Part D. Chapter 7: Physical Activity

INTRODUCTION

The combination of a healthy diet and regular physical activity is central to promoting overall health and preventing many chronic diseases. The *Dietary Guidelines for Americans* first emphasized the importance of physical activity in 1990 and has included the topic in every edition in the two decades since. Although the 1990 and 1995 *Dietary Guidelines for Americans* discussed physical activity as a tool for managing and maintaining a healthy body weight, it broadened this perspective with the 2000 edition. Beginning in 2000, the *Dietary Guidelines for Americans'* physical activity content reflected the growing evidence base on the relationship between physical activity and various health outcomes. This evidence, from a wide range of well-conducted studies, clearly demonstrates that physically active people have improved growth and development, higher levels of fitness, a lower risk profile for developing a number of disabling medical conditions, and lower rates of various chronic diseases than do people who are less active or sedentary.[1]

In 2008, the U.S. Department of Health and Human Services issued the first *Physical Activity Guidelines for Americans* (PAG).[2] The PAG serves as the benchmark and single, authoritative voice for science-based guidance on physical activity, fitness, and health for Americans 6 years and older (Table D7.1). The content of the PAG complements the *Dietary Guidelines for Americans*. Recognizing the dual importance of being physically active and eating a healthy diet to promote good health and reduce the risk of chronic diseases, therefore, the 2015 DGAC included a number of physical activity questions, including several related to body weight.

Table D7.1. *2008 Physical Activity Guidelines for Americans:* Key Recommendations

Recommendations for Children and Adolescents Ages 6 to 17 Years

Children and adolescents should do 60 minutes (1 hour) or more of physical activity daily.

- **Aerobic:** Most of the 60 or more minutes a day should be either moderate- or vigorous-intensity aerobic physical activity, and should include vigorous-intensity physical activity at least 3 days a week.
- **Muscle-strengthening:** As part of their 60 or more minutes of daily physical activity, children and adolescents should include muscle-strengthening physical activity on at least 3 days of the week.
- **Bone-strengthening:** As part of their 60 or more minutes of daily physical activity, children and adolescents should include bone-strengthening physical activity on at least 3 days of the week.
- It is important to encourage young people to participate in physical activities that are appropriate for their age, that are enjoyable, and that offer variety.

Recommendations for Adults Ages 18 Years and Older

- All adults should avoid inactivity. Some physical activity is better than none, and adults who participate in any amount of physical activity gain some health benefits.
- For substantial health benefits, adults should do at least 150 minutes (2 hours and 30 minutes) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous intensity aerobic activity. Aerobic activity should be performed in episodes of at least 10 minutes, and preferably, it should be spread throughout the week.
- For additional and more extensive health benefits, adults should increase their aerobic physical activity to 300 minutes (5 hours) a week of moderate intensity, or 150 minutes a week of vigorous intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity activity. Additional health benefits are gained by engaging in physical activity beyond this amount.
- Adults should also do muscle-strengthening activities that are moderate or high intensity and involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits.

Recommendations for Older Adults

The PAG recommendations for adults also apply to older adults. In addition, the following Guidelines are just for older adults (ages 65 years and older):

- When older adults cannot do 150 minutes of moderate-intensity aerobic activity a week because of chronic conditions, they should be as physically active as their abilities and conditions allow.
- Older adults should do exercises that maintain or improve balance if they are at risk of falling.
- Older adults should determine their level of effort for physical activity relative to their level of fitness.
- Older adults with chronic conditions should understand whether and how their conditions affect their ability to do regular physical activity safely.

Despite the consistent public health advice and encouragement to engage in regular physical activity, the majority of the U.S. population does not meet PAG recommendations. Using self-reported measures, in 2012 fewer than 21 percent of adults met the PAG recommendations for aerobic and muscle-strengthening physical activity, with fewer women than men meeting recommendations.[3] As reported in the National Health Interview Survey, physical activity participation rates are lower in Blacks or African Americans and Hispanic or Latinos than in White populations. Older adults had the lowest participation rates across all adult age groups.[3] In

2013, only 27 percent of adolescents met PAG recommendations; again, fewer girls than boys achieved recommended levels of physical activity.[4]

It is important to note that self-reported data on physical activity participation rates are likely to have significant over-reporting bias.[5] Using objective accelerometer data on a nationally representative sample, Troiano et al. demonstrated that the percentage of the population meeting PAG recommendations was much lower than with self-report. For example, when considering bouts of moderate- to vigorous-intensity aerobic physical activity lasting 8 to 10 minutes or longer, less than 5 percent of adults met 2008 PAG recommendations.[5] Nonetheless, some data indicate that Americans may be increasing their level of physical activity. Over the past six years, consistent data show a minimal, but positive, trend (Tables D7.2a and D7.2b).[3,6-8]

