al. (2005)	72 Hispanic families 249 Participants Arizona border communities	Diabetes management	Social support Social learning theory	Single group design Education Self-efficacy Team building Communication Collective efficacy 3 Home visits 5 Educational sessions 2 Celebratory events 12 Weeks	Education Family support Communication skills LHA training: existing knowledge and role 1 day diabetes training	Decreased sweetened drink consumption ($p < .001$) Increase in family PA ($p = .002$) Increase in family support ($p = .01$) Increase in confidence diet ($p < .001$) Increase in confidence PA ($p < .001$) LHA process data: participant attendance	S: formative process L: single group design Self-report measures Limited description of measures

Table 1 continued

Study	Sample and setting	Behavior targeted	Theoretical perspective	Intervention implementation strategy	Role of LHA	Outcomes/LHA process data	Strengths and limitations
Voorhees et al. (1996)	292 African American church goers 22 Urban churches in East Baltimore	Smoking cessation	Transtheoretical model	RCT Intensive intervention Minimal self-help Stage-specific strategies Environmental interventions Health screening 12 Months	Individual and group counseling support LHA training: Not reported	1 Year follow-up: stages of change (OR = 1.73; $p = .037$) LHA process data: not reported	S: theory-based Formative process Multi-level approach L: limited description of LHA training and process
Whitehorse et al. (1999)	487 Hispanic women Hispanic community & work sites Escondido, CA	Physical activity	Not reported	Single group Weekly moderate PA—Salsa Aerobics Printed nutritional messages Community support 6 Months	Project promotion Motivation Positive role model Education Resource identification Data collection Participant follow-up LHA training: 8.5 h	Enrollment data: 47% of referrals came from friends, 29% from doctors, 13% from family LHA process data: not reported	S: formative process Sustainability L: single group Not theory-based Limited description of LHA process
Wiist and Flack (1990)	African American community members ($N = 348$) African American churches ($N = 6$)	Nutrition	Not reported	2 Group design Nutrition education Usual care 6 Weeks	Intervention delivery LHA training: 6 h	Usual care group lower cholesterol levels ($p < .003$) 6 months Mean cholesterol level intervention group decreased by 10% from baseline LHA Process data: None reported	S: description of LHA training L: not theory-based Limited formative process Limited sustainability

Table 1 continued

Study	Sample and setting	Behavior targeted	Theoretical perspective	Intervention implementation strategy	Role of LHA	Outcomes/LHA process data	Strengths and limitations
Woodruff et al. (2002)	313 Latino smokers San Diego County	Smoking cessation	Social cognitive constructs	RCT Promotora program Helpline comparison 4 Home visits 3 Phone calls Positive reinforcement Stimulus control Modeling Social support Problem solving 3 Months	Educational sessions Community referral and follow-up Collect testimonials Recruitment LHA training: 25 h	Abstinence ($p = .014$) LHA process data: intervention dose	S: RCT Theory-based Description of LHA training L: limited formative process Limited sustainability

and community-wide activities. Individually-focused implementation strategies included the use of behavioral techniques targeting social support and goal setting, and educational strategies, such as the use of structured classes and individualized pamphlets and worksheets. Community-wide activities included church-based sermons, peer screenings, contests specific to behavioral change, and community exercise groups. Overall, intervention strategies were not well defined as a basis for replication. Both Kim et al. (2004) and Staten et al. (2005) implemented a clearly explicated, standardized and culturally relevant curriculum based on *Su Corazon, Su Vida*, a cardiovascular disease prevention manual developed for Latinos by the National Heart, Lung, and Blood Institute (NHLBI) (US Department of Health and Human Services 2000).

A number of studies reported the use of formative research processes in development of intervention strategies and materials. Such processes were implemented to ensure the cultural and contextual relevance of materials to the target population. Lewis et al. (1993) describe a constituency-based model, in which the community played a central role in defining needs, identifying strategies, and carrying them out. Schorling et al. (1997) designed smoking cessation interventions with the assistance of members of the community Coalition Board, while Sutherland et al. (1992) worked with church health committees in planning programs, considering individual needs and available resources.

Evaluation Methods

Few studies focused on the implementation and effectiveness of the LHA role through systematic evaluation of LHA activities. Lacey et al. (1991) provided LHA process data documenting the number of flyers, posters, and pamphlets distributed as well as the number of participants recruited for classes or reminder visits. Keyserling et al. (2002) provided the number of LHA phone calls to participants. In an evaluation of exposure to interventions, Campbell et al. (2002) found that 29% of women had heard about the natural helpers program; they most often received written materials from the natural helpers, followed by discussing health issues and getting together for group activities.

