September 1, 2017

Abby C. King, Ph.D.
Co-Chair
2018 Physical Activity Guidelines Advisory Committee
Professor of Health Research & Policy and Medicine
Stanford University School of Medicine
HRP Redwood Building, T-221
259 Campus Drive

Ken Powell, MD, MPH, FACSM
Co-Chair
2018 Physical Activity Guidelines Advisory Committee
Epidemiology and Public Health Consultant
Atlanta, GA 30303

Dear Drs. King and Powell:

The American Cancer Society (ACS) and the American Cancer Society Cancer Action Network (ACS CAN) appreciate the opportunity to provide comments to the 2018 Physical Activity Guidelines Advisory Committee (PAGAC or the Committee). ACS is a nationwide community-based voluntary health organization dedicated to eliminating cancer as a major health problem. ACS CAN is the nonprofit, nonpartisan advocacy affiliate of ACS.

ACS and ACS CAN applaud the U.S. Department of Health and Human Services (HHS) Office of Disease Prevention and Health Promotion and its federal partners for recognizing the need to update the *2008 Physical Activity Guidelines for Americans* and leading the development of the second edition of the *Physical Activity Guidelines for Americans (*Physical Activity Guidelines*)*. Policy-makers, public health practitioners, health care providers, sector leaders, and individuals need evidence-based, up-to-date information about the benefits of physical activity and successful strategies to help them meet evidence-based guidelines. In addition, like the *Dietary Guidelines for Americans* form the cornerstone of U.S. federal nutrition policy and nutrition education initiatives, the Physical Activity Guidelines should be the cornerstone of federal policy and initiatives to increase physical activity.

The Relationship Between Physical Activity and Cancer

ACS and ACS CAN strongly support increasing physical activity as a strategy for reducing cancer risk, recurrence, and premature death. One in five cancer cases are caused by physical inactivity, poor diet, and excess weight.[1] There is convincing evidence that lack of physical activity is associated with breast, colon, and endometrial cancers,[2] and more recent research that shows physical activity is associated with reduced risk of up to 10 additional cancers, including cancers of esophagus, lung, kidney, stomach (gastric cardia), head and neck, rectum, and bladder, and myeloid leukemia and myeloma.[3] Regular physical activity may help prevent certain cancers via both direct and indirect mechanisms, including

[1] American Cancer Society. *Cancer Facts & Figures, 2017.* Atlanta, GA: American Cancer Society, 2017.
[2] World Cancer Research Fund. Continuous Update Project. *Cancer Prevention & Survival*. May 2017. Available at http://www.wcrf.org/int/research-we-fund/continuous-update-project-findings-reports/summary-global-evidence-cancer. Accessed August 25, 2017.
[3] Moore SC, Lee IM, Weiderpass E, et al. Association of Leisure-Time Physical Activity With Risk of 26 Types of Cancer in 1.44 Million Adults. *JAMA Intern Med* 2016; 176(6): 816-25.

regulating sex hormones, insulin, and prostaglandins, and having various beneficial effects on the immune system.[4] In addition, physical activity plays a role in reducing cancer risk due to excess weight by helping to balance caloric intake to achieve or maintain a healthy weight. Excess weight is associated with increased risk of developing cancers of the endometrium, esophagus (adenocarcinoma), liver, stomach (gastric cardia), kidney, brain, pancreas, colon and rectum, gallbladder, ovary, breast (postmenopausal), and thyroid, and multiple myeloma.[5]

In addition to reducing cancer risk, physical activity is also beneficial following cancer diagnosis. Existing evidence strongly suggests that exercise is safe and feasible during cancer treatment, and that it may improve physical functioning, fatigue, and quality of life, and possibly expedite chemotherapy completion.[6] Physical activity after cancer diagnosis is also associated with a reduced risk of cancer recurrence and overall death among breast, colorectal, prostate, and ovarian cancer survivors.[7]

Consistent with the 2008 Physical Activity Guidelines, ACS recommends that adults engage in at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity activity each week, or an equivalent combination.[8] Children and adolescents should engage in at least one hour of moderate or vigorous intensity physical activity (MVPA) each day, including vigorous activity at least three days per week. Individuals of all ages should also limit sedentary behavior. For cancer survivors, ACS recommends engaging in regular physical activity as soon as possible following diagnosis. However, the intensity or duration of the activity may need to be decreased during chemotherapy or radiation treatment and for survivors experiencing extreme fatigue or with multiple or uncontrolled comorbidities.[9]

While the remainder of our comments provide input on the work of specific subcommittees, one overarching comment is that there currently appears to be inconsistency in the quantity and quality of evidence necessary for assigning a "level" of scientific evidence. The evidence base is more established for some outcomes compared to others (e.g., the evidence base for cardiovascular disease is far more extensive than for some cancer sites). It would be beneficial to make it clear if the same standard as for the 2008 Physical Activity Guidelines was used or an alternative standard.

