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AHA SCIENTIFIC STATEMENT

Increasing Equity of Physical Activity Promotion for Optimal Cardiovascular Health in Adults: A Scientific Statement From the American Heart Association

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ABSTRACT: Fewer than 1 in 4 adults achieves the recommended amount of physical activity, with lower activity levels reported among some groups. Addressing low levels of physical activity among underresourced groups provides a modifiable target with the potential to improve equity in cardiovascular health. This article (1) examines physical activity levels across strata of cardiovascular disease risk factors, individual level characteristics, and environmental factors; (2) reviews strategies for increasing physical activity in groups who are underresourced or at risk for poor cardiovascular health; and (3) provides practical suggestions for physical activity promotion to increase equity of risk reduction and to improve cardiovascular health. Physical activity levels are lower among those with elevated cardiovascular disease risk factors, among certain groups (eg, older age, female, Black race, lower socioeconomic status), and in some environments (eg, rural). There are strategies for physical activity promotion that can specifically support underresourced groups such as engaging the target community in designing and implementing interventions, developing culturally appropriate study materials, identifying culturally tailored physical activity options and leaders, building social support, and developing materials for those with low literacy. Although addressing low physical activity levels will not address the underlying structural inequities that deserve attention, promoting physical activity among adults, especially those with both low physical activity levels and poor cardiovascular health, is a promising and underused strategy to reduce cardiovascular health inequalities.

Key Words: AHA Scientific Statements ■ exercise ■ health ■ health equity ■ health status disparities ■ lifestyle ■ physical activity

Regular physical activity is a fundamental component of ideal cardiovascular health (CVH) and is widely recommended for both the prevention and treatment of cardiovascular disease (CVD).[1–4] However, fewer than 1 in 4 American adults achieves physical activity recommendations, with lower activity levels reported among some groups.[5,6] Addressing low levels of physical activity experienced by underresourced groups provides a modifiable target with the potential to improve equity in CVH, specifically fewer CVD and related events. It is important to note that physical activity will not address the underlying structural mechanisms that led to groups being underresourced or developing poor CVH. However, the CVH benefits of physical activity are well documented, and physical activity holds the potential to improve CVH among a wide range of groups.[3] This scientific statement (1) examines physical activity levels across strata of CVD risk factors, individual-level characteristics, and environmental factors; (2) reviews strategies for improving physical activity in groups who are underresourced or at risk for poor CVH; and (3) provides practical suggestions for physical activity promotion to increase the equity of risk reduction and improved CVH.

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PHYSICAL ACTIVITY LEVELS BY RISK FACTORS FOR POOR CVH

We describe levels of physical activity across strata of established CVD risk factors in the Physical Activity by CVD Risk Factors section, across individual-level characteristics in the Physical Activity Level by Individual-Level Characteristics section, and across geographic or environmental factors in the Physical Activity Levels by Geographic and Environmental Risk Factors section. There are complex relationships between these factors (eg, socioeconomic status and urbanization) and physical activity. Moreover, there is evidence of bidirectional associations between physical activity and many of these factors (eg, obesity, mental health).[7,8] To establish a foundation for understanding inequities in physical activity existing across CVD risk factors, individual-level factors, and geographic or environmental characteristics, the following subsections use nationally representative samples to demonstrate how physical activity levels vary across these factors.

We use the term physical activity in a broad sense encompassing the range of operational definitions found in the literature. In addition, we reference moderate- to vigorous-intensity physical activity (MVPA) as aligned with public health recommendations, but we also acknowledge that MVPA is limited to aerobic activity. Moreover, self-reported MVPA and muscle-strengthening activities are often limited to the leisure domain and are subject to recall error and social desirability bias; at the same time, objective measurement (eg, by accelerometer) largely assesses ambulatory, nonwater MVPA across all domains (eg, leisure, occupational, and transportation) and can produce variable estimates based on device, wear protocols, and data processing choices. Yet, physical activity measured across these methodologies should be correlated. Thus, although absolute estimates of physical activity (eg, MVPA, minutes of muscle strengthening, or rates of inactivity) may vary across studies, within-study comparisons across the risk factors of interest should be robust. Here and in the Supplemental Material, we summarize evidence from the most recent comprehensive, large, national samples and provide an overall interpretation of whether physical activity differs across risk factors for poor CVH, demographic characteristics, and geographic and environmental factors.

Physical Activity by CVD Risk Factors

In the following sections, we summarize the presence of inequities in physical activity levels across CVD risk factors from recent US population–based surveys (Table 1 and Supplemental Table S1).

Body Mass Index/Obesity

There is clear evidence from large epidemiological studies that MVPA is lower in adults with higher body mass index compared with adults with a body mass index of 18.5 to 24.9 kg/m^2.[5,9–11] For example, in 2015 BRFSS (Behavioral Risk Factor Surveillance System) data, adults with obesity were half as likely to report meeting both aerobic and muscle-strengthening recommendations for physical activity compared with adults with normal weight.[5] Furthermore, inverse trends have been observed for self-reported[5,10] and accelerometer-measured physical activity[9] across increasing body mass index categories (ie, normal, overweight, obesity). In the 2005 to 2006 NHANES (National Health and Nutrition Examination Survey), accelerometer-measured MVPA was lowest among adults with obesity (18.3 min/d), with higher rates among adults who were overweight (24.6 min/d) and normal weight (26.5 min/d; $P_{trend}<0.001$).[9]

Table 1. Association Between Physical Activity and CVD Risk Factors

Factor	Description of associations	Evidence
Obesity	Consistently lower physical activity with obese BMI category vs normal BMI[5,9–11]	++
Hypertension	Consistently lower physical activity in adults with hypertension vs those without hypertension[5,9,12]	++
Diabetes	Consistently lower physical activity in adults with diabetes vs those without diabetes[5,9,12]	++
High cholesterol	Lower self-reported physical activity with high vs normal cholesterol, although no association with objective MVPA from NHANES[5,9,12]	+/–
Smoking	Lower self-reported leisure physical activity with smoking in some studies, but no association using objective or self-reported multiple-domain NHANES data[5,9,10]	+/–

BMI indicates body mass index; CVD, cardiovascular disease; MVPA, moderate- to vigorous-intensity physical activity; and NHANES, National Health and Nutrition Examination Survey. Note: ++ indicates a strong consistent association seen across multiple large observational studies; +, association seen in large observational study; and +/–, limited evidence or equivocal findings (see Supplemental Table S1).

Blood Pressure

Physical activity has an inverse association with blood pressure and hypertension status. According to self-reported MVPA in the NHIS (National Health Interview Survey) from 2016 to 2018, the prevalence of meeting aerobic physical activity guidelines was lower in adults with hypertension (47.6%) compared with those without hypertension (56.6%).[12] Similarly, self-reported physical activity data from the BRFSS (2015) indicated a 12% to 33% lower prevalence ratio for meeting the aerobic guidelines, muscle-strengthening guidelines, or both among those with versus without hypertension.[5] In NHANES (2005–2006), there was significantly lower accelerometer-measured MVPA among higher blood pressure categories (hypertension [14.6 min/d], elevated blood pressure [23.9 min/d], and normotensive [26.3 min/d]).[9]

Glucose and Diabetes

Higher fasting glucose levels or diabetes has also been consistently associated with lower levels of physical activity. In self-reported physical activity data from NHIS (2016–2018), adults with (43.5%) versus without (55.1%) diabetes were less likely to meet aerobic physical activity guidelines.[12] Similarly, in BRFSS data (2015) with adjustment for demographic and confounding factors, there was a 31% to 56% lower chance of meeting the aerobic guidelines, muscle-strengthening guidelines, or both among those with versus without diabetes.[5] In NHANES (2003–2006), lower MVPA levels were observed with higher fasting glucose status (high [12.5 min/d], impaired [19.7 min/d], and normal [26.5 min/d]).[9]

