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# Reduction of Moderate Cardiovascular Disease Risk Factors in Adults through Community Based Intervention Programs

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**ABSTRACT**

**REDUCTION OF CARDIOVASCULAR DISEASE RISK FACTORS IN ADULTS**

by  
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Per the American Heart Association (AHA) 2016, and the Centers for Disease Control (CDC) 2016, most recent reports, cardiovascular disease (CVD) continues to be the leading cause of death nationally and globally. In the United States (U.S.), more than 600,000 adults die each year of heart disease (CDC, 2015). The economic burden that cardiovascular disease places on society is tremendous. In the U.S. alone, the estimated direct and overall cost resulting from CVD is reported to be between 273 billion and 444 billion dollars annually (CDC/MMWR, 2011; WHO, 2016). Because of estimations like these, The U.S. Department of Health and Human Services' Office of Disease Prevention and Health Promotion (ODPHP) has urged health care providers to "improve cardiovascular health and quality of life through prevention, detection, and treatment of risk factors for heart attack and stroke" through its *Healthy People 2020* campaign initiative (Healthy People.gov, 2017). Studies have shown that one of the most effective ways to decrease risk factors for developing cardiovascular disease is through making modification to one's behavior and lifestyle. In fact, the most prevalent risk factors for developing CVD are high blood pressure, high cholesterol, diabetes, poor diet, obesity, and smoking. All of which are modifiable. They can be prevented, and treated with education, behavioral modifications, and, or medications. A well proven, effective, and relatively low-cost way of achieving this is through participation in community based intervention programs aimed at reducing these modifiable risk factors. The following literature review seeks to answer the

question, “among the adult population, what types of community-based interventions have shown the greatest achievements in reducing modifiable, moderate cardiovascular disease risk factors?”

## Reduction of Moderate Cardiovascular Disease Risk Factors in Adults through Community Based Intervention Programs

Cardiovascular disease (CVD) continues to be the leading cause of death in the United States (U.S.) and is responsible for more than 17% of all national health expenditures (Heidenreich, 936). Assuming no change to current health policy, the prevalence of CVD will continue to increase by approximately 10% over the next 20 years. The American Heart Association (AHA) estimates that greater than 40% of US adults, or 116 million people, will have one or more forms of CVD by the year 2030 (Heidenreich, 936). According to the AHA, total direct and indirect medical costs of CVD are projected to exceed \$1 trillion by 2030 (Heidenreich, 936). However, CVD is largely preventable. Studies have shown that community based initiatives aimed at reducing modifiable risk factors such as obesity, smoking, hypertension, and diabetes, can decrease the overall incidence of CVD (Ferdinand, 338).

In an attempt to reduce CVD, there are now incentive programs for developing and implementing effective, evidence-based programs aimed at reducing cardiovascular risk factors. In 2011, The Centers for Medicare and Medicaid Services (CMS) determined there was adequate evidence to support intensive behavioral therapy aimed at reducing one's risk of CVD was not only reasonable, but also necessary in the prevention and early detection of heart disease (Centers for Medicare and Medicaid Services [CMS], 2015).

There is strong evidence supporting communities that receive and participate in a CVD education and intervention program achieve a reduction in CVD risk factors as well as a reduction in reported cardiovascular events (Ferdinand, 340). There are differing opinions on the types of education and interventions that are effective in reducing CVD risk factors. Studies support that population-based interventions hold significant potential in the reduction of CVD

(Sidebottom, 66). Reviews of community based programs found that communities which develop interventions based on an assessment of needs, and the availability of resources, tend to be more effective at lowering CVD risk factors.

The authors' purpose is to conduct a literature review of 5 community-based CVD intervention and education programs outcomes and disseminate the findings in order to provide an evidence-based practice recommendation for future community-based program development.

#### Process of discovery

During the process of locating evidence, an effective search strategy was developed that included advanced searches within databases such as CINAHL, Cochrane Review, and Medline. Also utilized was the Medical Subject Headings browser within the U.S. National Library of Medicine. The search was limited utilizing specific filters to include articles dated 2001-2016, written in the English language, randomized control trials, systematic reviews, and adult men and women aged 45-64. This process produced a list of 27 specific peer reviewed articles for critique. A hierarchy of evidence table was utilized to evaluate the validity, reliability, and applicability of studies yielded. Through this the process the authors were able identify interventions utilized in community and social based programs that yielded positive results.