Health Outcomes

Studies differed in the focus of the intervention and the types of outcomes evaluated. The majority of health outcomes included weight loss, change in body mass index (BMI), reduction in blood pressure, and reduction in serum cholesterol levels. Most studies evaluated health outcomes using standardized measures, although some presented a

more qualitative evaluation (Hatch et al. 1986; Sutherland et al. 1992). Where documented, interventions targeting health outcomes ranged from 6 to 36 weeks in length. While studies demonstrated significant outcomes as a result of intervention, many were of single group design, limiting the internal validity of findings.

Behavioral Outcomes

A number of interventions focused on behavioral change on the part of the target population, including smoking cessation, consumption of fruits and vegetables, and the performance of physical activity. Beneficial health outcomes include improved flexibility, increased physical activity, consumption of fruit and vegetables, decreased consumption of dietary fat, and smoking cessation. While promising in terms of cardiovascular risk reduction, documentation of behavioral outcomes were typically short-term, limiting the implications of interventions in understanding changes in health behaviors over time. Overall, the results of studies evaluating the behavioral outcomes of LHA interventions are mixed. In particular, smoking cessation was difficult to achieve, showing minimal effects. While behavioral outcomes were more likely to be evaluated using randomized controlled trials, measures used were typically self-report, and may have been subject to bias.

Knowledge and Motivation

Despite a consistent intervention focus on education, goal setting, and other motivational factors, there is limited evidence of the effectiveness of LHA regarding improvement in knowledge and related motivational outcomes. In this review, few studies focused on knowledge improvement as an outcome. Smith et al. (1997) found an increase in knowledge among African Americans with hypertension. Similarly, Keyserling et al. (2002) found that diabetes knowledge was greater among clinic and community participants versus clinic and minimal treatment groups. In evaluating progression in stage of change as a motivational indicator for smoking cessation among African American church members, Voorhees et al. (1996) identified progress as a process-oriented measure of motivation.

Related Outcomes

A small number of reports documented outcomes including resource identification, program sustainability, and coalition development. Outcomes were not quantitatively measured, but described as part of intervention process data. For example, Lacey et al. (1991) describe multilevel outcomes, although community-level program outcomes were not specifically measured. The program resulted in active involvement in and acceptance of the program by community organizations and leaders in the early planning and promotion of the program. Further, the program was integrated into existing health promotion activities within nurse-run Health Promotion Centers, providing some indication of program sustainability. Schorling et al. (1997) also reported multilevel evaluation methods, examining the effects of a smoking intervention delivered through a church coalition, as well as sense of community within the church, social network development, and the development of interventions for non-church attenders. Staten et al. (2005) noted the integration of the *Pasos Adelante* program within community-based coalitions, which resulted in coalitions working to have parks, playgrounds, and walking paths incorporated into city development plans.

Directions for Research and Practice

Community-based interventions have been identified as critically important for achieving the health objectives for the nation and for reducing health care costs. Utilization of a variety of health promotion theories and implementation strategies has expanded the body of knowledge in community-based programs for cardiovascular risk reduction. Based upon this review, the use of Lay Health Advisors in such programs, particularly those involving ethnic minority populations, may assist in program development, implementation, evaluation, and sustainability. Such programs are critical to address the challenge of developing culturally informed and responsive health promotion programs while also addressing the practical concerns of community members (Castro et al. 2004).

This review included studies using LHA targeting CHD risk reduction primarily in underserved populations, primarily low income, ethnic minority groups. The majority of studies were conducted in response to the pressing health concerns among these populations, such as higher rates of hypertension among African Americans and higher rates of physical inactivity, diabetes, and overweight among African Americans and Hispanics compared to whites (American Heart Association 2006). Ongoing efforts are needed to address the significant health needs and reduce health disparities across minority racial and ethnic groups; among the studies reviewed relatively few included Hispanics, American Indians, or Asians. Whether ethnic minority communities are more likely to respond positively to the LHA approach to cardiovascular risk reduction is not known. However, given the changing demographic composition of the United States, which is projected to have increasing proportions of ethnic minorities (Centers for Disease Control and Prevention 2006),

effective and sustainable interventions to decrease cardiovascular risk in these populations is important from a public health perspective.

