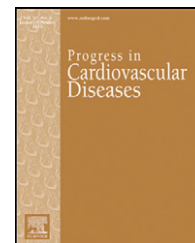


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## Adapting Technological Interventions to Meet the Needs of Priority Populations



Sarah E. Linke\*, Britta A. Larsen, Becky Marquez, Andrea Mendoza-Vasconez, Bess H. Marcus

Department of Family Medicine & Public Health, University of California San Diego, La Jolla, CA

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### ABSTRACT

Cardiovascular diseases (CVD) comprise the leading cause of mortality worldwide, accounting for 3 in 10 deaths. Individuals with certain risk factors, including tobacco use, obesity, low levels of physical activity, type 2 diabetes mellitus, racial/ethnic minority status and low socioeconomic status, experience higher rates of CVD and are, therefore, considered priority populations. Technological devices such as computers and smartphones are now routinely utilized in research studies aiming to prevent CVD and its risk factors, and they are also rampant in the public and private health sectors. Traditional health behavior interventions targeting these risk factors have been adapted for technology-based approaches. This review provides an overview of technology-based interventions conducted in these priority populations as well as the challenges and gaps to be addressed in future research. Researchers currently possess tremendous opportunities to engage in technology-based implementation and dissemination science to help spread evidence-based programs focusing on CVD risk factors in these and other priority populations.

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Cardiovascular diseases (CVD) comprise the leading cause of mortality worldwide, accounting for approximately 17.5 million deaths in 2012, including 7.4 million from ischemic heart disease and 6.7 million from stroke.<sup>1</sup> These statistics translate to 3 in every 10 deaths.<sup>1</sup> Compared to low- and middle-income countries, high-income countries are burdened by a higher percentage of deaths from CVD and other non-communicable diseases, largely due to the longer lifespan and lower prevalence of communicable diseases in these countries.<sup>1</sup>

Technological devices, such as computers and smartphones, are now routinely utilized in research studies aimed at preventing CVD and its risk factors.<sup>2</sup> Although these

devices are becoming increasingly available in low- and middle-income countries, few studies using technology to prevent CVD have been conducted in these less affluent areas.<sup>3</sup> Therefore, this review will focus on research conducted in high-income countries.

Within high-income countries, certain segments of the population face relatively higher CVD risk and are thus considered to be “priority populations.” In particular, individuals with the following risk factors (Fig 1) experience higher rates of CVD: tobacco use, obesity, low levels of physical activity (PA), type 2 diabetes mellitus (T2DM), racial/ethnic minority status, and low socioeconomic status (SES). Technology-based health behavior interventions are adapt-

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\* Address reprint requests to Sarah E. Linke, PhD, MPH, University of California San Diego, Department of Family Medicine & Public Health, 9500 Gilman Drive, Box 0628, La Jolla, CA, 92093-0628.

E-mail address: [slinke@ucsd.edu](mailto:slinke@ucsd.edu) (S.E. Linke).

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**Abbreviations and Acronyms**

CVD = Cardiovascular disease
PA = Physical activity
PDA = Personal digital assistant
HbA1c = Glycated hemoglobin
SES = Socioeconomic status
T2DM = Type 2 diabetes mellitus

able and often tailored to match the needs and characteristics of these specific populations (Fig 2). For example, a health behavior intervention based on the social cognitive theory might focus on smoking cessation for tobacco users, healthy

eating habits and PA promotion for individuals with T2DM, and all three of these health behaviors for racial/ethnic minorities with high rates of these behaviors.

Technology-based health behavior tools are appealing for many reasons, including their adaptability, expansive reach, cost-effectiveness, objective data collection capacity, and facilitation of real-time data collection and feedback (i.e., ecological momentary assessment and intervention). The following sections describe some of the adaptations that have been made to technology-based CVD prevention interventions to meet the needs of these priority populations as well as the outcomes extracted from these studies. It attempts to summarize best practices thus far and identify important gaps that remain for future research studies to explore or resolve.

## Tobacco Use

Tobacco use has been the leading cause of CVD and preventable premature death for the past four decades and has therefore been the target of health behavior change interventions more than any other single behavior.<sup>4</sup> Technology-based smoking cessation interventions have been tested in numerous randomized controlled trials and have also become mainstream in the government, public and private sectors.

Telephone counseling for smoking cessation (referred to as Quitlines) marked the first major use of technology to help smokers quit, and this method continues to be one of the most utilized and evidence-based approaches.<sup>5</sup> Telephone counseling is currently delivered in multiple languages, and most Quitlines

provide free access to additional cessation information and services, including telephone-based support and advice from an experienced cessation counselor, a personalized quit plan and self-help materials, social support and strategies to help them cope with cravings, cessation services and other resources offered near their residence, and/or access to the latest information about cessation medications.<sup>6</sup> Quitlines have continued to thrive despite the development of more technologically advanced smoking cessation delivery methods, which raises the question of whether or not these newer methods provide incremental benefits.

Smoking cessation websites emerged with the increasing utilization of the Internet for health information and services.<sup>7</sup> These websites contain facts/statistics about smoking and its health risks, questionnaires for smokers to complete to help them determine their stage of change, tips and tools to help smokers prepare to quit, strategies for them to use in the quitting process, and relapse prevention tools to help them remain tobacco free.

More recently, other technology-based approaches such as text messaging, smartphone applications (apps), and social media (e.g., Facebook) have expanded the reach and accessibility of smoking cessation interventions and support. For example, researchers and government-funded organizations have developed programs that enable smokers to reach out for real-time text-based support from smoking cessation counselors and/or other smokers trying to quit by texting keywords or codes.<sup>2</sup>

Countless smoking cessation apps with various features to help smokers quit, such as self-monitoring of cravings and numbers of cigarettes per day smoked, have been developed by research teams, government-funded organizations, and private companies alike.<sup>8</sup> Other programs have been delivered via Facebook to reach smokers who prefer to engage with their existing social media platform in their quitting journey.<sup>9</sup>

Combining many of the aforementioned methods is the Tobacco Control Research Branch of the National Cancer Institute's comprehensive Smokefree.gov (<http://smokefree.gov>) program, which "provides free, accurate, evidence-based information and professional assistance to help support the immediate and long-term needs of people trying to quit smoking".<sup>8</sup> Smokefree.gov provides multiple options to help smokers quit according to their preferences, including an extensive website

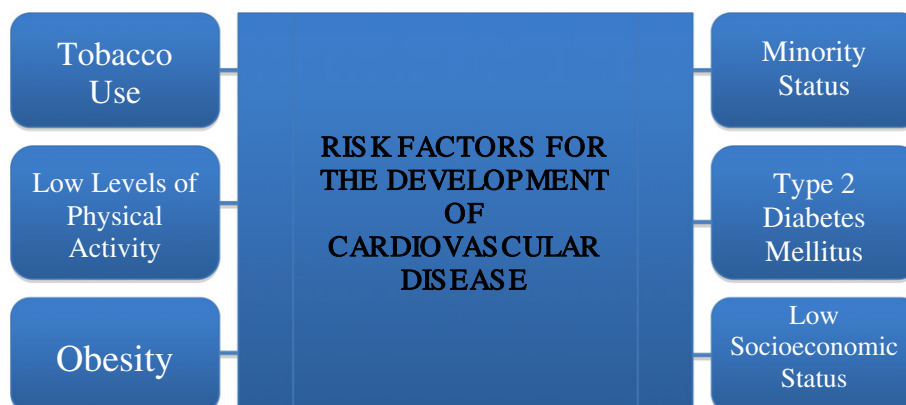


Fig 1 – Populations at high-risk for cardiovascular disease.

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