Physical Activity and Cancer Prevention

Overall, we are pleased that the Committee has made examining the relationship between physical activity and primary prevention of cancer a major area of focus. While we agree that physical activity reduces the risk of several types of cancers, we disagree with some of the Committee's specific conclusions. For example, the draft conclusions from the Committee deemed the evidence for an association between physical activity and lung cancer to be "moderate". However, past studies were largely unable to examine the association in never smokers without residual confounding by smoking, and adjustment for smoking (no matter the level of detail) does not account for the strong correlation between dose and intensity of smoking and amount of physical activity. Thus, residual confounding

[4] Kushi LH, Doyle C, McCullough M, et al. American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention: Reducing the Risk of Cancer with Healthy Food Choices and Physical Activity. *CA Cancer J Clin* 2012; 62: 30-67.
[5] American Cancer Society, 2017.
[6] Rock GL, Doyle C, Demark-Wahnefried W, et al. Nutrition and Physical Activity Guidelines for Cancer Survivors. *CA Cancer J Clin* 2012; 62(4): 243-274.
[7] Rock et al, 2012.
[8] Kushi et al, 2012.
[9] Rock et al, 2012.

leading to bias away from the null cannot be ruled out. A recent large prospective study,[10] and a large pooled analysis of 12 prospective cohorts[11] examined associations stratified by smoking status and found no association between physical activity and lung cancer in never smokers. This was also clearly demonstrated in a systematic review and meta-analysis including 22 prospective and six case-control studies that reported an overall relative risk of 0.76 (95% CI 0.69-0.85, trend p<0.001) between the highest level of recreational physical activity and the lowest overall. However, when stratifying on smoking status, an inverse association was only evident among current (RR=0.77, 95% CI 0.72-0.83) and former (RR=0.77, 95% CI 0.71-0.90) smokers. No association was observed among never smokers (RR=0.96, 95% CI 0.79-1.18).[12] While research has shown that there is no preventive effect of physical activity on lung cancer among never smokers, there may be a preventive effect on current and former smokers and physical activity should be promoted among these groups.

The committee also deemed the evidence for rectal cancer to be insufficient; however, in a different part of the draft conclusions, they reported that colorectal cancer was negatively associated with physical activity. Thus, it was unclear whether rectal cancer was considered negatively associated with physical activity, but should be added, as research has shown an association.[13]

There are various cancers for which only a few studies have been conducted, but are of high quality and suggest an inverse association with physical activity (including esophageal adenocarcinoma, gallbladder, liver, kidney, gastric cardia, myeloid leukemia, myeloma, head & neck, and bladder cancers).[14] These cancers should be cited as such to ensure that the broader range of cancers that may be physical activity-related are highlighted.

Physical Activity in Cancer Survivors

Currently, there are over 15.5 million cancer survivors in the United States. Due to successes in detection and treatment, the cancer survivor population is expected to reach 20 million by 2026.[15] Because current estimates suggest that at least 65 percent of cancer survivors fail to meet physical activity guidelines,[16] and therefore do not attain the full health benefits associated with being physically active, ACS and ACS CAN are extremely supportive of the Committee's decision to focus on physical activity after diagnosis with cancer as part of the Committee's review of the evidence on the benefits of physical activity for people with chronic conditions.

Conclusions Regarding the Benefits of Physical Activity for Cancer Survivors

We largely agree with the Committee's conclusions regarding the benefits of physical activity for cancer survivors, with a few exceptions. With respect to prostate cancer, the conclusion was stated as "no association for recurrence". However, there are few studies that have examined this association. Moreover, studying the association between physical activity and cancer recurrence is challenging due to methodologic difficulties in assessing recurrence for prostate (and other cancers). Thus, we

[10] Leitzmann, M.F., et al., *Prospective study of physical activity and lung cancer by histologic type in current, former, and never smokers.* A*m J Epidemiol*, 2009. 169(5): 542-53.
[11] Moore et al, 2016.
[12] Brenner, D., et al., Leisure-time physical activity and lung cancer risk: A systematic review and meta-analysis. *Lung Cancer,* 2016. 95: 17-27.
[13] Moore et al, 2016.
[14] Ibid.
[15] Miller, K.D., et al., Cancer treatment and survivorship statistics, 2016*. CA Cancer J Clin*, 2016. 66(4): p. 271-89.
[16] Tannenbaum, S.L., et al., Are Cancer Survivors Physically Active? A Comparison by US States*. J Phys Act Health*, 2016. 13(2): 159-67.

recommend that this be stated as "evidence is limited" rather than "no association" since that conclusion cannot be drawn based on the few studies available to date. More research in this space is warranted before scientific consensus on this relationship can be achieved.