Overall, studies targeting knowledge, behavioral change, and health outcomes documented positive results. However, the majority of the outcomes measured were self-report and lacked standardized measures, raising questions about the validity and maintenance of effects. The majority of studies focused on individual-level variables as primary outcomes. While important, these do not provide a full understanding of the potential for community mobilization and change as a result of LHA interventions. Few studies focused on measuring a change in the appropriate use of, or access to community and clinical services by the target population. Thus, we know little about the long term impact of LHA interventions on changes in the community in terms of resource utilization, new resource development, coalition formation, or changes in shared values for cardiovascular health. Evaluation of community-level indicators of intervention effects are needed, to demonstrate changes in community capacity, resource identification, and environmental change. Studies reviewed included relatively few randomized controlled trials, which emphasize the need for rigor in evaluating the effectiveness of LHA interventions (Lewin et al. 2005). One area of concern within the studies reviewed is the lack of significant follow-up to determine the long-term impact of interventions. With some interventions implemented for only several weeks, and an overall limited time to follow-up, the lasting impact of LHA interventions on cardiovascular risk reduction is difficult to evaluate. However, 18 month follow-up results from Campbell et al. (2002) did show a significant difference between intervention and control groups in regards to fruit and vegetable consumption. Voorhees et al. (1996) conducted 12 month follow-up to determine progression through stages of change among intervention and control participants in behaviors that impact cardiovascular risk. These authors determined that the intervention participants were more likely to progress through stages of change than their control counterparts. Balcazar et al. (2006) found that funding limited the ability to evaluate the extent to which project activities associated with follow-up, referrals, and community events to promote heart health resulted in improvements in the number of new patients screened and changes in lifestyle behaviors among participants. The 1 year time constraint in this study resulted in process inconsistency and lack of complete and clear data collection.

Additional studies are needed with clear specification of the intervention and LHA role in the intervention, to provide stronger support for LHA effectiveness. While the majority of interventions included social support, motivational factors, goal setting, and education, it is not clear from the published literature what factors are critical for efficacious interventions. As noted by Lewin et al. (2005), global statements about intervention content and delivery methods limit evaluation of the relationship between health outcomes and the delivery of LHA interventions, including which component of multiple interventions may be responsible for an effect. The mechanisms through which LHA are proposed to effect health promoting behaviors have been described (Eng and Young 1992; Eng et al. 1997); however, few studies adequately operationalized or tested these mechanisms in the research reviewed. While the majority of the studies reviewed documented some positive outcomes, it would be difficult to replicate the studies because of lack of information on the intervention itself, how LHA were trained to deliver the intervention, and the adequacy of intervention delivery. Studies did provide qualitative and quantitative LHA process data, but none of the studies evaluated provided data supporting evaluation of intervention fidelity. Kim et al. (2005) provide a relevant description of LHA recruitment and training, addressing system strengths and challenges in implementing a collaborative outreach program designed to address health disparities in a poor Latino community in Los Angeles. Balcazar et al. (2006) provide such an example in their implementation of the *Salud Para Su Corazon* program for promoting heart-healthy behaviors among Latinos. The authors provide detail on program structure and conceptual framework, the *promotora* training, the program curriculum as a culturally appropriate health education tool, and the application of the *promotora* model to the delivery of the curriculum in Latino communities. Further study into the process of LHA recruitment, training, program delivery, and specification of those elements are necessary for a LHA to be effective would be helpful for future research and program development. The limited current knowledge of LHA health promotion supports a research agenda that includes documentation of LHA activities.

Less than half of the studies reviewed used a theoretical perspective to guide program implementation and evaluation. Of those that included theoretical frameworks, often insufficient detail was provided to permit understanding of the operationalization of the major concepts in the intervention, particularly from a culturally relevant perspective. Many concluded that LHA involvement was significant in enhancing cultural competence, social support, intervention diffusion, and community building activities. However, these concepts were typically not specified as theory-based intervention strategies, or consistently measured as study outcomes. In one LHA-led intervention based on a social support theoretical perspective, which evaluated social support, Smith et al. (1997) found significant effects for blood pressure and knowledge, but no significant change in

perceived social support. Theory-based LHA programs which incorporate formative mechanisms and relevance to the community may show more promising results than those that lack a theoretical basis. For example, use of the ecological framework (focused on multiple levels of change within numerous societal components) in an intervention aimed at fruit and vegetable consumption among female blue collar workers seemed to be a key to success (Campbell et al. 2002). In another study, the *Salud Para Su Corazon* (SPSC) National Council of La Raza (NCLR) *Promotora* Model was used as a theoretical perspective; this model focused on several key components that included theory-based elements to guide participation and social action, as well as community-based organization, and culturally-enriched process dimensions, all of which led to positive cardiovascular health promotion outcomes in Hispanic program participants (Balcazar et al. 2006).