Table D7.2a. Proportion of adults who self-report meeting the Physical Activity Guidelines for Americans recommendations for aerobic and muscle-strengthening physical activity

Population	2008	2009	2012	2013
Adult Total:	18.2%	19.0%	20.6%	*
Adult Male	21.7%	22.0%	24.3%	
Adult Female	14.9%	16.2%	17.1%	

Table D7.2b. Proportion of adolescents who self-report meeting the Physical Activity Guidelines for Americans recommendations for aerobic physical activity

Adolescent Total:	**	18.4%	**	27.1%
Adolescent Boys		24.8%		36.6%
Adolescent Girls		11.4%		17.7%

* National Health Interview Survey, 2013 data unavailable at time of publication.
** Youth Risk Behavior Surveillance was not conducted in 2008 or 2012.
Sources: Pleis, 2008; Pleis, 2009; Blackwell et al., 2014; CDC, 2010; CDC, 2014

To ensure sufficient discussion of physical activity for the population across the life cycle, as well as its relationship with a range of health outcomes, the DGAC reviewed the three major Federal reports on physical activity and health outcomes and selected specific questions for inclusion in this chapter. The Committee did not conduct independent formal systematic reviews of the evidence. This chapter summarizes the key evidence contained in these reports of the benefits of physical activity on health. Due to the extensive nature and number of evidence reviews within the three reports, the Committee refers readers to specific information using hyperlinks in each review of evidence found in this chapter.

LIST OF QUESTIONS

Physical Activity and Health Outcomes in Children and Adolescents

1. What is the relationship between physical activity, body weight, and health outcomes in children and adolescents?

Physical Activity and Health Outcomes in Adults

2. What is the relationship between physical activity and body weight?
3. What is the relationship between physical activity and cardiorespiratory health?
4. What is the relationship between physical activity and metabolic health and risk of type 2 diabetes?
5. What is the relationship between physical activity and musculoskeletal health?
6. What is the relationship between physical activity and incidence of breast and colon cancer?
7. What is the relationship between physical activity and mental health?

Physical Activity and Health Outcomes in People with Disabilities

8. What is the relationship between physical activity and health outcomes in people with disabilities?

Physical Activity and Health Outcomes During Pregnancy and the Postpartum Period

9. Does being physically active during pregnancy and the postpartum period provide health benefits?

Physical Activity and Adverse Events

10. What is the relationship between the amount and type of physical activity and the risk of adverse events?

Physical Activity Dose

11. What dose of physical activity is most likely to provide health benefits in children and adolescents?
12. What dose of physical activity is most likely to provide health benefits in adults?
13. Are there any special considerations for dose of physical activity for older adults?

Physical Activity Interventions in Children and Adolescents

14. What is the relationship between physical activity participation and interventions in school-based settings?
15. What is the relationship between physical activity participation and interventions to change the built environment?
16. What is the relationship between physical activity participation and interventions based in home settings?
17. What is the relationship between physical activity participation and interventions based in early care and education centers?
18. What is the relationship between physical activity participation and interventions based in primary health care settings?

METHODOLOGY

The DGAC agreed to use existing systematic reviews and reports to address the physical activity topic area. The Committee used the PAG and two related reports—the *Physical Activity Guidelines Advisory Committee Report, 2008* (PAGAC) and the *Physical Activity Guidelines for Americans Midcourse Report*—as primary sources of evidence[1,2,9] and discussed at its public meetings questions that could be developed to frame the reports' key findings. The DGAC reviewed and extracted information on the methodological approaches from each report and identified key findings. The DGAC then carried forward verbatim conclusion statements from the PAGAC Report and PAG Midcourse Report and concurred with 2008 PAG recommendations to answer the questions. The DGAC subsequently assigned strength of evidence grades and, based on the various report findings and conclusions, developed an overall physical activity implications statement. Below is a brief description of each of the three reports.