Cholesterol

Data on cholesterol levels and physical activity levels are inconsistent. In NHANES (2003–2006), there was no significant trend in accelerometer-measured MVPA across adults with normal cholesterol, elevated cholesterol, or dyslipidemia.[9] However, in BRFSS data (2015), the odds of meeting aerobic, muscle-strengthening, or both physical activity guidelines were 6% to 24% lower among individuals with dyslipidemia compared with those with normal cholesterol levels.[5]

Smoking Status

Reports on the relationship between physical activity and smoking status range from a significant inverse relationship[5] to null findings.[9,10] In BRFSS data (2015), there were lower odds of meeting aerobic and muscle-strengthening physical activity recommendations for daily smokers (−48%), people who smoked a few days per week (−16%), and former smokers (−9%) compared with those who never smoked.[5] In NHANES, no significant trend was observed between smoking status and meeting physical activity guidelines by self-report (2015–2016)[10] or accelerometry (2003–2006).[9]

Physical Activity Level by Individual-Level Characteristics

Individual-level characteristics such as age, sex, race, ethnicity, socioeconomic status, mental health, and disability status have been associated with health inequity.[4,13] For example, there are high rates of CVD and CVD-related death among those ≥65 years of age. CVD is a leading cause of death for both males and females.[13] The American Heart Association acknowledged the urgent need to address the gap in knowledge and care delivery to reduce sex-based disparities.[14] Black adults have earlier onset of CVD compared with non-Hispanic (NH) White adults, and there is an urgent need to reduce this disparity.[15] Overall, Hispanic adults have lower rates of CVD-related death than NH White adults.[16,17] However, Mexican American females have poorer CVH than NH White females; CVD is a leading cause of death among Hispanic adults; and there are high rates of CVD risk factors among Hispanic adults.[16–18] In addition, poor CVH has been associated with intellectual and physical disabilities, lower education, lower income, depression, and serious mental illness.[19–23] In the following sections, we summarize the presence of inequities in physical activity across individual-level characteristics from recent US population–based surveys (Table 2 and Supplemental Table S2).

Age

Among adults, lower physical activity is consistently observed in older age groups.[5,6,24,25] The prevalence of meeting (1) aerobic or (2) aerobic and muscle-strengthening physical activity guidelines is inversely associated with age according to self-report questionnaires[5,6,25] and accelerometry data.[24] Similar relationships are apparent within domains of physical activity, including transportation, occupational/household, and leisure-time physical activity.[25] The magnitude of the effects is large; for example, in NHANES, adults ≥65 years of age were about half as likely as adults 18 to 25 years of age to meet aerobic activity guidelines according to objective[24] or self-reported[25] MVPA.

Table 2. Association Between Physical Activity and Individual-Level Characteristics

Factor	Description of associations	Evidence
Age	Consistently lower prevalence of meeting the physical activity guidelines with higher age across studies[5,6,24,25]	++
Biological sex	Consistently lower physical activity in female compared with male participants across most studies[5,6,25,26]	+
Race and ethnicity	Lower prevalence of meeting physical activity guidelines by self-report methods, across most domains, in those identifying as NH Black or Hispanic compared with those identifying as NH White[5,6,25]; NH Black and Hispanic individuals reported higher prevalence of meeting the guidelines through transportation physical activity compared with NH White individuals[5,6,25]	+
Disability status	Lower daily objective MVPA among adults who reported mobility disability compared with those who reported no mobility disability[27]	+
Socioeconomic status	Consistently lower prevalence of meeting the physical activity guidelines with lower income or education level[5,6,25,26]	+
Mental health	Lower self-reported physical activity in adults with depression or depressive symptoms[28]; small or no difference in objective MVPA in adults who did compared with those who did not use mental health services in the past month[5]	+/−

MVPA indicates moderate- to vigorous-intensity physical activity; and NH, non-Hispanic.

Note: ++ indicates a strong consistent association seen across multiple large observational studies; +, association seen in large observational study; and +/−, limited evidence or equivocal findings (see Supplemental Table S2).

Biological Sex

Both self-report[5,6,25,26] and accelerometry-based[24] physical activity levels are typically lower in females compared with males. For example, in BRFSS data (2015), females were 15% less likely to meet aerobic and muscle-strengthening guidelines compared with males.[5] The disparity is apparent when we consider total or domain-specific physical activity (transportation, occupational/household, and leisure-time physical activity).[25] However, in NHIS (2018), females and males reported a similar prevalence of meeting the minimal aerobic guidelines of at least 150 min/wk with leisure MVPA (17.4% in females, 16.0% in males), although males were more likely than females to meet the ≥300–min/wk threshold.[26]

Race and Ethnicity

Non-Hispanic White adults consistently have higher overall physical activity levels and higher prevalence of meeting physical activity guidelines compared with NH Black adults and Hispanic adults when assessed by self-report.[5,6,25] Although leisure and occupational physical activity in NHANES (2017–2018) followed similar patterns, transportation activity was highest in Hispanic adults and lowest in NH White adults.[25] In contrast, accelerometry data from NHANES (2003–2006) indicated that Hispanic adults tended to have higher MVPA (eg, 54.8% met guidelines) than NH White (43.9%) and NH Black (41.5%) adults, who were less likely to meet guidelines.[24] Differences were typically not reported among other racial, ethnic, or multiracial groups in the available population surveys in the United States.[5,6,25]

Disability Status

In NHANES (2003–2006), adults with disabilities had lower levels of MVPA (4.7 min/d) compared with those without disabilities (11.4 min/d), even after adjustments for demographic covariates ($P<0.001$).[27]

Socioeconomic Status

Among adults, lower education[5,6,25,26] and income levels[5] are consistently associated with lower physical activity levels. In BRFSS data (2015), 12% of adults with less than a high school degree compared with 27% of adults with college degrees reported meeting the aerobic and muscle-strengthening guidelines.[5] Similarly, 13% of adults with annual incomes <$15 000 compared with 21% of adults with annual incomes >$50 000 met these same guidelines.[25] The disparity was found in leisure and total physical activity, not the occupational and transportation activity domains.[25]

Mental Health

There is support for a direct relationship between mental health status and physical activity. In NHANES (2015–2018), compared with those with low depressive symptoms, those with high depressive symptoms were less likely to report having performed any physical activity within the past 30 days (50% versus 34%, respectively).[28] In 2003 to 2004 NHANES accelerometry data, the use of mental health services in the past month was associated with slightly lower MVPA in males (−3.0 min/d; $P=0.03$) but not females (3.6 min/d; $P=0.2$).[29] In 2015 self-reported BRFSS data comparing those with and those without a depressive disorder, there was a 17% to 41% lower prevalence ratio of meeting physical activity guidelines, muscle-strengthening guidelines, or both.[5]

Physical Activity Levels by Geographic and Environmental Risk Factors

CVH varies by location and urbanization.[30] For example, poor CVH is associated with Southern regions, rural areas, and urban areas.[21,31,32] Walkability is associated with lower rates of obesity, suggesting that the built environment may also be associated with CVH.[33] In this section, we summarize physical activity levels across geographic and other environmental factors. We focus on recent US population–based surveys (Table 3 and Supplemental Table S3).

