GLOBAL RECOMMENDATIONS ON PHYSICAL ACTIVITY FOR HEALTH

World Health Organization

WHO Library Cataloguing-in-Publication Data

Global recommendations on physical activity for health.

1.Exercise. 2.Life style. 3.Health promotion. 4.Chronic disease - prevention and control. 5.National health programs. I.World Health Organization.

ISBN 978 92 4 159 997 9 (NLM classification: QT 255)

Printed in Switzerland

Layout design: blossoming.it

LIST OF ABBREVIATIONS

AFRO: WHO Regional Office for Africa
AMRO/ PAHO: WHO Regional Office for the Americas
CDC: Centres for Disease Control and Prevention
CHD: Coronary Heart Disease
CVD: Cardio Vascular Disease
DPAS: Global Strategy on Diet, Physical Activity & Health
EMRO: WHO Regional Office for the Eastern Mediterranean
EURO: WHO Regional Office for Europe
GPAQ: Global Physical Activity Questionnaire
GSHS: Global School-based Health Survey
GRC: Guidelines Review Committee
HQ: Headquarters
LMIC: Low- and Middle-Income Countries
NCDs: Non-communicable Diseases
PA: Physical Activity
RO: Regional Officer
S: Strong Recommendation (WHO Guidelines Review Committee Definition)
SEARO: WHO Regional Office for South-East Asia
STEPS: The WHO STEPwise approach to Surveillance
W: Weak Recommendation (WHO Guidelines Review Committee Definition)
WHO: World Health Organization
WPRO: WHO Regional Office for the Western Pacific

ACKNOWLEDGEMENTS:

The development of this document was financially supported through the WHO/CDC Cooperative Agreements (2006/2010). The United Kingdom Government provided financial support to the face-to-face meeting of the guideline group members which was held in London, United Kingdom in October 2009.

Declarations of interests have been collected for all members of the guideline group (Appendix 4). These have been discussed with the WHO legal department. None of the members of the guideline group declared interest in terms of receiving commercial or non-commercial financial support for research and consulting from private bodies in the field of physical activity for health. It was concluded that none of the selected members presented conflict of interest.

PHOTO CREDITS:

Cover: V. Pierre; V. Candeias; P Merchez; V. Collazos
Chapter 2: V. Collazos; P. Desloovere; V. Pierre; A. Waak; V. Candeias; H. Anenden; E. Elsheikh
Chapter 3: P. Desloovere; A. Waak; C. Gaggero; V. Pierre; V. Collazos; B. Maloto-Adurias
Capter 4: P. Desloovere; F. Bull; C. Khasnabis; E. Elsheikh; M. Ciecierska. Age group: 5-17 years old: G. Xuereb; V. Collazos; V. Pierre; M. Kokic; V. Candeias; Franck. Age group: 18-64 years old: C. Gaggero; V. Pierre; MC. Engelsman; V. Collazos; N. Moindot; C. Sherer. Age group: 64 years old and above: A. Waak; P Gerace; J. Smith; V. Candeias; C. Gaggero
Chapter 5: V. Manso Castello Branco; B. Maloto-Adurias; V. Collazos; E. Engelsman; MC. Engelsman; S. Onur; V. Pierre

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

Physical inactivity is now identified as the fourth leading risk factor for global mortality. Physical inactivity levels are rising in many countries with major implications for the prevalence of noncommunicable diseases (NCDs) and the general health of the population worldwide.

The significance of physical activity on public health, the global mandates for the work carried out by WHO in relation to promotion of physical activity and NCDs prevention, and the limited existence of national guidelines on physical activity for health in low- and middle-income countries (LMIC) make evident the need for the development of global recommendations that address the links between the frequency, duration, intensity, type and total amount of physical activity needed for the prevention of NCDs.

The focus of the *Global Recommendations on Physical Activity for Health* is primary prevention of NCDs through physical activity at population level, and the primary target audience for these Recommendations are policy-makers at national level.

Issues not addressed in this document are clinical control and the management of disease through physical activity. Guidance on how to develop interventions and approaches to promote physical activity in population groups are similarly not addressed.

The following steps summarize the process undertaken by the WHO Secretariat in preparation of the *Global Recommendations on Physical Activity for Health*:

1. Review and compilation of the scientific evidence available for three age groups, for the following outcomes: cancer, cardiorespiratory, metabolic, musculoskeletal and functional health.
2. Setting out of a process to develop the Recommendations.
3. Establishment of a global guideline group with expertise both in subject matter and in policy development and implementation.
4. Meeting and electronic consultation of the guideline group to prepare the final draft of the *Global Recommendations on Physical Activity for Health*.
5. Peer review of the Recommendations and consultation with the WHO Regional Offices.
6. Finalization of the Recommendations, approval by the WHO Guideline Review Committee.
7. Translation, publication and dissemination.