In addition, we recommend that the Committee separately draw conclusions and make recommendations for the benefits of physical activity among individuals with cancer who are in active treatment versus post-treatment survivors. Individuals who are undergoing or have recently completed cancer treatment may be experiencing symptoms related to their cancer or its treatment that make certain types or intensities of physical activity more difficult, or in some circumstance, unsafe. While ACS Guidelines for Cancer Survivors recommend that cancer survivors follow its guidelines for cancer prevention as much as possible, the ACS cancer survivor guidelines also address unique challenges or concerns related to physical activity that individuals may experience at different steps along the cancer trajectory.[17] The Committee should acknowledge that such unique challenges or concerns may exist and refer cancer survivors and providers to the ACS guidelines for more information.

Lymphedema

One unique consideration that may affect cancer survivors' perceived ability to meet the Physical Activity Guidelines is lymphedema. Lymphedema can occur after any cancer or cancer treatment that affects lymph node drainage. Incidence estimates are 0- 65 percent of cancer patients, depending on measurement technique.[18, 19]

The 2008 PAGAC report noted there was no evidence to support increased risk of lymphedema associated with resistance exercise. Since 2008, randomized controlled trials[20, 21, 22, 23, 24]and systematic reviews[25, 26, 27] continue to show that moderate-intensity resistance training, conducted under typical safety protocols (e.g., proper technique, gradual progression in intensity) does not increase lymphedema incidence. Most research has focused on breast cancer survivors, and therefore research is needed examining whether physical activity increases risk of lymphedema among individuals treated for

[17] Rock et al, 2012.
[18] Gebruers, N., et al., Incidence and time path of lymphedema in sentinel node negative breast cancer patients: a systematic review. *Arch Phys Med Rehabil*, 2015. 96(6): 1131-9, 4.
[19] Paskett, E.D., et al., Cancer-related lymphedema risk factors, diagnosis, treatment, and impact: a review. *J Clin Oncol,* 2012. 30(30): 3726-33.
[20] Schmitz, K.H., et al., Physical Activity and Lymphedema (the PAL trial): assessing the safety of progressive strength training in breast cancer survivors. *Contemp Clin Trials,* 2009. 30(3): 233-45.
[21] Schmitz, K.H., et al., Weight lifting for women at risk for breast cancer-related lymphedema: a randomized trial. *JAMA,* 2010. 304(24): 2699-705.
[22] Zhang, X., et al., Changes in arm tissue composition with slowly progressive weight-lifting among women with breast cancer-related lymphedema. *Breast Cancer Res Treat,* 2017. 164(1): 79-88.
[23] Sagen, A., R. Karesen, and M.A. Risberg, Physical activity for the affected limb and arm lymphedema after breast cancer surgery. A prospective, randomized controlled trial with two years follow-up. *Acta Oncol*, 2009. 48(8): 1102-10.
[24] Kilbreath, S.L., et al., Upper limb progressive resistance training and stretching exercises following surgery for early breast cancer: a randomized controlled trial. *Breast Cancer Res Treat,* 2012. 133(2): 667-76.
[25] Keilani, M., et al., Resistance exercise and secondary lymphedema in breast cancer survivors-a systematic review. *Support Care Cancer,* 2016. 24(4): 1907-16..
[26] Nelson, N.L., Breast Cancer-Related Lymphedema and Resistance Exercise: A Systematic Review. *J Strength Cond Res*, 2016. 30(9): 2656-65.
[27] Singh, B., et al., Systematic Review and Meta-Analysis of the Effects of Exercise for Those With Cancer-Related Lymphedema. *Arch Phys Med Rehabil*, 2016. 97(2): 302-315 e13.

other cancer types, especially among cancers with high incidence rates of lymphedema (e.g., gynecological cancers).[28, 29]

Furthermore, research shows a lack of increased incidence of lymphedema due to resistance training, in combination with the strong evidence of the benefits of resistance training for muscle strength and physical function[30] among cancer survivors, and the importance of physical activity in maintaining a healthy weight, when obesity is a known risk factor for lymphedema.[31] Therefore, we encourage the Committee to include a section on lymphedema to reinforce the communication of the scientific evidence for safety of resistance training for individuals at risk for lymphedema.