Geographic Region

On the basis of self-reported BRFSS data (2017–2020), states in the South (27.5%) had the highest prevalence of physical inactivity, followed by states in the Midwest (25.2%), Northeast (24.7%), and West (21.0%).[34,35] Similar patterns are reported for meeting the aerobic physical activity guidelines, which had the lowest activity levels in the South and the highest levels in the West.[35]

Table 3. Association Between Physical Activity and Environmental Risk Factors

Factor	Description of associations	Evidence
Geographic region	Lowest physical activity in the South, followed by the Midwest, Northeast, and West regions[34,35]	+
Urbanization	Lower physical activity levels in rural areas in most studies[34,36,37]; however, self-reported domain-specific activity in NHANES indicated no difference in leisure MVPA but higher levels of household and thereby total MVPA in the most rural-dwelling participants[13,16]	+
Built environment	Lower physical activity associated with lack of walkable infrastructure (eg, sidewalks, places to walk to, walking access to transit stops)[2]	+
Weather and air quality environment	Consistently lower physical activity associated with higher air pollution and poor or extreme weather (eg, very high or low temperatures, high precipitation)[38,39]	+

MVPA indicates moderate- to vigorous-intensity physical activity; and NHANES, National Health and Nutrition Examination Survey.

Note: ++ indicates a strong consistent association seen across multiple large observational studies; +, association seen in large observational study; and +/−, limited evidence or equivocal findings (see Supplemental Table S3).

Urbanization

Most studies found lower levels of physical activity in rural compared with urban environments.[34,36,37] In NHANES (2003–2006), accelerometer-measured MVPA was higher in participants living in urban areas (188.3 min/wk) compared with participants living in rural areas (162.4 min/wk).[36] Rural-dwelling participants were less likely to report meeting physical activity guidelines and more likely to be inactive in the NHIS (2016–2017)[37] and BRFSS (2001) data.[34] Yet, self-reported activity in NHANES (2003–2006) that included multiple domains found that participants from nonmicropolitan rural (<10 000 population size) areas reported higher total and household MVPA than residents of urban areas, but the groups did not differ in leisure or transportation activity.[25,34] In addition, there were consistent interactive effects of urbanization and geographic region. In NHANES (2003–2006), the least active populations were in rural locations in the South and Midwest, and rural–urban differences were more pronounced in these areas compared with the Northeast and West.[25,34]

Environment (Built)

In NHIS (2015), the odds of meeting aerobic guidelines were higher among participants who perceived more walkable infrastructure such as having places to walk, available bus and transit services, and availability of streets with sidewalks according to self-reported questionnaire data.[40] These findings are aligned with the Community Preventive Services Task Force 2016 report that transportation systems with street connectivity, activity-friendly (pedestrian and bicycle) routes, and close proximity and access to parks and recreational facilities are associated with higher physical activity.[41]

Environment Weather and Air Quality

Evidence consistently indicates that adverse weather or air quality is associated with lower physical activity. In the self-reported NHIS (2015) data, the odds of meeting aerobic guidelines for physical activity were 16% lower if weather was perceived as a consistent barrier.[40] In BRFSS data (2003–2011), the odds of reporting no participation in physical activity were higher when participants lived in areas with extreme hot or cold temperatures or high precipitation.[38] In terms of air pollution, 2001 and 2003 to 2011 BRFSS data indicated that higher air pollution was associated with higher levels of physical inactivity.[38,39]

The Potential to Improve CVH Through Physical Activity Promotion

As shown by the data in this section, physical activity is associated with traditional modifiable risk factors, substantiating the recommendations to emphasize physical activity promotion for the prevention and treatment of CVD. In fact, CVD risk factors consistently improve among individuals who engage in regular physical activity.[3] Regular physical activity is associated with improvements in systolic blood pressure (average effects, −3 mm Hg [95% CI, −4 to −2]),[42,43] diastolic blood pressure (average effects, −3 mm Hg [95% CI, −3 to 0]),[42,43] weight (range, −2 to −3 kg), and high-density lipoprotein cholesterol (range, 1–2 mg/dL),[42] as well as a 21% reduction in overall risk of incident CVD.[42,44]

Current guidelines recommend weekly accumulation of 150 to 300 minutes of moderate-intensity physical activity, 75 to 150 minutes of vigorous physical activity, or an equivalent combination of both, in addition to muscle-strengthening activities at least twice a week.[45] However, lower amounts of physical activity still provide CVH benefits.[3,45] Compared with those reporting no or minimal leisure-time activity, individuals who adhere to the lower threshold of the guidelines have a relatively lower risk of many diseases, including coronary heart disease (relative risk, 0.86 [95% CI, 0.77–0.96]),[3,46] heart failure (hazard ratio, 0.90 [95% CI, 0.87–0.92]),[3,46] and stroke (relative risk, 0.80 [95% CI, 0.74–0.86]).[47,48] More benefits are realized at the upper threshold of the guidelines, with higher reductions in the relative risk of coronary heart disease (relative risk, 0.80 [95% CI, 0.74–0.88]), heart failure (hazard ratio, 0.70 [95% CI, 0.67–0.73]),[3,46] and stroke (relative risk, 0.73 [95% CI, 0.67–0.79]).[47,48]

These CVH benefits associated with physical activity are applicable to a wide range of individuals.[45] Data presented in this section have also shown that some underresourced groups (eg, Black adults, adults in rural settings) who have poor CVH[30,49] also have low physical activity levels.[13] The intersection of low activity levels and poor CVH in underresourced groups highlights the potential for physical activity promotion to reduce CVH disparities.

PROMOTING PHYSICAL ACTIVITY TO ADDRESS INEQUITIES IN CVH

Many underresourced groups have low levels of physical activity. Therefore, we review general strategies for increasing physical activity, along with relevant evidence for specific strategies demonstrated to be effective among underresourced groups.

Promoting Physical Activity

Although the cardiovascular benefits of regular physical activity are well established, the best strategies for promoting physical activity are less clear. The Physical Activity Guidelines for Americans,[45] the American College of Sports Medicine guidelines,[50] and the US Preventive Services Task Force Guidelines for Physical Activity[51]

identify evidence-based strategies for increasing physical activity. The strategies listed in these statements do not form an exhaustive list but rather provide an overview of strategies thought to be generally effective. These strategies (Table 4) encompass a range of techniques to help engage the individual in different domains (eg, behavioral and physical/built environment) and at different levels (eg, individual, interpersonal, and community).

Promoting Physical Activity in Underresourced Groups

The strategies in Table 4 can be adapted for different groups, and some strategies explicitly indicate the use of a tailored approach (eg, model physical activity using individuals with whom the target group identifies). Although many strategies lend themselves to targeting populations or subgroups, limited evidence supporting these physical activity promotion strategies was derived from underresourced groups.[52] Illustrating this point, multicomponent approaches have been shown to be effective for promoting physical activity, yet the evidence base for this strategy among underresourced groups is modest and equivocal.[53] A better understanding is needed of the extent to which these general strategies are effective in underresourced groups. In this section, we summarize review articles to summarize the best available evidence for physical activity strategies that have been demonstrated to be effective among adults who are Black or Hispanic, have a low income, or live in rural settings.