The recommendations set out in this document address three age groups: 5–17 years old; 18–64 years old; and 65 years old and above. A section focusing on each age group includes the following:

- a narrative summary of scientific evidence;
- the current physical activity recommendations;
- the interpretation and justification for the recommendations made.

RECOMMENDED LEVELS OF PHYSICAL ACTIVITY FOR HEALTH

5–17 years old

For children and young people of this age group physical activity includes play, games, sports, transportation, recreation, physical education or planned exercise, in the context of family, school, and community activities. In order to improve cardiorespiratory and muscular fitness, bone health, cardiovascular and metabolic health biomarkers and reduced symptoms of anxiety and depression, the following are recommended:

1. Children and young people aged 5–17 years old should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily.
2. Physical activity of amounts greater than 60 minutes daily will provide additional health benefits.
3. Most of daily physical activity should be aerobic. Vigorous-intensity activities should be incorporated, including those that strengthen muscle and bone, at least 3 times per week.

18–64 years old

For adults of this age group, physical activity includes recreational or leisure-time physical activity, transportation (e.g walking or cycling), occupational (i.e. work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities.
In order to improve cardiorespiratory and muscular fitness, bone health and reduce the risk of NCDs and depression the following are recommended:

1. Adults aged 18–64 years should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week, **or** do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, **or** an equivalent combination of moderate- and vigorous-intensity activity.
2. Aerobic activity should be performed in bouts of at least 10 minutes duration.
3. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, **or** engage in 150 minutes of vigorous-intensity aerobic physical activity per week, **or** an equivalent combination of moderate- and vigorous-intensity activity.
4. Muscle-strengthening activities should be done involving major muscle groups on 2 or more days a week.

65 years old and above

For adults of this age group, physical activity includes recreational or leisure-time physical activity, transportation (e.g walking or cycling), occupational (if the person is still engaged in work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities.
In order to improve cardiorespiratory and muscular fitness, bone and functional health, and reduce the risk of NCDs, depression and cognitive decline, the following are recommended:

1. Adults aged 65 years and above should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week, **or** do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, **or** an equivalent combination of moderate- and vigorous-intensity activity.
2. Aerobic activity should be performed in bouts of at least 10 minutes duration.
3. For additional health benefits, adults aged 65 years and above should increase their moderate-intensity aerobic physical activity to 300 minutes per week, **or** engage in 150 minutes of vigorous-intensity aerobic physical activity per week, **or** an equivalent combination of moderate- and vigorous-intensity activity.
4. Adults of this age group with poor mobility should perform physical activity to enhance balance and prevent falls on 3 or more days per week.
5. Muscle-strengthening activities should be done involving major muscle groups, on 2 or more days a week.
6. When adults of this age group cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow.

Overall, across all the age groups, the benefits of implementing the above recommendations, and of being physically active, outweigh the harms. At the recommended level of 150 minutes per week of moderate-intensity activity, musculoskeletal injury rates appear to be uncommon. In a population-based approach, in order to decrease the risks of musculoskeletal injuries, it would be appropriate to encourage a moderate start with gradual progress to higher levels of physical activity.

2 PHYSICAL ACTIVITY FOR HEALTH

2.1 PUBLIC HEALTH SIGNIFICANCE OF PHYSICAL ACTIVITY

Physical inactivity has been identified as the fourth leading risk factor for global mortality (6% of deaths globally). This follows high blood pressure (13%), tobacco use (9%) and high blood glucose (6%). Overweight and obesity are responsible for 5% of global mortality *(1)*.

Levels of physical inactivity are rising in many countries with major implications for the general health of people worldwide and for the prevalence of NCDs such as cardiovascular disease, diabetes and cancer and their risk factors such as raised blood pressure, raised blood sugar and overweight. Physical inactivity is estimated as being the principal cause for approximately 21–25% of breast and colon cancer burden, 27% of diabetes and approximately 30% of ischaemic heart disease burden *(1)*. In addition, NCDs now account for nearly half of the overall global burden of disease. It is estimated currently that of every 10 deaths, 6 are attributable to noncommunicable conditions *(2)*.

Global health is being influenced by three trends: population-ageing, rapid unplanned urbanization, and globalization, all of which result in unhealthy environments and behaviours. As a result, the growing prevalence of NCDs and their risk factors has become a global issue affecting both low- and middle-income countries. Nearly 45% of the adult disease burden in these countries is now attributable to NCDs. Many low- and middle-income countries are beginning to suffer the double burden of communicable and noncommunicable diseases, and health systems in these countries are now having to cope with the additional costs of treating both.

It has been shown that participation in regular physical activity reduces the risk of coronary heart disease and stroke, diabetes, hypertension, colon cancer, breast cancer and depression. Additionally, physical activity is a key determinant of energy expenditure, and thus is fundamental to energy balance and weight control *(1–6)*.