Quality of Life Among Cancer Survivors

We also urge the Committee to consider the benefits of physical activity for improved quality of life in cancer survivors. Health-related quality of life is a multidimensional concept encompassing subjective perceptions of positive and negative aspects of cancer diagnosis, treatment and survivorship, including physical, emotional, social, and cognitive functions. The 2008 PAGAC report noted that most existing research supported a positive effect of physical activity on quality of life in cancer survivors. Recent research and several meta-analyses continue to provide evidence of a positive effect of physical activity on quality of life among cancer survivors. Furthermore, evidence suggests that: (a) the effect is present across many cancer types,[32, 33, 34, 35, 36, 37, 38](b) resistance training, alone, produces a small effect on quality of life,[39] and, (c) larger effect sizes are evident for interventions conducted during treatment, compared to post-treatment.[40]

As such, we encourage the PAGAC to include a section in their report dedicated to the effects of physical activity on health-related quality of life among cancer survivors. This will bolster importance of considering health outcomes beyond that of mortality and cancer recurrence, as well as communicate the broad impact of physical activity on cancer patients' overall health and well-being.

Fatigue in Cancer Survivors

---

[28] Gebruers et al, 2015.
[29] Paskett et al, 2012.
[30] Focht, B.C., et al., Resistance exercise interventions during and following cancer treatment: a systematic review. *J Support Oncol*, 2013. 11(2): p. 45-60.
[31] Paskett et al, 2012.
[32] Gerritsen, J.K. and A.J. Vincent, Exercise improves quality of life in patients with cancer: a systematic review and meta-analysis of randomised controlled trials. *Br J Sports Med,* 2016. 50(13): p. 796-803.
[33] Hayes, S.C., et al., Does the effect of weight lifting on lymphedema following breast cancer differ by diagnostic method: results from a randomized controlled trial. *Breast Cancer Res Treat*, 2011. 130(1): p. 227-34.
[34] Mishra, S.I., et al., Are exercise programs effective for improving health-related quality of life among cancer survivors? A systematic review and meta-analysis. *Oncol Nurs Forum*, 2014. 41(6): p. E326-42.
[35] Mishra, S.I., et al., The effectiveness of exercise interventions for improving health-related quality of life from diagnosis through active cancer treatment. *Oncol Nurs Forum,* 2015. 42(1): p. E33-53.
[36] Capozzi, L.C., et al., The impact of physical activity on health-related fitness and quality of life for patients with head and neck cancer: a systematic review. *Br J Sports Med,* 2016. 50(6): p. 325-38.
[37] Hasenoehrl, T., et al., The effects of resistance exercise on physical performance and health-related quality of life in prostate cancer patients: a systematic review. *Support Care Cancer*, 2015. 23(8): p. 2479-97.
[38] Smits, A., et al., The effect of lifestyle interventions on the quality of life of gynaecological cancer survivors: A systematic review and meta-analysis. *Gynecol Oncol*, 2015. 139(3): p. 546-52.
[39]Focht, B.C., et al., Resistance exercise interventions during and following cancer treatment: a systematic review. *J Support Oncol,* 2013. 11(2): p. 45-60.
[40] Gerritsen and Vincent, 2016.

The Committee should also consider the benefits of physical activity for reducing fatigue among cancer survivors. Fatigue is a distressing adverse effect associated with several cancer treatments, including chemotherapy, radiotherapy, as well as hormone/biological therapies.[41] Estimated prevalence of fatigue during cancer treatment is 25-99 percent, depending on treatment regimen and cancer type.

In the 2008 PAGAC report, the Committee noted that only three of eight studies reported a positive and statistically significant impact of physical activity on cancer-related fatigue. Since 2008, tremendous scientific activity in this space has resulted in systematic reviews and meta-analyses suggesting a positive effect of physical activity on cancer-related fatigue.[42, 43, 44, 45, 46, 47, 48, 49, 50] Of particular note is a recent meta-analysis (69 studies) showing that physical activity has a moderate and statistically significant effect on fatigue, and that this effect is superior to pharmaceutical treatment (14 studies).[51] Therefore, we encourage the Committee to include a section in their report dedicated to communicating the robust evidence of physical activity as medicine for cancer-related fatigue.

Weight Management

In the 2008 Physical Activity Guidelines, there was discussion related to the moderate evidence for an association between physical activity and weight maintenance. While more research is needed on the amount of physical activity needed to prevent weight gain, the impact of physical activity on health and longevity also goes beyond its influence on weight management. This concept is often referred to as "fit versus fat" supporting that at any weight, physically active individuals are at a lower risk of disease than inactive individuals. For example, a recent large pooled study of six cohorts and more than 650,000 adults showed that there was a substantial benefit to overall longevity at every level of body mass index. That is, for example, among individuals who were class I or II obese, there was an average of three years of life gained by meeting physical activity minimum thresholds.[52] Therefore, we ask the Committee to consider expansion of this concept in the 2018 guidelines to state that physical activity is beneficial even in the absence of weight maintenance.