Table 4. Recommended Strategies for Promoting Physical Activity

Guideline	Recommended strategies
USPAG[45]	Individual-focused • Use theory-based behavioral interventions • Offer guidance from peers or professionals on goal setting, self-monitoring, social support, and motivation • Encourage accountability contracts or the buddy system • Provide technology for self-monitoring, goal setting, and coaching Community-focused • Create strategic signage with prompts encouraging physical activity • Provide access to amenities and facilities that support physical activity • Implement community-wide social marketing campaigns to promote and support physical activity • Design the community-built environment that makes it easier for people to be active
ACSM[50]	Intrapersonal • Use motivational interviewing • Use theory-based behavioral interventions • Prioritize client's goals and preferences when developing a physical activity plan • Model physical activity using individuals with whom the target group identifies • Recommend enjoyable and nontraditional physical activity options (eg, dancing) Social environment • Use support groups and peer programs • Provide an environment in which the participant feels comfortable • Use creative solutions to reduce sedentary time (eg, activity breaks at work) • Use community-wide social marketing campaigns to promote physical activity Physical environment • Design the community-built environment to encourage an active lifestyle Policy • Support policies such as regular physical education • Mandate support for physical activity in workplaces
USPSTF[51]	• Use behavioral counseling interventions that include motivational interviewing • Address physical activity barriers • Encourage goal setting and self-monitoring • Target to achieve ≥90–180 min of MVPA weekly • Plan face-to-face or virtual behavioral counseling sessions

ACSM indicates American College of Sports Medicine; MVPA, moderate- to vigorous-intensity physical activity; USPAG, Physical Activity Guidelines for Americans; and USPSTF, US Preventive Services Task Force.

A systematic review of literature from 2009 to 2013 identified 12 trials examining changes in physical activity or fitness among predominantly Black samples.[54] The 8 trials reporting increases in physical activity or fitness had female samples and used a range of strategies, including clinic-based programs, individual-based interventions using technology, and small groups or community coaches.[54] A systematic review of literature from 2009 to 2015 identified 13 physical activity interventions for Black females.[55] The review identified 2 effective strategies, coupling physical activity promotion with healthy food choices and social support. A review of lifestyle interventions that targeted changes in physical activity, weight, or diet among Black males identified 14 interventions in both clinical and community-based settings and found that lifestyle approaches were, in general, effective in increasing physical activity in this group.[56] However, no specific strategies were identified, and the effectiveness of lifestyle approaches for weight loss in this group was more ambiguous.[56] These reviews noted effective physical activity programs for either males or females who were Black; however, the lack of consensus on the most effective strategies highlights a need for more research.

A systematic review of physical activity interventions from 1988 to 2011 identified 8 studies that examined changes in physical activity among Hispanic adult samples who were predominantly female. Among these, 7 studies reported increases in physical activity, and 1 study also reported an improved 10-year coronary heart disease risk score.[57] Because of the limited number of studies and modest follow-up times, the best strategies for physical activity promotion were not identified. A review of barriers and facilitators of physical activity among Hispanic males and females identified self-efficacy and social support as consistent facilitators of physical activity.[58] The effective strategies identified included cultural tailoring approaches such as community settings (eg, faith based, within Hispanic communities), the use of lay health workers or promotores de salud to engage members, linguistic accommodations

for Spanish speakers (eg, intervention conducted in Spanish, study material and questionnaire translations), and community-based participatory research practices (eg, involving community members in the intervention, discussion with community leaders).[58] Interventions for some subgroups, including individuals from specific countries of origin, older adults, and males, may need to provide further support or have additional tailoring.[59]

Other reviews examined physical activity programs for underresourced groups independently of race or ethnicity. A systematic review of interventions to support healthy eating, physical activity, and smoking cessation in low-income groups indicated that more effective physical activity programs included behavioral practice and a focus solely on physical activity.[60] A review of physical activity interventions for females in low-income groups demonstrated that group-based compared with individual- or community-based interventions were more likely to be effective.[61] Limitations to the studies reviewed included modest follow-up time, reliance on self-report, and a lack of comparison or control groups.[61] In a meta-analysis of physical activity interventions in rural settings, the pooled evidence showed that the interventions did not result in increased physical activity.[62] The built environment in rural settings—specifically the availability of trails, fitness centers, and parks; pleasant aesthetics; perception of safety or low crime; and walkable destinations—was associated with higher physical activity level among adults.[63]

The World Health Organization physical activity guidelines for individuals with disabilities, both physical conditions (eg, spinal cord injury) and mental or cognitive conditions (eg, intellectual disability, schizophrenia), affirm the health benefits of physical activity in those with disabilities.[64] Moreover, the quantity of physical activity necessary to receive benefits among individuals with disabilities is the same as that in the general population.[64] There is evidence that physical activity promotion can be effective in those with a disability (eg, adults with mental illness[65]); however, there is insufficient evidence to conclude the most effective strategies.

Indeed, there were underresourced groups and subgroups with elevated CVD for whom we could not find reviews (eg, American Indian and Alaska Native people, those with housing insecurity, and among sexual and gender minorities).[66–68] This is due, in part, to the notable lack of research on successful physical activity programs that could be used to inform effective promotion strategies in many underresourced groups. For example, American Indian and Alaska Native individuals have higher rates of CVD, higher rates of diabetes, and lower physical activity levels than the general population.[66] Further evidence of effective programs to improve health in these communities is needed. Similarly, little research has investigated strategies to promote physical activity among sexual and gender minority populations who have elevated CVD and could benefit from increased physical activity.[68,69] More research is needed to determine the most effective strategies to increase physical activity among numerous underresourced groups.

Some strategies appeared to be effective across underresourced groups such as engaging the target community in designing and implementing the intervention, developing culturally appropriate intervention materials and physical activity options, identifying exercise models with whom the target group can identify, building social support, and using culturally sensitive physical activity outcome measures.[70] Similarly, strategies to engage those with low literacy levels such as the use of audiovisual and interactive multimedia rather than print media, the use of simple messages with short sentences and 1- or 2-syllable words, and the use of large print with lots of space could be applied across different low-literacy subgroups.[53] Efforts to improve equity in physical activity and CVH should include identifying such cross-cutting strategies that would support a wide range of underresourced groups.

INCREASING EQUITY IN PHYSICAL ACTIVITY PROMOTION

Promoting Physical Activity in the Health Care Setting

To promote physical activity and CVH in the underresourced groups highlighted previously, health care professionals should regularly assess and promote physical activity in the health care setting.[71,72] This strategy is encompassed in recommendations for behavioral counseling to prevent and treat CVD.[51] Regular physical activity is an essential part of treating and preventing CVD, including among mild- to moderate-risk patient groups.[42] Fortunately, a growing body of literature affirms that physical activity promotion programs can be effective among a wide range of underresourced groups. Therefore, health care professionals should strive to consistently engage their patients in discussions of the benefits of regular physical activity and strategies to help increase regular physical activity. It is helpful for health care professionals to be informed about physical activity resources available to patient groups, including free access to public spaces, referrals to fitness professionals, and free or low-cost physical activity groups and memberships.[73] Health care professionals can also encourage the use of wearable devices with physical activity tracking such as using applications (apps) on a smartphone or low-cost pedometers.[71] Even during life events and transitions, there are effective strategies for encouraging regular physical activity, and it may be more critical during these stressful times.[74] Unfortunately, counseling for physical activity may not be covered by insurance; moreover, underresourced groups may not have access to health

care.[75] Long-term solutions to these structural barriers will require upstream approaches to address access to care, expansion of coverage for preventive services, and continued development of community resources to support regular physical activity.[75]