#### Reducing CVD Through Population-Based Interventions

The Heart of New Ulm study focused on reducing CVD through population-based interventions in rural Minnesota with the purpose of examining changes in CVD risk factors over a six-year time frame. The sample for this study included a total of 7,855 residents in the target population. The focus was residents aged 40-79 and nine modifiable risk factors: blood pressure

(BP), low-density lipoprotein (LDL), high-density lipoprotein (HDL), glucose, body mass index (BMI), smoking status, alcohol consumption, physical inactivity, and diet (Sidebottom, 68). This project was a collaborative partnership between local healthcare institutions and the community of New Ulm. Interventions, such as heart health screenings, community health summits, formal run/walk events, working with local retailers to offer healthier selections, social marketing campaigns, weight management phone coaching, wellness assessments and behavioral change programs were designed to focus on the major modifiable risk factors listed above and were delivered through health care, worksite and community settings. Through these interventions, this study yielded significant improvements in BP, LDL, and glucose over a five-year span while the BMI remained stable. However, a negative outcome was a reduction in HDL and an increase in smoking status (Sidebottom, 74).

Another study, The Hartslag Limburg, aimed to investigate the effect of a cardiovascular disease prevention program on modifiable cardiovascular risk factors after a five-year period. Combined, there were a total of 3,172 participants in this study. They also evaluated the modifiable risk factors. These modifiable risk factors include, BMI, blood pressure, non-fasting glucose, and cholesterol levels. However, this study also evaluated the participants' physical examination to include height/weight and waist circumference. The researchers' evaluation of pre- and post-intervention data was statistically significant in supporting a reduction in CVD risk factors through interventions, such as, walking and cycling groups, educational grocery tours, stop smoking campaigns, and computer-tailored nutrition. The most significant results of the study showed a 2.9 cm reduction in waist circumference for men and a 2.1 cm reduction in women, a 7.8 mmHg reduction in systolic blood pressure in men and a 5.5 mmHg reduction in women, a 0.36 kg/m<sup>2</sup> reduction in BMI for men and a 0.25 kg/m<sup>2</sup> in women. Finally, there was a

0.11 mmol/L reduction in total cholesterol for women and a 0.23mmol/L reduction serum glucose in women (Schuit, 237).

In reviewing The Rockford Coronary Health Improvement Project (CHIP), a community based project designed to educate members of the community on cardiovascular disease and its risk factors, the project objective was to generate accountability and motivation within the community. CHIP study participants were recruited from the general population after the program information was presented at service clubs, churches, corporations, and through media, billboards, brochures and health care providers. Just as in The Heart of New Ulm and The Hartslag Limburg studies, the researchers evaluated lab results such as HDL, LDL and glucose, and SBP and DBP readings. In addition, the CHIP study included lifestyle/nutrition knowledge testing, and had participants provide their personal medical histories, socioeconomic data, food diaries and exercise frequencies. This study also compared pre- and post intervention outcomes. Coronary risk factors were determined and assigned as follows: SBP  $\geq$  130 and, or DBP  $\geq$  85; overweight: BMI $>$ 25; impaired glucose tolerance/fasting blood sugar  $\geq$  110; LDL $\geq$  100mg%; smoker; sedentary lifestyle (no physical activity at all). Risk categories were assigned to all participants: Zero Risk factor: 0 risk factors; Moderate Risk: 1-2 risk factors; High Risk: 3 or more risk factors.

In contrast to the previously mentioned studies, the CHIP intervention program consisted of 40 hours of intensive education and daily reading assignments. However, all three studies, The Heart of New Ulm, The Hartslag Limburg, and Rockford CHIP, included interventions focused on smoking cessation and physical activity. After completion of the 4-week program CHIP participants were encouraged to join the Rockford CHIP Alumni organization where they could attend monthly educational and support meetings (Englert, 516). Results of the CHIP