Physical Activity Guidelines Advisory Committee Report, 2008. In 2007, the Secretary of HHS appointed a 13-member Physical Activity Guidelines Advisory Committee and charged them with reviewing existing scientific literature to identify areas where sufficient evidence existed to develop a comprehensive set of specific physical activity recommendations and highlight areas where further scientific research was needed.[1] The PAGAC conducted systematic searches of the scientific literature on physical activity and selected health outcomes in people ages 5 years and older. Similar to the 2010 and 2015 DGAC, the PAGAC developed analytic frameworks for each question and examined a diverse array of literature representing a number of study designs, including randomized controlled trials (RCTs), non-randomized trials, prospective cohort studies, case-control studies, and other observational studies. For each topic area, the PAGAC used the best available and most appropriate body of evidence to answer specific questions. One

of the PAGAC's major goals was to integrate the scientific information on the relationship between physical activity and health and to summarize it in a manner that could be used effectively by HHS to develop the *Physical Activity Guidelines for Americans* and related policy statements.

Physical Activity Guidelines for Americans, 2008. In 2008, HHS issued the PAG, which provides science-based guidance to help Americans ages 6 years and older improve their health through appropriate physical activity.[2] The 2008 PAG is designed to provide information and guidance on the types and amounts of physical activity that provide substantial health benefits. The primary audiences for the PAG are policymakers, health professionals, and interested members of the public.

Physical Activity Guidelines for Americans Midcourse Report: Strategies to Increase Physical Activity Among Youth. In spring 2012, HHS convened a subcommittee of the President's Council on Fitness, Sports & Nutrition to review the evidence on strategies to increase youth physical activity and make recommendations. The *Physical Activity Guidelines for Americans Midcourse Report*, released in 2013, is intended to identify interventions that can help increase physical activity in youth across a variety of settings.[9] The subcommittee used a review-of-reviews approach to assess the current literature on interventions to increase physical activity in youth across five selected settings: schools, preschool and childcare centers, community, family and home, and primary health care. A total of 31 reviews covering 910 studies were examined. In its report, the subcommittee expanded the PAG's age focus on those ages 6 years and older to include children ages 3 to 5 years.

Overall, the DGAC concurs with the findings and evidence grades of the *Physical Activity Guidelines Advisory Committee Report, 2008*; the *2008 Physical Activity Guidelines for Americans*; and the *Physical Activity Guidelines for Americans Midcourse Report: Strategies to Increase Physical Activity Among Youth*.[1,2,9] These reports state that being physically active is one of the most important steps that people of all ages can take to improve and maintain their health.

PHYSICAL ACTIVITY AND HEALTH OUTCOMES IN CHILDREN AND ADOLESCENTS

Question 1: What is the relationship between physical activity, body weight, and health outcomes in children and adolescents?

Source of Evidence: *Physical Activity Guidelines Advisory Committee Report, 2008*

Conclusion

The DGAC concurs with the 2008 PAGAC, which found that strong evidence demonstrates that the physical fitness and health status of children and adolescents is substantially enhanced by frequent physical activity. Compared to inactive young people, physically active children and adolescents have higher levels of cardiorespiratory endurance and muscular strength, and well documented health benefits include lower body fatness, more favorable cardiovascular and metabolic disease risk profiles, enhanced bone health, and reduced symptoms of anxiety and depression. These conclusions are based on the results of prospective observational studies in which higher levels of physical activity were found to be associated with favorable health parameters as well as intervention studies in which exercise treatments caused improvements in physical fitness and various health-related factors. **DGAC Grade: Strong**

Review of Evidence

A body of RCTs, non-randomized trials, prospective cohort studies, case-control studies, other observational studies, and meta-analyses support the relationship between physical activity and physical fitness (i.e., cardiorespiratory fitness and muscular strength), healthy body weight and composition, cardio-metabolic health, bone health, and mental health (i.e., anxiety and depression).

For additional details on this body of evidence, visit: Appendix E-2.49 and *Physical Activity Guidelines Advisory Committee Report, 2008* at http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf.

For evidence reviews on:

- Physical fitness, see Part G. Section 9: Youth
- Body weight and composition, see Part G. Section 9: Youth
- Cardio-metabolic health, see Part G. Section 9: Youth
- Bone health, see Part G. Section 9: Youth
- Mental health, see Part G. Section 9: Youth

PHYSICAL ACTIVITY AND HEALTH OUTCOMES IN ADULTS

Question 2: What is the relationship between physical activity and body weight?

Question 3: What is the relationship between physical activity and cardiorespiratory health?

Question 4: What is the relationship between physical activity and metabolic health and risk of type 2 diabetes?

Question 5: What is the relationship between physical activity and musculoskeletal health?

Question 6: What is the relationship between physical activity and incidence of breast and colon cancer?