A Call to Action for Research to Increase Equity in Physical Activity and CVH

As stated, there is strong evidence linking regular physical activity to the prevention and treatment of CVD. To ensure equity in the realization of these CVH benefits, continued efforts are needed to understand the best approaches for engaging and supporting low-activity, underresourced groups. Moreover, support needed for physical activity adoption may differ from the support needed for maintenance.[76] These approaches should take into consideration commonly identified barriers to physical activity such as cost, lack of access, lack of time, and lack of knowledge, as well as barriers specific to individual groups.[77,78] Examples of barriers specific to underresourced groups are a need for childcare among single parents and cultural norms that discourage female individuals from exercising.[58,79] Facilities that are not compliant with Americans With Disabilities Act standards may present access barriers for those with a disability. For others, a distrust of the health care system can create a barrier.[69]

Interventions demonstrated to increase physical activity in randomized controlled trials may be a poor fit for individuals and communities who were not involved in their development and do not have the expertise, staffing, or funding to implement them with fidelity.[80] Strategies to develop programs that are better able to support underresourced communities include building interdisciplinary teams, using community-based participatory research, and developing multilevel interventions.[81] As a result of the intersectionality of the groups listed in the previous section, programs may need to address combinations of factors such as developing materials that are both culturally tailored and appropriate for those with low literacy or low socioeconomic status. Structural inequities create additional challenges for physical activity programs. Individuals from underresourced communities may have more urgent and pressing priorities (eg, food, medical care, and housing insecurities). There is a complex interplay of factors across multiple domains (eg, individual level, society, and health care system). The National Institute on Minority Health and Health Disparities has a research framework that depicts levels of influence (individual, interpersonal, community, and societal) across domains of influence (biological, behavioral, physical/built, sociocultural environment, and health care system).[82] The framework was designed to help researchers consider the complex nature of health disparities. Wide-scale adoption of a standardized framework in health disparities research could improve our ability to synthesize findings across studies, identify important gaps, and develop programs that use multifaceted strategies for improving the equity of CVH.

Continued efforts are needed to understand the best approaches for engaging and supporting low-activity, underresourced groups.[15,80] The success of different approaches is likely affected by recruitment, delivery settings, and tailoring and targeting of programs. Because of the importance of these and other complex contextual elements, caution is needed before determining that a particular strategy does or does not work for a particular group. We also need a better understanding of how to facilitate wide-scale uptake within and across underresourced communities and support long-term implementation of sufficient quality to yield CVH benefits.[80] This necessitates dissemination and implementation research, especially among underresourced subgroups, that engages the community across stages of the research process, includes long-term partnerships and follow-up periods, and includes assessment of health outcomes when possible.

CONCLUSIONS

There is great potential to gain unrealized health benefits in underresourced groups through increasing physical activity levels. However, to realize these benefits, we must do more. Research efforts are needed to rigorously explore the specific strategies across different domains and levels that provide the active ingredient in successful physical activity promotion programs. In many underresourced groups, this work has begun but is only in its infancy. The most effective steps forward are likely to engage communities as full and equal partners in research from the outset; to prioritize scalable interventions that fit with the routines, practices, and goals of the communities that we hope will adopt them; and to understand the supports that these communities need to sustain quality implementation. We should also explore broad-reaching strategies such as policy change, improvements in the built environment, and inclusion of physical activity as a vital sign in electronic medical records. Addressing inequities in physical activity is a challenging task and, it is important to note, will not address underlying structural inequities that contribute to poor CVH and deserve attention. Nonetheless, increasing physical activity should be the cornerstone of our efforts to reduce inequities in CVH and health care.