Furthermore, the Committee should also consider that in the absence of weight management (or prevention of weight gain), physical activity provides various benefits to measures of body composition other than weight itself. For example, a high volume of aerobic exercise has been shown in randomized

---

[41] Bower, J.E., Cancer-related fatigue--mechanisms, risk factors, and treatments. *Nat Rev Clin Oncol,* 2014. 11(10): p. 597-609.
[42] Hasenoehrl et al, 2015.
[43] Cramp, F. and J. Byron-Daniel, Exercise for the management of cancer-related fatigue in adults. *Cochrane Database Syst Rev,* 2012. 11: Cd006145.
[44] Dennett, A.M., et al., Moderate-intensity exercise reduces fatigue and improves mobility in cancer survivors: a systematic review and meta-regression. *J Physiother,* 2016. 62(2): p. 68-82.
[45] Duijts, S.F., et al., Effectiveness of behavioral techniques and physical exercise on psychosocial functioning and health-related quality of life in breast cancer patients and survivors--a meta-analysis. *Psychooncology*, 2011. 20(2): p. 115-26.
[46] Gardner, J.R., P.M. Livingston, and S.F. Fraser, Effects of exercise on treatment-related adverse effects for patients with prostate cancer receiving androgen-deprivation therapy: a systematic review. *J Clin Oncol*, 2014. 32(4): p. 335-46.
[47] Lipsett, A., et al., The impact of exercise during adjuvant radiotherapy for breast cancer on fatigue and quality of life: A systematic review and meta-analysis. *Breast,* 2017. 32: p. 144-155,
[48] Meneses-Echavez, J.F., E. Gonzalez-Jimenez, and R. Ramirez-Velez, Effects of supervised exercise on cancer-related fatigue in breast cancer survivors: a systematic review and meta-analysis. *BMC Cancer*, 2015. 15: p. 77,
[49] Paramanandam, V.S. and V. Dunn, Exercise for the management of cancer-related fatigue in lung cancer: a systematic review. *Eur J Cancer Care (Engl*), 2015. 24(1): p. 4-14,
[50] Mustian, K.M., et al., Comparison of Pharmaceutical, Psychological, and Exercise Treatments for Cancer-Related Fatigue: A Meta-analysis. *JAMA Oncol*, 2017. 3(7): p. 961-968.
[51] Ibid.
[52] Moore SC, Patel AV, Matthews CE. Leisure time physical activity of moderate to vigorous intensity and mortality: a large pooled cohort analysis. *PLoS Med.* 2012; 9(11): e1001335.

control trials to reduce total fat, visceral fat, and other biomarkers of adiposity to a greater extent than its effect on body weight itself.[53, 54,55] Expanding to these other anthropomorphic measures will broaden the benefits of physical activity on weight management.

Sedentary Behavior

We are pleased that the Committee is reviewing the research on the harms of sedentary behavior, independent of physical activity. At the most recent PAGAC meeting, the Committee concluded that the relationship between sedentary behavior and all-cause mortality was driven by cardiovascular disease mortality associations. However, in various large prospective cohort studies, associations for "all other causes" (which include all causes of death except cardiovascular disease and cancer) have been positive.[56, 57] In the NIH-AARP Diet & Health Study, a large prospective study of older adults, various other causes of death were found to be drivers of the "all other causes" association.[58] Therefore, we urge the Committee to revise its conclusion to clarify that sedentary behavior increases the risk for death resulting from a number of different causes, including cardiovascular disease and cancer.

For cancer-specific relationships between sitting time and disease, the evidence was considered "moderate" for associations with endometrial, colon, and lung cancers. However, many of the studies reviewed in drawing these conclusions are based on job classification and/or occupational sitting time.[59] Moreover, similar to the association between physical activity and lung cancer risk, the association between sitting time and lung cancer is confounded by smoking as those with the highest cumulative smoking history are likely to have health issues that also result in increased time spent sitting. Thus, reverse causality cannot be ruled out and analyses stratified by smoking status should be carefully considered.

For breast cancer, the committee concluded that there was no association with sitting time. The evidence is not as clear when considering studies published after the review cited by the Committee.[60] Similarly, the Committee concluded there were "no associations" for other cancers and listed cancers such as ovary. However, the studies to date (which were also published after the last published review or meta-analysis) have found that ovarian cancer and multiple myeloma may be associated with sedentary time.[61] Thus, for these cancers, the evidence may be limited, but is suggestive of an association. The Committee should acknowledge this research and change its conclusion to "limited".