Question 7: What is the relationship between physical activity and mental health?

Source of Evidence: *Physical Activity Guidelines Advisory Committee Report, 2008*

Conclusion

The DGAC concurs with the 2008 PAGAC, which found that compared to less active people, physically active adults and older adults exhibit a higher level of cardiorespiratory and muscular fitness, healthier body weight and body composition, and a biomarker profile that is more favorable for preventing cardiovascular disease (CVD) and type 2 diabetes and enhancing bone health. In addition, there is an association between higher levels of physically activity in adults and older adults and lower rates of all-cause mortality, coronary heart disease, high blood pressure, stroke, type 2 diabetes, metabolic syndrome, colon cancer, breast cancer, and depression. High-intensity muscle-strengthening activity enhances skeletal muscle mass, strength, power, and intrinsic neuromuscular activation. Physically active adults who are overweight or obese experience a variety of health benefits that are generally similar to those observed in physically active people of ideal body weight. Physical activity reduces risk of depression and is associated with lower risk of cognitive decline in adults and older adults. Physical activity is associated with higher levels of functional health and a lower risk of falling in older adults. **DGAC Grade: Strong**

In older adults with existing functional limitations, fairly consistent evidence indicates that regular physical activity is safe and has a beneficial effect on functional ability. Consistent evidence indicates that physically active adults and older adults have better quality sleep and health-related quality of life. **DGAC Grade: Moderate**

Review of Evidence

A body of well-designed prospective cohort studies, case-control studies, and other observational studies exists for the relationship between regular physical activity and lower risk of all-cause mortality; coronary heart disease (CHD), CVD, and stroke; type 2 diabetes; metabolic syndrome, body weight, and body composition; bone health; functional health; cancer; and mental health. A body of RCTs and meta-analyses provides evidence for a positive effect of physical activity on blood pressure, atherogenic dyslipidemia, and cardiorespiratory fitness; body weight and body composition; bone health and muscular strength; falls risk; mental health; and type 2 diabetes.

For additional details on this body of evidence, visit: Appendix E-2.49 and *Physical Activity Guidelines Advisory Committee Report, 2008* at http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf.

For evidence reviews on:

- All-cause mortality, see Part G, Section 1: All-cause Mortality
- Coronary heart disease (CHD), CVD, and stroke; blood pressure, atherogenic dyslipidemia, and cardiorespiratory fitness, see Part G, Section 2: Cardiorespiratory Health
- Type 2 diabetes, see Part G, Section 3: Metabolic Health
- Metabolic syndrome, see Part G, Section 3: Metabolic Health
- Body weight and body composition, see Part G, Section 4: Energy Balance
- Bone health and muscular strength, see Part G, Section 5: Musculoskeletal Health
- Functional health and falls risk, see Part G, Section 6
- Cancer, see Part G, Section 7
- Mental Health, see Part G, Section 8

PHYSICAL ACTIVITY AND HEALTH OUTCOMES IN PEOPLE WITH DISABILITIES

Question 8: What is the relationship between physical activity and health outcomes in people with disabilities?

Source of Evidence: *Physical Activity Guidelines Advisory Committee Report, 2008*

Conclusion

The DGAC concurs with the 2008 PAGAC, which found that for people with physical disabilities, strong evidence shows that exercise can increase cardiorespiratory, musculoskeletal,

and mental health outcomes; and for people with cognitive disabilities, strong evidence shows that exercise can improve musculoskeletal health and select functional health and mental health outcomes. **DGAC Grade: Strong**

For people with physical disabilities, moderate evidence indicates that physical activity improves a variety of functional health outcomes and reduces the effects of certain types of secondary conditions (i.e., pain and fatigue associated with the primary disability); and for people with cognitive disabilities, moderate evidence indicates that physical activity improves cardiorespiratory health outcomes, musculoskeletal fitness, and metabolic health, and helps maintain healthy weight. **DGAC Grade: Moderate**

For people with physical disabilities, limited evidence suggests physical activity may promote a healthy weight and improve metabolic health, and for people with cognitive disabilities, limited evidence suggests that physical activity may reduce secondary conditions. **DGAC Grade: Limited**

Based on these conclusions from the 2008 PAGAC, the PAG provided recommendations on physical activity for people with disabilities (Table D7.3). The DGAC concurs with these recommendations.