ARTICLE INFORMATION

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a

Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

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REFERENCES

1. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, Jones DW, Materson BJ, Oparil S, Wright JT Jr, et al; Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; National Heart, Lung, and Blood Institute. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension*. 2003;42:1206–1252. doi: 10.1161/01.HYP.0000107251.49515.c2
2. Grundy SM, Stone NJ, Bailey AL, Beam C, Birtcher KK, Blumenthal RS, Braun LT, de Ferranti S, Faiella-Tommasino J, Forman DE, et al. 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA guideline on the management of blood cholesterol: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines [published correction appears in *Circulation*. 2019;139:e1182–e1186]. *Circulation*. 2019;139:e1082–e1143. doi: 10.1161/CIR.0000000000000625
3. Kraus WE, Powell KE, Haskell WL, Janz KF, Campbell WW, Jakicic JM, Troiano RP, Sprow K, Torres A, Piercy KL; 2018 Physical Activity Guidelines Advisory Committee. Physical activity, all-cause and cardiovascular mortality, and cardiovascular disease. *Med Sci Sports Exerc*. 2019;51:1270–1281. doi: 10.1249/MSS.0000000000001939
4. Whelton PK, Carey RM, Aronow WS, Casey DE Jr, Collins KJ, Dennison Himmelfarb C, DePalma SM, Gidding S, Jamerson KA, Jones DW, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. 2018;138:e484–e594. doi: 10.1161/CIR.0000000000000596
5. Bennie JA, De Cocker K, Teychenne MJ, Brown WJ, Biddle SJH. The epidemiology of aerobic physical activity and muscle-strengthening activity guideline adherence among 383,928 U.S. adults. *Int J Behav Nutr Phys Act*. 2019;16:34. doi: 10.1186/s12966-019-0797-2
6. Hyde ET, Whitfield GP, Omura JD, Fulton JE, Carlson SA. Trends in meeting the physical activity guidelines: muscle-strengthening alone and combined with aerobic activity, United States, 1998-2018. *J Phys Act Health*. 2021;18:S37–S44. doi: 10.1123/jpah.2021-0077
7. Barone Gibbs B, Aaby D, Siddique J, Reis JP, Sternfeld B, Whitaker K, Pettee Gabriel K. Bidirectional 10-year associations of accelerometer-measured sedentary behavior and activity categories with weight among middle-aged adults. *Int J Obes (Lond)*. 2020;44:559–567. doi: 10.1038/s41366-019-0443-8
8. Steinmo S, Hagger-Johnson G, Shahab L. Bidirectional association between mental health and physical activity in older adults: Whitehall II prospective cohort study. *Prev Med*. 2014;66:74–79. doi: 10.1016/j.ypmed.2014.06.005
9. Barreira TV, Harrington DM, Katzmarzyk PT. Cardiovascular health metrics and accelerometer-measured physical activity levels: National Health and Nutrition Examination Survey, 2003-2006. *Mayo Clin Proc*. 2014;89:81–86. doi: 10.1016/j.mayocp.2013.10.001
10. Du Y, Liu B, Sun Y, Snetselaar LG, Wallace RB, Bao W. Trends in adherence to the Physical Activity Guidelines for Americans for aerobic activity and time spent on sedentary behavior among US adults, 2007 to 2016. *JAMA Netw Open*. 2019;2:e197597. doi: 10.1001/jamanetworkopen.2019.7597
11. Shaikh RA, Sikora A, Siahpush M, Singh GK. Occupational variations in obesity, smoking, heavy drinking, and non-adherence to physical activity recommendations: findings from the 2010 National Health Interview Survey. *Am J Ind Med*. 2015;58:77–87. doi: 10.1002/ajim.22405
12. Omura JD, Hyde ET, Imperatore G, Loustalot F, Murphy L, Puckett M, Watson KB, Carlson SA. Trends in meeting the aerobic physical activity guideline among adults with and without select chronic health conditions, United States, 1998-2018. *J Phys Act Health*. 2021;18:S53–S63. doi: 10.1123/jpah.2021-0178
13. Tsao CW, Aday AW, Almarzooq ZI, Alonso A, Beaton AZ, Bittencourt MS, Boehme AK, Buxton AE, Carson AP, Commodore-Mensah Y, et al; on behalf of the American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics–2022 update: a report from the American Heart Association [published correction appears in *Circulation*. 2022;146:e141]. *Circulation*. 2022;145:e153–e639. doi: 10.1161/CIR.0000000000001052
14. Wenger NK, Lloyd-Jones DM, Elkind MSV, Fonarow GC, Warner JJ, Alger HM, Cheng S, Kinzy C, Hall JL, Roger VL, et al; on behalf of the American Heart Association. Call to action for cardiovascular disease in women: epidemiology, awareness, access, and delivery of equitable health care: a presidential advisory from the American Heart Association. *Circulation*. 2022;145:e1059–e1071. doi: 10.1161/CIR.0000000000001071
15. Carnethon MR, Pu J, Howard G, Albert MA, Anderson CAM, Bertoni AG, Mujahid MS, Palaniappan L, Taylor HA Jr, Willis M, et al; on behalf of the American Heart Association Council on Epidemiology and Prevention; Council on Cardiovascular Disease in the Young; Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; Council on Functional Genomics and Translational Biology; and Stroke Council. Cardiovascular health in African Americans: a scientific statement from the American Heart Association. *Circulation*. 2017;136:e393–e423. doi: 10.1161/CIR.0000000000000534
16. Heron M. Deaths: leading causes for 2016. *Natl Vital Stat Rep*. 2018;67:1–77.
17. Khan SU, Lone AN, Yedlapati SH, Dani SS, Khan MZ, Watson KE, Parwani P, Rodriguez F, Cainzos-Achirica M, Michos ED. Cardiovascular disease mortality among Hispanic versus non-Hispanic White adults in the United States, 1999 to 2018. *J Am Heart Assoc*. 2022;11:e022857. doi: 10.1161/JAHA.121.022857
18. Pool LR, Ning H, Lloyd-Jones DM, Allen NB. Trends in racial/ethnic disparities in cardiovascular health among US adults from 1999-2012. *J Am Heart Assoc*. 2017;6:e006027. doi: 10.1161/JAHA.117.006027
19. Devulapalli S, Shoirah H, Dhamoon MS. Ideal cardiovascular health metrics are associated with disability independently of vascular conditions. *PLoS One*. 2016;11:e0150282. doi: 10.1371/journal.pone.0150282
20. Schroeder EC, DuBois L, Sadowsky M, Hilgenkamp TIM. Hypertension in adults with intellectual disability: prevalence and risk factors. *Am J Prev Med*. 2020;58:630–637. doi: 10.1016/j.amepre.2019.12.011
21. Gebreab SY, Davis SK, Symanzik J, Mensah GA, Gibbons GH, Diez-Roux AV. Geographic variations in cardiovascular health in the United States: contributions of state- and individual-level factors. *J Am Heart Assoc*. 2015;4:e001673. doi: 10.1161/JAHA.114.001673
22. Levine GN, Cohen BE, Commodore-Mensah Y, Fleury J, Huffman JC, Khalid U, Labarthe DR, Lavretsky H, Michos ED, Spatz ES, et al; on behalf of the American Heart Association Council on Clinical Cardiology; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Cardiovascular and Stroke Nursing; and Council on Lifestyle and Cardiometabolic Health. Psychological health, well-being, and the mind-heart-body connection: a scientific statement from the American Heart Association. *Circulation*. 2021;143:e763–e783. doi: 10.1161/CIR.0000000000000947
23. Correll CU, Solmi M, Veronese N, Bortolato B, Rosson S, Santonastaso P, Thapa-Chhetri N, Fornaro M, Gallicchio D, Collantoni E, et al. Prevalence, incidence and mortality from cardiovascular disease in patients with pooled and specific severe mental illness: a large-scale meta-analysis of 3,211,768 patients and 113,383,368 controls. *World Psychiatry*. 2017;16:163–180. doi: 10.1002/wps.20420
24. Zenko Z, Willis EA, White DA. Proportion of adults meeting the 2018 Physical Activity Guidelines for Americans according to accelerometers. *Front Public Health*. 2019;7:135–135. doi: 10.3389/fpubh.2019.00135
25. Whitfield GP, Ussery EN, Saint-Maurice PF, Carlson SA. Trends in aerobic physical activity participation across multiple domains among US adults, National Health and Nutrition Examination Survey 2007/2008 to 2017/2018. *J Phys Act Health*. 2021;18:S64–S73. doi: 10.1123/jpah.2021-0173
26. Whitfield GP, Hyde ET, Carlson SA. Participation in leisure-time aerobic physical activity among adults, National Health Interview Survey, 1998–2018. *J Phys Act Health*. 2021;18:S25–S36. doi: 10.1123/jpah.2021-0014
27. Manns P, Ezeugwu V, Armijo-Olivo S, Vallance J, Healy GN. Accelerometer-derived pattern of sedentary and physical activity time in persons with mobility disability: National Health and Nutrition Examination Survey 2003 to 2006. *J Am Geriatr Soc*. 2015;63:1314–1323. doi: 10.1111/jgs.13490
28. Cao C, Hu L, Xu T, Liu Q, Koyanagi A, Yang L, Carvalho AF, Cavazos-Rehg PA, Smith L. Prevalence, correlates and misperception of depression symptoms in the United States, NHANES 2015-2018. *J Affect Disord*. 2020;269:51–57. doi: 10.1016/j.jad.2020.03.031
29. Janney CA, Richardson CR, Holleman RG, Glasheen C, Strath SJ, Conroy MB, Kriska AM. Gender, mental health service use and objectively measured physical activity: data from the National Health and Nutrition Examination Survey (NHANES 2003-2004). *Ment Health Phys Act*. 2008;1:9–16. doi: 10.1016/j.mhpa.2008.05.001
30. Ostchega Y, Hughes JP, Zhang G, Nwankwo T, Graber J, Nguyen DT. Differences in hypertension prevalence and hypertension control by urbanization among adults in the United States, 2013-2018. *Am J Hypertens*. 2022;35:31–41. doi: 10.1093/ajh/hpab067
31. Parcha V, Kalra R, Suri SS, Malla G, Wang TJ, Arora G, Arora P. Geographic variation in cardiovascular health among American adults. *Mayo Clin Proc*. 2021;96:1770–1781. doi: 10.1016/j.mayocp.2020.12.034