With any health promotion intervention or program, one of the greatest challenges is the sustainability of resources and outcomes generated during the intervention. Many interventions within this review implemented comprehensive programs, but did not necessarily plan for, facilitate, or evaluate continuation of program activities or development of sustainable resources following program funding. Qualitative evaluations did provide some indication of community interest, changes in community values regarding risk reducing behaviors, and resource development. In developing community-based interventions for cardiovascular risk reduction, additional programs are needed which address sustainability issues relative to development and continuation of resources to achieve outcomes including community capacity and lasting changes in cardiovascular risk.

Because each community is different, it is important to include community representatives during formative phases of research, to ensure that programs are culturally appropriate and relevant to the community being served (Whitehorse et al. 1999). One essential role of LHA, that of empowering community members to identify their own needs and implement their own solutions, is seen in a number of the interventions reviewed. For example, Sutherland et al. (1992) described how LHA were used to establish a health committee for recruitment, program planning, research design, implementation, project assessment and reporting procedures. These members developed action plans that identified goals and objectives of their own church program, helping and hindering forces, supporting forces, as well as identification of specific individuals to facilitate identification of program activities and development of specific church-based interventions. Authors note that through shared values with the target community, LHA can serve as key program facilitators in understanding health concerns, strengths, and resources. Formative data, including LHA perspectives, may best inform culture-bound health concerns and relevant intervention approaches. Further, involvement of LHA in the implementation stage may prove to be a critical process to the success of implementing intervention activities and securing greater participation among the priority populations. Formative data may also be generated from community members themselves. Tessaro et al. (2000) describe the use of focus group data from women at various worksites as a basis for recruiting LHA, determining program content, and developing culturally tailored training materials.

Additional research is needed which moves cardiovascular risk reduction research beyond a focus on the individual to explore the social context, resources, and strengths related to cardiovascular risk reduction, as well as generate essential "localized understandings" as a basis for intervention design. Successful intervention design requires an integrative understanding of the unique cultural and contextual perspectives, characteristics, and resources of the target population, as well as the theoretically relevant determinants of behavior that can be transformed into culturally sensitive behavior change strategies(Fleury and Lee 2006; Resnicow et al. 2002). The unique role of the LHA may be in fostering the cultural and contextual explication of key intervention components, which allows for cultural sensitivity in intervention design, consistent with what Resnicow et al. (2002) refer to as "deep structure." Deep structure reflects how cultural, social, psychological, and contextual factors influence health behavior specific to racial and ethnic populations. Because churches play a strong cultural and social role in many communities, and are a place where community members come together, they have been shown in this review to provide a relevant setting for LHA interventions. LHA may play a significant role in addressing cardiovascular risk factors because of their connectedness to individuals and communities, as well as their understanding of cultural and contextual issues, particularly when they are members of targeted church communities.

Summary

LHA interventions targeting cardiovascular risk reduction were found to result in positive outcomes. However, differences in populations targeted, outcomes, LHA interventions and roles make it difficult to draw conclusions about the overall effectiveness LHA interventions in cardiovascular risk reduction. Drawing from the strengths of the literature, best practices for LHA interventions in cardiovascular risk reduction would include: (a) Selection and development of the LHA as a role model and support from the community of interest; leadership development

provides an essential resource to the community, beyond the goals of an individual study. (b) Involvement of the LHA in formative and summative research exploring community concerns, strengths, and resources. As part of the community, LHA can add to discussion on the cultural and contextual relevance of program development. Similarly, LHA can provide meaningful input during data analysis, evaluation of program feasibility, and determination of program institutionalization in the community. (c) Specification and ongoing evaluation of the LHA role, role implementation, and training. Further, a clear understanding of how the LHA operationalizes critical components of the intervention is essential to strengthen internal validity and rule out alternative explanations for intervention effect. Essential next steps for development of the science related to LHA interventions for cardiovascular risk reduction include clear specification of the role of the LHA in intervention, as well as documentation of LHA contacts, to support intervention fidelity, evaluation of needed program "dose" to achieve effects, and translation of findings to practice. Stronger operationalization and testing of theoretical frameworks for LHA interventions, including evaluation of multilevel frameworks and analysis of the theoretical mechanisms through which LHA effect risk reducing behaviors are key to establishing LHA effectiveness. Given the central role of the LHA in the community, attention is needed to evaluation of the impact of LHA interventions on resource development, utilization, and community capacity. Extended follow-up of interventions would further clarify the sustainability of intervention effects and a cost-benefit evaluation of the LHA role in health outcomes. Formative research will foster development of culturally and contextually relevant models for LHA interventions, which better address the concerns and strengths of each community. This review provides a beginning understanding of relevant findings and considerations for cardiovascular risk reduction using LHA, as a basis for guiding and strengthening future research.

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