Physical Activity Across the Lifespan

---

[53] Ryan AS, Ge S, Blumenthal JB, et al. Aerobic exercise and weight loss reduce vascular markets of inflammation and improve insulin sensitivity in obese women. *J Am Geriatr Soc* 2014; 62(4): 607-14.
[54] Friedenreich CM, Neilson HK, O'Reilly R, et al. Effects of a high vs moderate volume of aerobic exercise on adiposity outcomes in postmenopausal women: a randomized clinical trial. *JAMA Oncol* 2015; 1(6): 766-76.
[55] Friedenreich CM, Woolcott CG, McTiernan A, et al. Adiposity changes after a 1-year aerobic exercise intervention among postmenopausal women: a randomized controlled trial. *Int J Obes* (Lond.) 2011; 35(3): 427-35.
[56] Patel AV, et al., Leisure time spent sitting in relation to total mortality in a prospective cohort of US adults. *Am J Epidemiol,* 2010. 172: p. 419-429.
[57] Matthews, C.E., et al., Amount of time spent in sedentary behaviors and cause-specific mortality in US adults. *The American Journal of Clinical Nutrition,* 2012. 95(2): 437-445.
[58] Keadle SK, et al., Causes of death associated with prolonged TV viewing: NIH-AARP Diet and Health Study. *Am J Prev Med,* 2015. 49: 811.
[59] Schmid D and Leitzmann MF. Television viewing and time spent sedentary in relation to cancer risk: a meta-analysis. *JNCI* 2014.
[60] Patel AV, et.al. Leisure-time spent sitting and site-specific cancer incidence in a large US cohort. *Ca Epid Biomark Prev* 2015.
[61] Ibid.

Initiating and adhering to sufficient levels of physical activity throughout the lifespan is paramount to both physical and mental health. While physical activity is important for chronic disease prevention regardless of age, it has unique benefits during different stages of life. For example, during childhood and adolescence, physical activity (including weight-bearing activity) is particularly important to maximize peak bone mass, which can subsequently reduce losing bone density later in life.[62] Moreover, physical activity in middle and older ages is paramount to enhance mobility and prevent falls, as well as to improve cognitive function and prevent decline.[63]

Unfortunately, many Americans do not adhere to the suggested guidelines during childhood, adolescence and adulthood. In fact, Troiano and colleagues,[64] examining nationally-representative data with accelerometry, noted that physical activity declines with age. Specifically, they found that 42 percent of children aged 6-11 years met physical activity guidelines, in comparison to 8 percent of adolescents, and less than 5 percent of adults.[65] It should be noted that meeting guidelines in childhood and adolescence is usually more time consuming than in adulthood given that adults need to engage in at least 150 minutes of moderate intensity activity or 75 minutes of vigorous activity (or an equivalent combination of both) to meet guidelines, whereas children and adolescent need to engage in at least one hour of daily MVPA (i.e., ≥ 420 minutes per week), with at least three days a week in vigorous intensity levels.[66] Yet despite having to spend less time, fewer adults meet guidelines than their younger counterparts.

Thus, it appears that life transitions serve as an impediment to habitually engaging in an active lifestyle. For example, Brown and Trost found that marriage, children and maintaining a work-life balance was related to less physical activity among adult young women.[67] A systematic review and pooled analysis by Dumith et al. observed a decline in activity during adolescence, with a more pronounced decline in girls' activity in recent studies. They noted that the decline was higher in girls who were 9-12 years and boys who were 13-16 years.[68] Engberg et al., in a systematic review, emphasized that life events, such as transition to retirement, impact leisure-time physical activity.[69]

Individuals experiencing life transitions and events can be targeted for physical activity promotion. Guidelines and specific strategies should be recommended for individuals during life transitions and strategies to overcome specific barriers should be provided to prevent decline in activity levels. Special attention should be given to the children-adolescent transition as well as to adolescent-adulthood juncture in order to maintain activity throughout the lifespan. Hence, it might be worth considering providing separate guidelines for children and separate recommendations for adolescents to help achieve this goal. In addition, the mid-life to older-adult transition is noteworthy as well (e.g., transition

---

[62] Pitukcheewanont P, Punyasavatsut N, Feuille M. Physical activity and bone health in children and adolescents. *Pediatr Endocrinol Rev PER*. 2010;7(3):275-282.

[63] McPhee JS, French DP, Jackson D, et al. Physical activity in older age: perspectives for healthy ageing and frailty. *Biogerontology*. 2016;17:567-580.