Table D7.3. PAG Recommendations for Adults with Disabilities

- Adults with disabilities, who are able to, should get at least 150 minutes a week of moderate-intensity, or 75 minutes a week of vigorous-intensity aerobic activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Aerobic activity should be performed in episodes of at least 10 minutes, and preferably, it should be spread throughout the week.
- Adults with disabilities, who are able to, should also do muscle-strengthening activities of moderate or high intensity that involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits.
- When adults with disabilities are not able to meet the Guidelines, they should engage in regular physical activity according to their abilities and should avoid inactivity.
- Adults with disabilities should consult their health-care provider about the amounts and types of physical activity that are appropriate for their abilities.

Review of Evidence

A body of RCTs, meta-analyses, and non-randomized trials provides evidence on physical activity in people with physical and cognitive disabilities. Non-randomized trials were included in the review of evidence for this question due to the high variability of physical and cognitive disabilities considered.

For additional details on this body of evidence, visit: Appendix E-2.49 and *Physical Activity Guidelines Advisory Committee Report, 2008* at http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf.

For evidence reviews on:

- Physical and cognitive disabilities, see Part G, Section 11: Understudied Populations. Review of the Science: Health Outcomes Associated with Physical Activity in People With Disabilities (pages G11-2 to G11-35)

For additional details about the PAG recommendations, visit:
http://www.health.gov/paguidelines/pdf/paguide.pdf.

PHYSICAL ACTIVITY AND HEALTH OUTCOMES DURING PREGANCY AND THE POSTPARTUM PERIOD

Question 9: Does being physically active during pregnancy and the postpartum period provide health benefits?

Source of Evidence: *Physical Activity Guidelines Advisory Committee Report, 2008*

Conclusion

The DGAC concurs with the 2008 PAGAC, which found that while the benefits of maternal physical activity have clearly been demonstrated, there is a lack of prospective, randomized intervention studies in diverse populations. Based on current evidence, unless there are medical reasons to the contrary, a pregnant woman can begin or continue a regular physical activity program throughout gestation, adjusting the frequency, intensity, and time as her condition warrants. Very little evidence exists for the dose of activity that confers the greatest health benefits to women during pregnancy and the postpartum period. In the absence of data, it is reasonable for women during pregnancy and the postpartum period to follow the moderate-intensity physical activity recommendations set for adults unless specific medical concerns warrant a reduction in activity. **DGAC Grade: Limited**

Based on these conclusions from the 2008 PAGAC, the PAG provided recommendations on physical activity for women who are pregnant or in the postpartum period (Table D7.4). The DGAC concurs with these recommendations.

Table D7.4. PAG Recommendations for Women During Pregnancy and the Postpartum Period

- Healthy women who are not already highly active or doing vigorous-intensity activity should get at least 150 minutes of moderate-intensity aerobic activity a week during pregnancy and the postpartum period. Preferably, this activity should be spread throughout the week.
- Pregnant women who habitually engage in vigorous-intensity aerobic activity or who are highly active can continue physical activity during pregnancy and the postpartum period, provided that they remain healthy and discuss with their health care provider how and when activity should be adjusted over time.

Review of Evidence

Laboratory investigations and observational studies provide evidence on physical activity during pregnancy and the postpartum period.

For additional details on this body of evidence, visit: Appendix E-2.49 and *Physical Activity Guidelines Advisory Committee Report, 2008* at http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf.

For evidence reviews on:

- Pregnancy and the postpartum period, see Part G, Section 11: Understudied Populations. Review of the Science: Physical Activity During Pregnancy and the Postpartum Period (pages G11-35 to G11-38)

For additional details about the PAG recommendations, visit:
http://www.health.gov/paguidelines/pdf/paguide.pdf.

PHYSICAL ACTIVITY AND ADVERSE EVENTS

Question 10: What is the relationship between the amount and type of physical activity and the risk of adverse events?

Source of Evidence: *Physical Activity Guidelines Advisory Committee Report, 2008*

Conclusion

The DGAC concurs with the 2008 PAGAC, which found that the benefits of regular physical activity outweigh the inherent risk of adverse events. Risk of musculoskeletal injuries is lower for non-contact (e.g., walking) and limited contact (e.g., baseball) activities than for contact (e.g., basketball) and collision (e.g., football) activities. The usual dose of regular physical activity is directly related to the risk of musculoskeletal injury and inversely related to the risk of sudden adverse cardiac events. The risk of musculoskeletal injuries and sudden cardiac adverse events is directly related to the size of the difference between the usual dose of activity and the new or momentary dose of activity. The most consistently reported risk factor for musculoskeletal injuries and sudden cardiac adverse events is inactivity and low fitness. **DGAC Grade: Strong**

Based on these conclusions from the 2008 PAGAC, the PAG provided recommendations on physical activity and reducing the risk of adverse events (Table D7.5). The DGAC concurs with these recommendations.