2.2 MANDATE ON PHYSICAL ACTIVITY FOR HEALTH

In May 2004, the Fifty-seventh World Health Assembly endorsed Resolution WHA57.17: *Global Strategy on Diet, Physical Activity and Health* and recommended that Member States develop national physical activity action plans and policies to increase physical activity levels in their populations *(5)*. Furthermore, in May 2008, the Sixty-first World Health Assembly endorsed Resolution WHA61.14: *Prevention and Control of Noncommunicable Diseases: Implementation of the Global Strategy* and *the Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases (7)*.

This Action Plan urges Member States to implement national guidelines on physical activity for health and encourages them to develop and put into practice policies and interventions that:

- develop and implement national guidelines on physical activity for health;
- introduce transport policies that promote active and safe methods of travelling to and from schools and workplaces, such as walking or cycling;
- ensure that physical environments support safe active commuting, and create space for recreational activity.

The action plan urges WHO to provide countries with technical support in either implementing or strengthening nationwide actions to reduce risk factors for NCDs.

2.3 IMPORTANCE OF NATIONAL AND REGIONAL PHYSICAL ACTIVITY GUIDELINES

The limited existence of national guidelines on physical activity for health in low- and middle-income countries, the public health significance of physical activity and the global mandates for the work of WHO, related to promotion of physical activity and NCD prevention, make evident the need for the development of global recommendations that address the links between the frequency, duration, intensity, type and total amount of physical activity needed for the prevention of NCDs.

Scientifically-informed recommendations, with a global scope, on the benefits, type, amount, frequency, intensity, duration and total amount of the physical activity necessary for health benefits are key information for policy-makers wanting to address physical activity at population level and who are involved in the development of guidelines and policies at regional and national levels on prevention and control of NCDs.

The development and publication of science-based national or regional physical activity guidelines can:

- inform national physical activity policies and other public health interventions;
- provide the starting point to the establishment of goals and objectives for physical activity promotion at national level;
- foster intersectoral collaboration and contribute to setting up national goals and objectives regarding physical activity promotion;
- provide a foundation for physical activity promotion initiatives;
- justify the allocation of resources to physical activity promotion interventions;
- create a framework for joint action for all other relevant stakeholders around the same goal;
- provide an evidence-based document that enables all relevant stakeholders to transfer policy into action with the allocation of the appropriate resources; and
- facilitate national surveillance and monitoring mechanisms to monitor population levels of physical activity.

3 DEVELOPMENT OF THE GLOBAL RECOMMENDATIONS ON PHYSICAL ACTIVITY FOR HEALTH

3.1 SCOPE AND TARGET AUDIENCE

The *Global Recommendations on Physical Activity for Health* aim to provide guidance on the dose-response relationship between physical activity and health benefits (i.e. the frequency, duration, intensity, type and total amount of physical activity needed for health enhancement and prevention of NCDs). The primary prevention of NCDs through physical activity, at population level, is the focus of this document, while the management of disease through physical activity, and clinical control are not addressed.

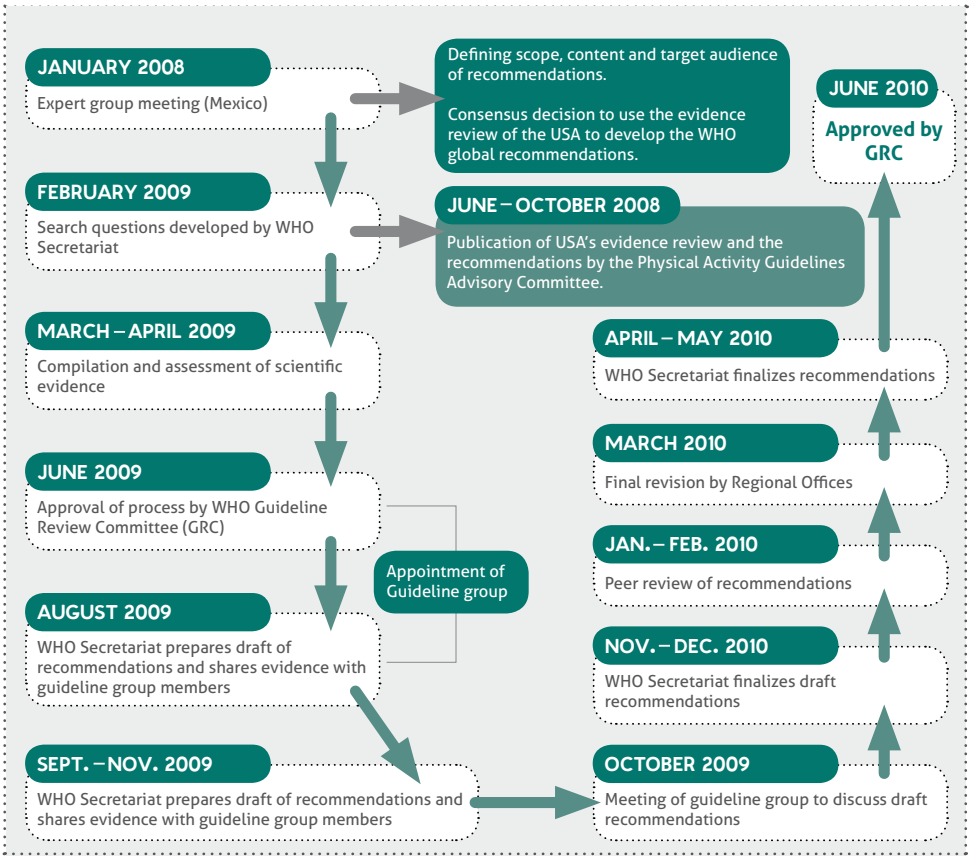
By reviewing the evidence and compiling it in the format of recommendations on the frequency, duration, intensity, type and total amount of physical activity to be achieved at the population level, this document aims to assist policy-makers in the development of public health policies. National-level policy-makers are the primary target audience of these recommendations, as these are expected to constitute a resource for them in the development of national guidelines for health-enhancing physical activity.