[64] Troiano RP, Berrigan D, Dodd KW, et al. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc*. 2008;40(1):181-188.

[65] Ibid.

[66] Guidelines Index - 2008 Physical Activity Guidelines - health.gov. https://health.gov/paguidelines/guidelines/. Accessed August 7, 2017.

[67] Brown WJ, Trost SG. Life transitions and changing physical activity patterns in young women. *Am J Prev Med* 2003;25(2):140-143.

[68] Dumith SC, Gigante DP, Domingues MR, Kohl HW. Physical activity change during adolescence: a systematic review and a pooled analysis. *Int J Epidemiol*. 2011;40(3):685-698..

[69] Engberg E, Alen M, Kukkonen-Harjula K, Peltonen JE, Tikkanen HO, Pekkarinen H. Life events and change in leisure time physical activity: a systematic review. *Sports Med Auckl NZ*. 2012;42(5):433-447.

to retirement), not only to add years to life (i.e., longevity), but also life to years (i.e., improved quality of life).[70]

Physical Activity Promotion

We are pleased that the PAGAC is reviewing the evidence regarding the effectiveness of strategies to increase physical activity and recommend that the Committee dedicate a substantial portion of its report to physical activity promotion. Given that the majority of Americans,[71] including the majority of cancer survivors,[72] do not get enough physical activity, attention must be paid to strategies to help Americans meet the Physical Activity Guidelines. We applaud the PAGAC for using the socio-ecological model as the framework for identifying strategies for increasing physical activity. Interventions are needed at multiple levels, including policy, systems, environmental, and individual behavior change strategies, to help Americans overcome barriers to increasing physical activity and reducing sedentary time. The National Physical Activity Plan[73] is a comprehensive set of policies, programs, and initiatives designed to increase physical activity across the U.S. population. The PAGAC should link its recommendations for increasing physical activity to strategies in one or more of the nine societal sectors in the National Physical Activity Plan.

Conclusions Regarding Interventions for Physical Activity Promotion

With respect to the specific interventions reviewed by the Committee, we are pleased that the Committee found evidence to support the effectiveness of various types of technology, community-based policies, and individual interventions to increase physical activity. With respect to activity monitors (i.e., wearable devices, Smartphone apps), the Committee should acknowledge the fact that few studies have examined the impact of such devices in increasing physical activity long-term (beyond about six months). While we agree that there is strong evidence to support the efficacy of the devices in increasing physical activity in the short-term and in research settings, their long-term, real-world effectiveness is relatively untested and warrants additional research. In addition, the Committee should examine and make recommendations for the characteristics of a successful intervention across settings and intervention types. Based on the available evidence, we believe the most successful interventions are theory-based, sustainable over time, of sufficient intensity to lead to sustained behavior change, and make increasing physical activity convenient and enjoyable. If there is not sufficient evidence for various types of community interventions to increase physical activity in the U.S., the Committee should examine the effectiveness of city- or country-specific interventions in the U.S. or globally. We believe that there is evidence to support the effectiveness of community-, school-, and public policy interventions to increase physical activity.

Walking

We also recommend that the Committee focus on walking as a type of physical activity that can be done by individuals of varying ages, socioeconomic backgrounds, fitness levels, and health status. While walking at low intensity and for short duration is often part of one's daily routine (i.e., walking from a parking garage to a building or climbing stairs in one's home), walking can also be intentionally added to

[70] Katz DL. Childhood Obesity Trends in 2013: Mind, Matter, and Message. *Child Obes*. 2013;9(1):1-2.
[71] CDC. Facts about Physical Activity. May 23, 2014. Available at https://www.cdc.gov/physicalactivity/data/facts.htm. Accessed August 7, 2017.
[72] Tannenbaum, S.L., et al. Are Cancer Survivors Physically Active? A Comparison by US States. *J Phys Act Health*, 2016. 13(2): 159-67.
[73] See http://www.physicalactivityplan.org/index.html for more information about the National Physical Activity Plan.

one's usual activities to increase physical activity. This can include walking or running as a leisure activity, including walking around one's neighborhood, or walking as transportation to reach a specific destination. A brisk walk is a moderate intensity physical activity. Walking can be easily incorporated into daily routines because it requires no special equipment or membership fees and can be done in a variety of settings. In addition, when walking is intentionally added to usual activities, it may also replace other more sedentary leisure activities. A special focus on strategies to promote walking and walkability would also support the goals of *Step It Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities*.[74]