32. Harrington RA, Califf RM, Balamurugan A, Brown N, Benjamin RM, Braund WE, Hipp J, Konig M, Sanchez E, Joynt Maddox KE. Call to action: rural health: a presidential advisory from the American Heart Association and American Stroke Association. *Circulation*. 2020;141:e615–e644. doi: 10.1161/CIR.0000000000000753
33. Chandrabose M, Rachele JN, Gunn L, Kavanagh A, Owen N, Turrell G, Giles-Corti B, Sugiyama T. Built environment and cardio-metabolic health: systematic review and meta-analysis of longitudinal studies. *Obes Rev*. 2019;20:41–54. doi: 10.1111/obr.12759
34. Reis JP, Bowles HR, Ainsworth BE, Dubose KD, Smith S, Laditka JN. Nonoccupational physical activity by degree of urbanization and US geographic region. *Med Sci Sports Exerc*. 2004;36:2093–2098. doi: 10.1249/01.mss.0000147589.98744.85
35. Centers for Disease Control and Prevention. Nutrition, physical activity, and obesity: data, trend and maps. Accessed May 15, 2022. https://cdc.gov/nccdphp/dnpao/data-trends-maps/index.html
36. Fan JX, Wen M, Kowaleski-Jones L. Rural–urban differences in objective and subjective measures of physical activity: findings from the National Health and Nutrition Examination Survey (NHANES) 2003–2006. *Prev Chronic Dis*. 2014;11:E141. doi: 10.5888/pcd11.140189
37. Whitfield GP, Carlson SA, Ussery EN, Fulton JE, Galuska DA, Petersen R. Trends in meeting physical activity guidelines among urban and rural dwelling adults–United States, 2008-2017. *MMWR Morb Mortal Wkly Rep*. 2019;68:513–518. doi: 10.15585/mmwr.mm6823a1
38. An R, Xiang X. Ambient fine particulate matter air pollution and leisure-time physical inactivity among US adults. *Public Health*. 2015;129:1637–1644. doi: 10.1016/j.puhe.2015.07.017
39. Wen X-J, Balluz LS, Shire JD, Mokdad AH, Kohl HW 3rd. Association of self-reported leisure-time physical inactivity with particulate matter 2.5 air pollution. *J Environ Health*. 2009;72:40–44; quiz 45.
40. Gebauer SC, Salas J, Scherrer J, Callahan LF. Which aspects of neighbourhood environment are most associated with meeting physical activity recommendations in American adults: an NHIS study. *BMJ Open*. 2020;10:e038473. doi: 10.1136/bmjopen-2020-038473
41. Omura JD, Carlson SA, Brown DR, Hopkins DP, Kraus WE, Staffileno BA, Thomas RJ, Lobelo F, Fulton JE; on behalf of the American Heart Association Physical Activity Committee of the Council on Lifestyle and Cardiometabolic Health; Council on Cardiovascular and Stroke Nursing; and Council on Clinical Cardiology. Built environment approaches to increase physical activity: a science advisory from the American Heart Association. *Circulation*. 2020;142:e160–e166. doi: 10.1161/CIR.0000000000000884
42. Barone Gibbs B, Hivert MF, Jerome GJ, Kraus WE, Rosenkranz SK, Schorr EN, Spartano NL, Lobelo F; on behalf of the American Heart Association Council on Lifestyle and Cardiometabolic Health; Council on Cardiovascular and Stroke Nursing; and Council on Clinical Cardiology. Physical activity as a critical component of first-line treatment for elevated blood pressure or cholesterol: who, what, and how? A scientific statement from the American Heart Association. *Hypertension*. 2021;78:e26–e37. doi: 10.1161/HYP.0000000000000196
43. Corso LM, Macdonald HV, Johnson BT, Farinatti P, Livingston J, Zaleski AL, Blanchard A, Pescatello LS. Is concurrent training efficacious antihypertensive therapy? A meta-analysis. *Med Sci Sports Exerc*. 2016;48:2398–2406. doi: 10.1249/MSS.0000000000001056
44. Li J, Siegrist J. Physical activity and risk of cardiovascular disease: a meta-analysis of prospective cohort studies. *Int J Environ Res Public Health*. 2012;9:391–407. doi: 10.3390/ijerph9020391
45. 2018 Physical Activity Guidelines Advisory Committee. 2018 Physical Activity Guidelines Advisory Committee scientific report. 2018. Accessed May 15, 2022. https://health.gov/sites/default/files/2019-09/PAG_Advisory_Committee_Report.pdf
46. Sattelmair J, Pertman J, Ding EL, Kohl HW 3rd, Haskell W, Lee IM. Dose response between physical activity and risk of coronary heart disease: a meta-analysis. *Circulation*. 2011;124:789–795. doi: 10.1161/CIRCULATIONAHA.110.010710
47. Lee CD, Folsom AR, Blair SN. Physical activity and stroke risk: a meta-analysis. *Stroke*. 2003;34:2475–2481. doi: 10.1161/01.STR.0000091843.02517.9D
48. Benjamin EJ, Virani SS, Callaway CW, Chamberlain AM, Chang AR, Cheng S, Chiuve SE, Cushman M, Delling FN, Deo R, et al; on behalf of the American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics–2018 update: a report from the American Heart Association [published correction appears in *Circulation*. 2018;137:e493]. *Circulation*. 2018;137:e67–e492. doi: 10.1161/CIR.0000000000000558
49. Commodore-Mensah Y, Loustalot F, Himmelfarb CD, Desvigne-Nickens P, Sachdev V, Bibbins-Domingo K, Clauser SB, Cohen DJ, Egan BM, Fendrick AM, et al. Proceedings from a National Heart, Lung, and Blood Institute and the Centers for Disease Control and Prevention workshop to control hypertension. *Am J Hypertens*. 2022;35:232–243. doi: 10.1093/ajh/hpab182
50. Garber CE, Blissmer B, Deschenes MR, Franklin BA, Lamonte MJ, Lee IM, Nieman DC, Swain DP; American College of Sports Medicine. American College of Sports Medicine position stand: quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Med Sci Sports Exerc*. 2011;43:1334–1359. doi: 10.1249/MSS.0b013e318213fefb
51. Mangione CM, Barry MJ, Nicholson WK, Cabana M, Coker TR, Davidson KW, Davis EM, Donahue KE, Jaen CR, Kubik M, et al; USPSTF. Behavioral counseling interventions to promote a healthy diet and physical activity for cardiovascular disease prevention in adults without cardiovascular disease risk factors: US Preventive Services Task Force recommendation statement. *JAMA*. 2022;328:367–374. doi: 10.1001/jama.2022.10951
52. Marcus BH, Williams DM, Dubbert PM, Sallis JF, King AC, Yancey AK, Franklin BA, Buchner D, Daniels SR, Claytor RP. Physical activity intervention studies: what we know and what we need to know: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity); Council on Cardiovascular Disease in the Young; and the Interdisciplinary Working Group on Quality of Care and Outcomes Research [published correction appears in *Circulation*. 2010;122:e8]. *Circulation*. 2006;114:2739–2752. doi: 10.1161/CIRCULATIONAHA.106.179683
53. Artinian NT, Fletcher GF, Mozaffarian D, Kris-Etherton P, Van Horn L, Lichtenstein AH, Kumanyika S, Kraus WE, Fleg JL, Redeker NS, et al; on behalf of the American Heart Association Prevention Committee of the Council on Cardiovascular Nursing. Interventions to promote physical activity and dietary lifestyle changes for cardiovascular risk factor reduction in adults: a scientific statement from the American Heart Association. *Circulation*. 2010;122:406–441. doi: 10.1161/CIR.0b013e3181e8edf1
54. Whitt-Glover MC, Keith NR, Ceaser TG, Virgil K, Ledford L, Hasson RE. A systematic review of physical activity interventions among African American adults: evidence from 2009 to 2013. *Obes Rev*. 2014;15(suppl 4):125–145. doi: 10.1111/obr.12205
55. Bland V, Sharma M. Physical activity interventions in African American women: a systematic review. *Health Promot Perspect*. 2017;7:52–59. doi: 10.15171/hpp.2017.11
56. Newton RL Jr, Griffith DM, Kearney WB, Bennett GG. A systematic review of weight loss, physical activity and dietary interventions involving African American men. *Obes Rev*. 2014;15(suppl 4):93–106. doi: 10.1111/obr.12209
57. Ickes MJ, Sharma M. A systematic review of physical activity interventions in Hispanic adults. *J Environ Public Health*. 2012;2012:156435. doi: 10.1155/2012/156435
58. Larsen BA, Noble ML, Murray KE, Marcus BH. Physical activity in Latino men and women: facilitators, barriers, and interventions. *Am J Lifestyle Med*. 2014;9:4–30. doi: 10.1177/1559827614521758
59. Loya JC. Systematic review of physical activity interventions in Hispanic adults. *Hisp Health Care Int*. 2018;16:174–188. doi: 10.1177/1540415318809427
60. Bull ER, Dombrowski SU, McCleary N, Johnston M. Are interventions for low-income groups effective in changing healthy eating, physical activity and smoking behaviours? A systematic review and meta-analysis. *BMJ Open*. 2014;4:e006046. doi: 10.1136/bmjopen-2014-006046
61. Cleland V, Granados A, Crawford D, Winzenberg T, Ball K. Effectiveness of interventions to promote physical activity among socioeconomically disadvantaged women: a systematic review and meta-analysis. *Obes Rev*. 2013;14:197–212. doi: 10.1111/j.1467-789X.2012.01058.x
62. Cleland V, Squibb K, Stephens L, Dalby J, Timperio A, Winzenberg T, Ball K, Dollman J. Effectiveness of interventions to promote physical activity and/or decrease sedentary behaviour among rural adults: a systematic review and meta-analysis. *Obes Rev*. 2017;18:727–741. doi: 10.1111/obr.12533
63. Frost SS, Goins RT, Hunter RH, Hooker SP, Bryant LL, Kruger J, Pluto D. Effects of the built environment on physical activity of adults living in rural settings. *Am J Health Promot*. 2010;24:267–283. doi: 10.4278/ajhp.08040532
64. Carty C, van der Ploeg HP, Biddle SJH, Bull F, Willumsen J, Lee L, Kamenov K, Milton K. The first global physical activity and sedentary behavior guidelines for people living with disability. *J Phys Act Health*. 2021;18:86–93. doi: 10.1123/jpah.2020-0629