Table D7.5. PAG Recommendations for Reducing the Risk of Adverse Events

To do physical activity safely and to reduce risk of injuries and other adverse events, people should:

- Understand the risks and yet be confident that physical activity is safe for almost everyone.
- Choose to do types of physical activity that are appropriate for their current fitness level and health goals, because some activities are safer than others.
- Increase physical activity gradually over time whenever more activity is necessary to meet the guidelines or health goals. Inactive people should "start low and go slow" by gradually increasing how often and how long activities are done.
- Protect themselves by using appropriate gear and sports equipment, looking for safe environments, following rules and policies, and making sensible choices about when, where, and how to be active.
- Be under the care of a health care provider if they have chronic conditions or symptoms. People with chronic conditions and symptoms should consult their health care provider about the types and amounts of activity appropriate for them.

Review of Evidence

A body of RCTs, meta-analyses, well-designed prospective cohort studies, and case control studies provides evidence on physical activity and risk of adverse events.

For additional details on this body of evidence, visit: Appendix E-2.49 and *Physical Activity Guidelines Advisory Committee Report, 2008* at http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf.

For evidence reviews on:

- Adverse events, see Part G, Section 10: Adverse Events

For additional details about the PAG recommendations, visit: http://www.health.gov/paguidelines/pdf/paguide.pdf.

PHYSICAL ACTIVITY DOSE

Question 11: What dose of physical activity is most likely to provide health benefits in children and adolescents?

Source of Evidence: *Physical Activity Guidelines Advisory Committee Report, 2008*

Conclusion

The DGAC concurs with the 2008 PAGAC, which found that substantial evidence indicates important health and fitness benefits can be expected to accrue to most children and adolescents who participate daily in 60 or more minutes of moderate to vigorous physical activity. Also,

certain specific types of physical activity should be included in an overall physical activity pattern in order for children and adolescents to gain comprehensive health benefits. These include regular participation in each of the following types of physical activity on 3 or more days per week: resistance exercise to enhance muscular strength in the large muscle groups of the trunk and limbs, vigorous aerobic exercise to improve cardiorespiratory fitness and cardiovascular and metabolic disease risk factors, and weight-loading activities to promote bone health. **DGAC Grade: Strong**

Based on these conclusions from the 2008 PAGAC, the PAG provides recommendations on physical activity for children and adolescents (Table D7.1). The DGAC concurs with these recommendations.

Review of Evidence

A body of RCTs, meta-analyses, non-randomized trials, well-designed prospective cohort studies, case-control studies, and other observational studies supports the dose of physical activity most likely to provide health benefits in children and adolescents.

For additional details on this body of evidence, visit: Appendix E-2.49 and *Physical Activity Guidelines Advisory Committee Report, 2008* at http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf.

For evidence reviews on:

- Children and adolescents, see Part G, Section 9: Youth

For additional details about the PAG recommendations, visit: http://www.health.gov/paguidelines/pdf/paguide.pdf.

Question 12: What dose of physical activity is most likely to provide health benefits in adults?

Source of Evidence: *Physical Activity Guidelines Advisory Committee Report, 2008*

Conclusion

The DGAC concurs with the 2008 PAGAC, which found that for overall public health benefit, data from a large number of studies evaluating a wide variety of benefits in diverse populations generally support 30 to 60 minutes per day of moderate- to vigorous-intensity physical activity on 5 or more days of the week. For a number of benefits, including all-cause mortality, coronary heart disease, stroke, hypertension, and type 2 diabetes in adults and older adults, lower risk is consistently observed at 2.5 hours per week of moderate- to vigorous-intensity activity. The

amount of moderate- to vigorous-intensity activity most consistently associated with significantly lower rates of colon and breast cancer and the prevention of unhealthy weight gain or significant weight loss by physical activity alone is in the range of 3 to 5 hours per week. The available evidence suggests that the major health benefits of physical activity and the dose needed for major health benefits are similar for all adults, regardless of race or ethnicity. For a variety of health and fitness outcomes, including chronic disease prevention, improvement of various disease biomarkers and the maintenance of a healthy weight, reasonably strong evidence demonstrates that amounts of moderate- to vigorous-intensity activity that exceed 150 minutes per week are associated with greater health benefits. **DGAC Grade: Strong**

Based on these conclusions from the 2008 PAGAC, the PAG provides recommendations on physical activity for adults ages 18 years and older (Table D7.1). The DGAC concurs with these recommendations.