Physical Activity Disparities

The Committee should also include a focus on strategies to reduce disparities in physical activity levels with the goal of reducing morbidity and mortality risk among disadvantaged populations. While most American youth and adults are not getting enough physical activity, this lack of physical activity is not evenly distributed among races, ages, incomes, and education levels. For example, 40 percent of adults with less than a high school degree get no leisure-time physical activity, compared with 15 percent of adults with at least a college degree.[75] Similarly, American adults earning $75,000 or more annually are 1.9 times more likely to meet physical activity guidelines during the week than their lower income counterparts earning less than $20,000 a year.[76] Non-Hispanic blacks, Hispanics, and American Indian/Alaska Natives are also significantly more likely to be inactive than non-Hispanic whites based on self-reported activity.[77] Physical activity also declines with age; while 17 percent of adults ages 18-24 get no self-reported leisure-time physical activity, the prevalence rises slowly to nearly one in three adults by age 65.[78] Strategies targeting groups with lower rates of physical activity are needed to increase physical activity levels across the population and reduce chronic diseases caused by inactivity. We recommend that the Committee include recommendations for strategies aimed at increasing physical activity among disadvantaged groups. For example, requirements for physical education quality and quantity in schools can help to ensure all youth get a minimum amount of physical activity and learn the skills and information they need to be active later in life. For adults, policies and interventions that make communities safe and walkable and make it easier for people to be physically active help to ensure all people have opportunities to be active. More research is needed on the effectiveness of tailored interventions to increase physical activity.

Messaging About Physical Activity

Overall, the public health community must do a better job of both messaging about the benefits of physical activity and encouraging changes to the physical and social environments to be more conducive to an active lifestyle. We agree with the Committee's conclusions that clear and consistent evidence shows that the greatest improvement in health and reduction in mortality risk comes from doing some moderate-vigorous activity for people who do no physical activity at all. This should be the primary goal of strategies to promote physical activity. One of the major scientific advancements since the 2008

[74] HHS. *Step It Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities.* September 2015. Available at https://www.surgeongeneral.gov/library/calls/walking-and-walkable-communities/index.html. Accessed August 8, 2017.
[75] CDC. National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition, Physical Activity, and Obesity. Data, Trends and Maps. Available at https://www.cdc.gov/nccdphp/dnpao/data-trends-maps/index.html. Accessed Aug 16, 2017.
[76] Shuval K, Li Q, Gabriel KP, Tchernis R. Income, physical activity, sedentary behavior, and the 'weekend warrior' among U.S. adults. *Preventive Medicine*. In Press.
[77] CDC, 2017.
[78] Ibid.

PAGAC report is that sedentary behavior is harmful to our nation's health. Research has shown that decreasing sedentary behavior by 60 minutes per day and simultaneously adding light activity has positive health implications, especially among the large proportion of the US who do not get any MVPA.[79, 80] Thus, this is where the 2018 PAGAC report can have the biggest public health impact.

Furthermore, for people who are already active at some level, there are additional health benefits that can come from increasing their physical activity levels to 150 minutes or even 300 minutes per week.

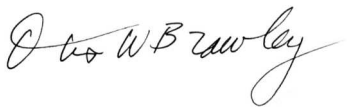
Based on this evidence, messaging and strategies are needed:

- to establish a recommended minimum amount of moderate-to-vigorous physical activity;
- to establish a recommended maximum of daily sedentary behavior;
- to encourage sedentary individuals to reduce their sedentary behavior and increase their light physical activity, even if they don't reach the recommended levels of MVPA; and
- to encourage those doing some MVPA to be more active.

Conclusion

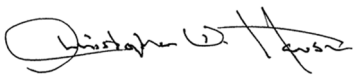
Thank you for considering our comments. If you have questions, please feel free to contact Alpa Patel, Ph.D., Strategic Director, CPS-III, at ACS, at alpa.patel@cancer.org or 404-329-7726, or Melissa Maitin-Shepard, MPP, Senior Analyst, Policy Analysis & Legislative Support, at ACS CAN, at melissa.maitin-shepard@cancer.org or 202-585-3205.

Sincerely,



Otis W. Brawley, MD
Chief Medical Officer
American Cancer Society

Richard C. Wender, MD
Chief Cancer Control Officer
American Cancer Society



Christopher W. Hansen
President
American Cancer Society
Cancer Action Network

CC: Members of the 2018 Physical Activity Guidelines Advisory Committee

[79] Matthews, C. E., Keadle, S. K., Troiano, R. P.., et al. (2016). Accelerometer-measured dose-repose for physical activity, sedentary time, and mortality in US adults. *Am J Clin Nutr,* 104, 1424-1432.
[80] Young, D. R., Hivert, M-F, Alhassan, et al. (2016). Sedentary behavior and cardiovascular morbidity and mortality: A science advisory from the American Heart Association. *Circulation*, 134, e262-279.