interventions show a substantial shift in coronary risk factor among participants, decreasing the average participants' risk categories from 3.4 (high-risk) to 2.3 (moderate risk) in four weeks in both men and women. Similar to The Heart of New Ulm and The Hartslag Limburg studies, the CHIP participants improved coronary risk factors included reductions in SBP/DBP, BMI, fasting glucose levels, total cholesterol, and LDL. In addition, CHIP smoking cessation counseling participants yielded a short term quit rate of 27%. Health knowledge scores also improved 60% post education. Another outcome of this study was a consumer driven change noted in the grocery stores and restaurants as they began to offer healthier choices (Englert, 513). As with the Hartslag Limburg Study and The Heart of New Ulm study, the Rockford CHIP study supports a well-designed, relatively low cost, community-based lifestyle and education program can make dramatic beneficial changes in participant's health behaviors. Also found within the Heart of New Ulm study, was the use of social media as an avenue to engage and influence friends and followers of the program which was therefore found to increase adherence to interventions. Similarly, the use of other digital health interventions such as e-mail, mobile text messaging, and mobile applications, were also shown to significantly reduce CVD outcomes in the systematic review and meta-analysis conducted by Widmer, et al (478). Another systematic review conducted by Free, et al specifically focused on the use of text messaging and adherence to smoking cessation (1). This review found an increased adherence to smoking cessation with supportive daily text messaging and suggests that mobile technologies can be a powerful media for providing individual level support (Free, 2).

Table 1

## Community-Based Interventions

Study Interventions	Examples
Education programs	Computer-tailored nutritional teaching, formalized 40 hr. intensive education, food shopping tours, health summits and workshops
Exercise clubs	Walking clubs, international exercise "teams", Daily exercise programs
Smoking cessation programs	Campaigns and programs
Technology based programs	Social marketing, Twitter, Facebook, text messaging, PDAs, interactive multiplatform exercise application, free phone coaching
Screening programs	In the community and worksites

Source: Englert, H.S., Diehl, H.A., Greenlaw, R.L., Willich, S.N., Aldana, S. (2007). The effect of a community-based coronary risk reduction: The Rockford CHIP. *Preventative Medicine, 44*, 513-519.

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## Synthesis

Despite the time, and effort put into research aimed at reducing cardiovascular disease (CVD) it remains to be the leading cause of death in the U.S. and globally. The burden that the morbidity and mortality of CVD places on individuals, the economy, and the community is tremendous. This literature review of EBP community-based interventions provides recommendations for future community program development. As defined in Table 1, the studies reviewed supported the following intervention themes: education programs, exercise clubs, technology-based programs, and smoking cessation programs. Research has continually demonstrated that individuals who engage in community-based intervention programs aimed at lifestyle and behavioral changes are more successful in achieving long-term results (Englert, 513 Sidebottom 74 Schuit, 237). Yet, despite consistently yielding positive results, the creation and implementation of these types of programs tends to be underutilized in the community setting. With the goal of sustainable change, healthcare providers must also look to future technology in order to give our patients something that is easily accessible and cost effective. The use of technology has had significant impact on reducing modifiable risk factors for CVD. Interventions such text messaging, utilizing social media, and phone coaching, have shown to reduce risk factors (Sidebottom, 69) (Widmer, 469) (Free, 2). Mobile technologies can be a powerful media for providing individual level support to health care consumers (Free et al. 2). For example, smoking cessation support through text messaging interventions has supported an increase adherence to cessation (Free, 2). Although there is promising evidence of the benefit of mobile health technologies, further high quality trials are required to evaluate the long-term effects of this type of intervention.

Innovative studies, such as The Heart of New Ulm, The Hartslag Limburg Study, and The Rockford CHIP Project have all demonstrated that community-based strategies aimed at educating and improving the health of participants can be extremely successful at lowering modifiable risk factors, such as BMI, SBP/DBP, blood glucose levels, total cholesterol, and LDL, and by doing so they ultimately made a substantial impact in the reduction of CVD. An additional positive outcome of community-based programs, like these, are that they provide strong social support among participants that supported the success of these programs. The support group theory includes friendships, peer reinforcement, support, and intimate relationships which strengthens the adherence to interventional trials (Boutin-Foster, 22). In addition, the sustainment of a new behavior and attitude can result from education delivered by key opinion leaders in a favorable social setting combined with continual exposure to role models at the individual and societal level (Bandura, 2004). For example, there was a consumer driven change in the community grocery stores and restaurants, as participants sought healthier items.

Healthcare providers can use the effective community-based initiatives in this literature review to promote and develop the implementation of similar low-cost, highly effective programs within their communities. By using these initiatives, including current technology, and creating partnerships with other health care providers, business leaders, community programs, and organizers, primary healthcare providers have the potential to make revolutionary improvements in the incidence of CVD, and the overall health of the populations they serve.

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