65. Vancampfort D, Rosenbaum S, Schuch F, Ward PB, Richards J, Mugisha J, Probst M, Stubbs B. Cardiorespiratory fitness in severe mental illness: a systematic review and meta-analysis. *Sports Med*. 2017;47:343–352. doi: 10.1007/s40279-016-0574-1
66. Breathett K, Sims M, Gross M, Jackson EA, Jones EJ, Navas-Acien A, Taylor H, Thomas KL, Howard BV; on behalf of the American Heart Association Council on Epidemiology and Prevention; Council on Quality of Care and Outcomes Research; Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; and Council on Lifestyle and Cardiometabolic Health. Cardiovascular health in American Indians and Alaska Natives: a scientific statement from the American Heart Association. *Circulation*. 2020;141:e948–e959. doi: 10.1161/CIR.0000000000000773
67. Sims M, Kershaw KN, Breathett K, Jackson EA, Lewis LM, Mujahid MS, Suglia SF; on behalf of the American Heart Association Council on Epidemiology and Prevention and Council on Quality of Care and Outcomes Research. Importance of housing and cardiovascular health and well-being: a scientific statement from the American Heart Association. *Circ Cardiovasc Qual Outcomes*. 2020;13:e000089. doi: 10.1161/HCQ.0000000000000089
68. Streed C Jr, Caceres B, Mukherjee M. Preventing cardiovascular disease among sexual and gender minority persons [published online February 16, 2021]. *Heart*. doi: 10.1136/heartjnl-2021-319069. https://heart.bmj.com/content/107/13/1100.long
69. Hasson RE, Brown DR, Dorn J, Barkley L, Torgan C, Whitt-Glover M, Ainsworth B, Keith N. Achieving equity in physical activity participation: ACSM experience and next steps. *Med Sci Sports Exerc*. 2017;49:848–858. doi: 10.1249/MSS.0000000000001161
70. Conn VS, Coon Sells TG. Effectiveness of interventions to increase physical activity among minority populations: an umbrella review. *J Natl Med Assoc*. 2016;108:54–68. doi: 10.1016/j.jnma.2015.12.008
71. Lobelo F, Rohm Young D, Sallis R, Garber MD, Billinger SA, Duperly J, Hutber A, Pate RR, Thomas RJ, Widlansky ME, et al; on behalf of the American Heart Association Physical Activity Committee of the Council on Lifestyle and Cardiometabolic Health; Council on Epidemiology and Prevention; Council on Clinical Cardiology; Council on Genomic and Precision Medicine; Council on Cardiovascular Surgery and Anesthesia; and Stroke Council. Routine assessment and promotion of physical activity in healthcare settings: a scientific statement from the American Heart Association. *Circulation*. 2018;137:e495–e522. doi: 10.1161/CIR.0000000000000559
72. Whitsel LP, Bantham A, Jarrin R, Sanders L, Stoutenberg M. Physical activity assessment, prescription and referral in US healthcare: how do we make this a standard of clinical practice? *Prog Cardiovasc Dis*. 2021;64:88–95. doi: 10.1016/j.pcad.2020.12.006
73. Omura JD, Watson KB, Loustalot F, Fulton JE, Carlson SA. Primary care providers' awareness of physical activity-related intensive behavioral counseling services for cardiovascular disease prevention. *Am J Health Promot*. 2019;33:208–216. doi: 10.1177/0890117118784226
74. Lane-Cordova AD, Jerome GJ, Paluch AE, Bustamante EE, LaMonte MJ, Pate RR, Weaver RG, Webber-Ritchey KJ, Gibbs BB; on behalf of the Committee on Physical Activity of the American Heart Association Council on Lifestyle and Cardiometabolic Health. Supporting physical activity in patients and populations during life events and transitions: a scientific statement from the American Heart Association. *Circulation*. 2022;145:e117–e128. doi: 10.1161/CIR.0000000000001035
75. Vermeesch AL, Bustamante EE, Coleman N, Goldsby T, Hasson RE, Hooker SP, Marquez DX, Conroy MB. Exercise is medicine for underserved and vulnerable populations: factors influencing implementation. *Transl J Am Coll Sports Med*. 2022;7:e000196. doi: 10.1249/tjx.0000000000000196
76. Ball K, Carver A, Downing K, Jackson M, O'Rourke K. Addressing the social determinants of inequities in physical activity and sedentary behaviours. *Health Promot Int*. 2015;30(suppl 2):ii818–ii19. doi: 10.1093/heapro/dav022
77. Kelly S, Martin S, Kuhn I, Cowan A, Brayne C, Lafortune L. Barriers and facilitators to the uptake and maintenance of healthy behaviours by people at mid-life: a rapid systematic review. *PLoS One*. 2016;11:e0145074. doi: 10.1371/journal.pone.0145074
78. Pedersen MRL, Hansen AF, Elmose-Osterlund K. Motives and barriers related to physical activity and sport across social backgrounds: implications for health promotion. *Int J Environ Res Public Health*. 2021;18:5810. doi: 10.3390/ijerph18115810
79. Jackson J, Roscoe C, Mourton N. *Understanding and Addressing Inequalities in Physical Activity*. Public Health England; 2021. GOV-8139. Accessed May 15, 2022. https://www.gov.uk/government/publications/physical-activity-understanding-and-addressing-inequalities
80. Glasgow RE, Vinson C, Chambers D, Khoury MJ, Kaplan RM, Hunter C. National Institutes of Health approaches to dissemination and implementation science: current and future directions. *Am J Public Health*. 2012;102:1274–1281. doi: 10.2105/AJPH.2012.300755
81. Bantham A, Taverno Ross SE, Sebastiao E, Hall G. Overcoming barriers to physical activity in underserved populations. *Prog Cardiovasc Dis*. 2021;64:64–71. doi: 10.1016/j.pcad.2020.11.002
82. Alvidrez J, Castille D, Laude-Sharp M, Rosario A, Tabor D. The National Institute on Minority Health and Health Disparities research framework. *Am J Public Health*. 2019;109:S16–S20. doi: 10.2105/AJPH.2018.304883