Review of Evidence

A body of well-designed prospective cohort studies and case control studies provides evidence on physical activity dose most likely to provide health benefits in adults.

For additional details on this body of evidence, visit: Appendix E-2.49 and *Physical Activity Guidelines Advisory Committee Report, 2008* at http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf.

For evidence reviews on:

- Adults, see Part E: Integration and Summary of the Science (pages E-23 to E-24)

For additional details about the PAG recommendations, visit: http://www.health.gov/paguidelines/pdf/paguide.pdf.

Question 13: Are there any special considerations for dose of physical activity for older adults?

Source of Evidence: *Physical Activity Guidelines Advisory Committee Report, 2008*

Conclusion

The DGAC concurs with the 2008 PAGAC, which found that, because the exercise capacity of adults tends to decrease as they age, older adults generally have lower exercise capacities than younger persons. Thus, they may need a physical activity plan that is of lower absolute intensity and amount (but similar in self-perceived relative intensity and amount) than is appropriate for more fit people, especially when they have been sedentary and are starting an activity program.

For older adults at risk of falling, strong evidence exists that regular physical activity is safe and reduces falls by about 30 percent. Most evidence supports a program of exercise with the following characteristics: 3 times per week of balance training and moderate-intensity muscle-strengthening activities for 30 minutes per session and with additional encouragement to participate in moderate-intensity walking activities 2 or more times per week for 30 minutes per session. Some evidence, albeit less consistent, suggests that tai chi exercises also reduce falls. Successful reduction in falls by tai chi interventions resulted from programs conducted from 1 to 3 hours or more per week. No evidence indicates that planned physical activity reduces falls in adults and older adults who are not at risk of falls. **DGAC Grade: Strong**

Based on these conclusions from the 2008 PAGAC, the PAG provides recommendations on physical activity for adults ages 65 years and older (Table D7.1). The DGAC concurs with these recommendations.

Review of Evidence

A body of RCTs, meta-analyses, and non-randomized trials provides evidence on physical activity dose in older adults.

For additional details on this body of evidence, visit: Appendix E-2.49 and *Physical Activity Guidelines Advisory Committee Report, 2008* at http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf.

For evidence reviews on:

- Older adults, see Part E: Integration and Summary of the Science (pages E-23 to E-24)

For additional details about the PAG recommendations, visit:
http://www.health.gov/paguidelines/pdf/paguide.pdf.

PHYSICAL ACTIVITY INTERVENTIONS FOR CHILDREN AND ADOLESCENTS

Question 14: What is the relationship between physical activity participation and interventions in school-based settings?

Question 15: What is the relationship between physical activity participation and interventions to change the built environment?

Question 16: What is the relationship between physical activity participation and interventions based in home settings?

Question 17: What is the relationship between physical activity participation and interventions based in early care and education centers?

Question 18: What is the relationship between physical activity participation and interventions based in primary health care settings?

Source of Evidence: *Physical Activity Guidelines for Americans Midcourse Report: Strategies to Increase Physical Activity Among Youth*

Conclusion

The DGAC concurs with the *Physical Activity Guidelines for Americans Midcourse Report: Strategies to Increase Physical Activity Among Youth*, which found that multi-component school-based interventions that include strategies such as physical education, active transportation, and activity breaks can increase physical activity in children and adolescents during school hours. **DGAC Grade: Strong**

Reasonably consistent evidence suggests that changing the built environment as well as interventions in early care and education centers can increase physical activity in children and adolescents. **DGAC Grade: Moderate**

Evidence to date is insufficient to conclude that intervention strategies in home or primary health care settings increase physical activity in children and adolescents. **DGAC Grade: Grade Not Assignable**

Review of Evidence

A body of systematic reviews and meta-analyses supports interventions to increase physical activity in children and adolescents.

For additional details on this body of evidence, visit: Appendix E-2.49 and *Physical Activity Guidelines for Americans Midcourse Report: Strategies to Increase Physical Activity Among Youth* at http://www.health.gov/paguidelines/midcourse/pag-mid-course-report-final.pdf.

