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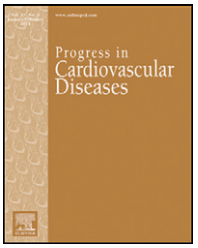

Can Population Levels of Physical Activity Be Increased? Global Evidence and Experience

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ABSTRACT

Physical inactivity is one of the most important contributors to the global burden of disease and has become a global public health priority. We review the evidence on physical activity (PA) interventions, actions, and strategies that have the greatest potential to increase PA at the population level. Using the socio-ecological framework to conceptualize PA interventions, we show that PA can be targeted at multiple levels of influence and by multiple sectors outside the health system. Examples of promoting PA on a national scale are presented from Finland, Canada, Brazil, and Colombia. A strong policy framework, consistent investment in public health programs, multi-sectoral support and actions, and good surveillance characterize each of these success stories. Increasing PA globally will depend on successfully applying and adapting these lessons around the world taking into account country, culture, and context.

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Physical inactivity accounts for more than five million premature deaths each year, making it one of the most important contributors to the global burden of disease.[1] Public health policy is beginning to be informed by this fact. Physical activity (PA) is prominently featured in the World Health Organization's Global Action Plan for the Prevention and Control of Non-Communicable Diseases (NCDs) 2013–2020 and the targets and indicators within a global monitoring framework for NCDs.[2,3] Many countries have national public health plans with specific objectives that support and encourage physical activity, including the United States (US), United Kingdom, Brazil, Colombia, Australia, and India.[4–9] The ubiquity of inactivity as a public health challenge was made clear in The Lancet series on PA in 2012.[1,10–14] Nearly one third of adults are inactive worldwide[10] and there is a growing evidence-base on the correlates and determinants of physical activity[11] and effective interventions to increase PA[12]. However, substantial gaps in the evidence remain, especially related to interventions in low and middle-income countries (LMICs) and interventions at a scale beyond the community-level.[13]

In this paper we critically review the evidence on PA interventions, actions, and strategies that have the greatest

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Abbreviations and Acronyms

LTPA = leisure time physical activity

LMICs = low and middle-income countries

NCD = non-communicable diseases

PA = physical activity

SEM = socio-ecological model

US = United States

potential to increase PA at the population level. We will first define a framework for understanding ways to change population levels of PA, then summarize the published systematic reviews on PA interventions, highlight four examples of promoting PA at a national scale, and finally synthesize recommendations for public health policy, research, and practice given our current understanding of the field.

Increasing PA at the population level depends on several factors: the efficacy and effectiveness of the chosen public health and clinical interventions; supportive policy, environments, and planned actions in sectors other than public health and medicine; the population reach of these actions; continuity; scalability; secular trends in key domains such as the economy, technology, and politics; and country, culture, and context.[13] In other words, PA promotion is a true public health activity fitting well within classic definitions such as those from Last's *A Dictionary of Public Health*[15] ("An organized activity of society to promote, protect, improve, and, when necessary, restore the health of individuals, specified groups, or the entire population."[16]), and the Institute of Medicine report *The Future of Public Health*[17] ("Public Health is organized community efforts aimed at the prevention of disease and promotion of health. Its mission is the fulfillment of society's interest in assuring conditions in which people can be healthy."[17]).

Successful PA promotion is also characterized by a balance between a strong science base (i.e., evidence-based reviews) and artful application of that science. This blending of the science and art of PA promotion relies on scientific studies, quantitative data, qualitative data, professional judgment, and timing. Again, matching nicely with our understanding of how evidence-based public health ("the process of integrating science-based interventions with community preferences to improve population health"[18]) should guide modern public health policy and practice. A key concept in each of these definitions is that public health is population health. A seemingly obvious corollary to this is that global public health must of necessity be especially focused on understanding how to best deliver public health strategies addressing the most important causes of disease and disability to large populations. In reality, this is often not the case. Global public health has been slow to adapt to the triple transition (epidemiologic, demographic, and lifestyle) that has shifted the center of gravity of the global burden of disease to NCDs in LMIC.[19–21] Until quite recently this has also been the case for public health research and programs for physical activity, with the bulk of the evidence and most of the best examples of national plans and policies for PA coming from a handful of high-income countries.[4,5,8,13,14] However, as we will see from recently published evidence-based reviews and our four case studies, research, policy, and programs for PA are also becoming a priority in middle-income countries.

Evidence-based reviews

There is a large and growing body of evidence on the effectiveness of PA interventions. Systematic reviews have been conducted using a variety of evidence-based constructs, and these reviews themselves were recently reviewed and summarized in *The Lancet*[12]. We will briefly summarize the results of the key evidence-based reviews and attempt to place them in a socio-ecological framework in order to better understand the totality of the evidence for effectiveness of PA interventions. The United States *Guide to Community Preventive Services*[22] ("the *Community Guide*" http://www.thecommunityguide.org), *the Guide to Clinical Preventive Services*[23] ("the *Clinical Guide*" http://www.ahrq.gov/professionals/clinicians-providers/guidelines-recommendations/guide/), and the United Kingdom *National Institute for Health and Care Excellence* (*NICE*)[24] (http://www.nice.org.uk/) have been among the most comprehensive review processes to date[25–28]. The clinical interventions reviewed in the *Clinical Guide* and community-based and health system-based interventions reviewed by the *Community Guide* have been used by researchers and practitioners to guide health promotion and disease prevention efforts in both clinical and community settings. In recent years, the *Community Guide* process has been culturally adapted to review PA promotion and obesity prevention interventions in Latin America. The *Guide for Useful Interventions for PA in Brazil and Latin America* (Project *GUIA*)[29] synthesized the evidence for PA interventions in Latin America (http://www.projectguia.org/en/), and the *Guide to Obesity Prevention in Latin America and US* (Project *GOL*)[30] synthesized the evidence for diet and PA interventions for obesity treatment or prevention among Latinos in the US and Latin America (http://www.sdprc.net/research/other-projects/project-gol/). Both collaborations evaluated interventions based on criteria from the *Community Guide*.

Across the existing models for evaluating PA interventions, there are several major categories for conceptualizing intervention approaches, including behavioral and social, campaigns and informational, health-care based, as well as environmental and policy approaches. In a recent review in *The Lancet*, these approaches were found to be effective at increasing PA across various ages, social groups, communities, and countries.[12]

Classifying interventions based on the approach applied to increase PA is useful for evaluating similar interventions; however, this method of conceptualization is not based on any theoretical framework. In fact, few reviews of strategies for promoting health behaviors use a theoretical framework for conceptualizing interventions. To address this gap, we organized the aforementioned approaches for PA promotion within the theoretical framework of the socio-ecological model (SEM), which posits that behavior is influenced by factors that co-exist and interact at multiple levels[31]. The key levels of influence include the intrapersonal (individual), interpersonal, community/organizational, and environmental/policy levels (Fig 1). The notion behind the SEM is that because factors that influence behavior do not act alone, a multilevel