For evidence reviews on:

- School-based interventions, see School Setting (pages 9 to 14)
- Early care and education interventions, see Preschool and Childcare Center Setting (page 15)
- Built environment interventions, see Community Setting (pages 16 to 18)
- Home-based interventions, see Family and Home Setting (page 19)
- Primary care interventions, see Primary Health Care Setting (pages 20 to 21)

IMPLICATIONS

Given the strong evidence for health benefits of regular physical activity as well as the low levels of adherence to national recommendations, every effort should be made to encourage and facilitate programs at multiple levels so that children, adults, and older adults can meet the 2008 PAG in combination with the *Dietary Guidelines for Americans.* This can be achieved if programs, policies, and communication strategies are developed across sectors to increase opportunities for engaging in physical activity and to improve the built environment. Ultimately, these actions can create a culture of health that facilitates participation in regular physical activity. Individuals, communities, schools, health care, and the private and public sectors should:

- Ensure that all individuals have access to safe, affordable, and enjoyable modes of physical activity throughout the day in the environments where they live, learn, work, and play. These opportunities must include structured programming and informal modes of transportation and play.
- Focus particular attention on people with the greatest health disparities, as these individuals have the lowest physical activity participation rates but can gain the most health benefits by being physically active.
- Support policies and promote programs for children, adolescents, adults, and older adults that help set and reinforce a personal value system that instills a lifetime of physical activity.
- Enact effective policies and strengthen existing policies within schools, communities, health care settings, housing, and worksites that promote opportunities for regular physical activity.
- Enact effective policies and strengthen existing policies that promote active transport (e.g., walking and bicycling) within and between communities.
- Develop and promote programs to create or enhance access to safe and enjoyable places to be physically active, including public spaces and local, state, and national parks.

- Develop and implement ongoing physical activity promotion campaigns that involve high-visibility and multiple delivery channels and multiple sectors of influence.
- Coordinate efforts between numerous Federal and non-Federal initiatives, such as the President's Council on Fitness, Sports and Nutrition, *Let's Move!,* the National Physical Activity Plan, and Active Schools Acceleration Project.

CHAPTER SUMMARY

The findings outlined in this chapter provide strong evidence supporting the importance of regular physical activity for health promotion and disease prevention in the U.S. population. Physical activity is important for all people—children, adolescents, adults, older adults, women during pregnancy and the postpartum period, and individuals with disabilities. The findings further provide guidance on the dose of physical activity needed across the lifecycle to realize these significant health benefits.

Future Physical Activity Guidelines Advisory Committees will be asked to carefully review the most recent evidence so that the Federal government can fully update the PAG. Given the exceedingly low physical activity participation rates in this country, it will be critically important for the next PAGAC to identify proven strategies and approaches to increase population-level physical activity across the lifespan.

NEEDS FOR FUTURE RESEARCH

1. Evaluate best practices in programming at the community and national level and identify which local and national policies in the public and private sector have demonstrated the greatest effect on increasing physical activity participation across the lifespan, especially in populations with the greatest health disparities.

   Rationale: Physical activity participation rates are exceptionally low across all age groups, and are especially low in individuals with the greatest health disparities. Many different initiatives are currently underway in the private and public sector to help increase physical activity on a population level. Understanding which programs and policies are having the greatest impact will help focus valuable resources and national recommendations for maximum public health benefit.

2. Identify the dose of physical activity needed to achieve health benefits, as well as appropriate growth and development, for children younger than age 6 years.

   Rationale: Until recently, very little effort has been focused on understanding the health benefits of physical activity for young children. Given that this is a critical age of growth and development, considerable research should be focused on this age group.

3. Evaluate the effects of various modes and doses of physical activity on health outcomes in older adults.

   Rationale: Older adults are the fastest growing segment of the population. They also have the greatest burden of disease and functional (mental and physical) limitations. To reduce burden of disease and related economic impacts, research regarding mode and dose of physical activity should be focused on this age group.

4. Further evaluate the importance of light activity, short bouts of physical activity (i.e., 10-minutes or less) and modes of activity on health outcomes across the lifespan.

   Rationale: The review of the evidence in the 2008 PAGAC Report focused primarily on moderate- and vigorous-intensity activity. Emerging research highlights the positive effects of light activity as well as shorter bouts of vigorous activity on health outcomes. Understanding the health impact of the full range of mode, intensity, duration, frequency, and setting will help to further refine the PAG to support maximum public health benefit.

5. Further investigate the effects of sedentary behaviors on health outcomes, including duration, frequency, and mode of sedentary activities.

   Rationale: Increasing evidence demonstrates the negative health consequences of sedentary behaviors. Clarity on the types and duration of sedentary behaviors that have the most negative health impact would help to identify meaningful evidence-based public health recommendations.

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