Guidance on how to develop interventions and approaches to promote physical activity in population groups is an issue that is not addressed in the document. However, information for this can be found in the publication: *A guide for population-based approaches to increasing levels of physical activity: implementation of the Global Strategy on Diet, Physical Activity and Health (3).*

3.2 DEVELOPMENT PROCESS

The Recommendations set out in this document were developed according to the process outlined in the figure below. A detailed description of the methodology used for developing the *Global Recommendations on Physical Activity for Health* is included in Appendix 1.

FIG.1: DEVELOPMENT OF THE GLOBAL RECOMMENDATIONS ON PHYSICAL ACTIVITY FOR HEALTH



4 RECOMMENDED POPULATION LEVELS OF PHYSICAL ACTIVITY FOR HEALTH

4.1 INTRODUCTION

The following section presents the recommended levels of physical activity for three age groups: 5–17 years old, 18–64 years old and 65 years old and above. These age groups were selected taking into consideration the nature and availability of the scientific evidence relevant to the selected outcomes. The recommendations do not address the age group of children less than 5 years old. Although children in this age range benefit from being active, more research is needed to determine what dose of physical activity provides the greatest health benefits.

Each section includes:

- remarks on the target population;
- a narrative summary of the scientific evidence;
- the recommendations on physical activity for health; and
- the interpretation and justification for the recommendations presented.

The *Global Recommendations on Physical Activity for Health* are relevant for the following health outcomes:

- Cardiorespiratory health (coronary heart disease, cardiovascular disease, stroke and hypertension).
- Metabolic health (diabetes and obesity).
- Musculoskeletal health (bone health, osteoporosis).
- Cancer (breast and colon cancer).
- Functional health and prevention of falls.
- Depression.

The recommendations presented in this document use the concepts of frequency, duration, intensity, type and total amount of physical activity needed for health enhancement and prevention of NCDs. Box 1 includes definitions of these and other useful concepts. Further information can be found in the Glossary in Appendix 5.

BOX 1: DEFINITIONS OF CONCEPTS USED IN THE RECOMMENDED LEVELS OF PHYSICAL ACTIVITY

Type of physical activity (What type)**.** The mode of participation in physical activity. The type of physical activity can take many forms: aerobic, strength, flexibility, balance.

Duration (For how long)**.** The length of time in which an activity or exercise is performed. Duration is generally expressed in minutes.

Frequency (How often)**.** The number of times an exercise or activity is performed. Frequency is generally expressed in sessions, episodes, or bouts per week.

Intensity (How hard a person works to do the activity)**.** Intensity refers to the rate at which the activity is being performed or the magnitude of the effort required to perform an activity or exercise.

Volume (How much in total)**.** Aerobic exercise exposures can be characterized by an interaction between bout intensity, frequency, duration, and longevity of the programme. The product of these characteristics can be thought of as volume.

Moderate-intensity physical activity. On an absolute scale, moderate intensity refers to activity that is performed at 3.0–5.9 times the intensity of rest. On a scale relative to an individual's personal capacity, moderate-intensity physical activity is usually a 5 or 6 on a scale of 0–10.

Vigorous-intensity physical activity. On an absolute scale, vigorous intensity refers to activity that is performed at 6.0 or more times the intensity of rest for adults and typically 7.0 or more times for children and youth. On a scale relative to an individual's personal capacity, vigorous-intensity physical activity is usually a 7 or 8 on a scale of 0–10.

Aerobic activity. Aerobic activity, also called endurance activity, improves cardiorespiratory fitness. Examples of aerobic activity include: brisk walking, running, bicycling, jumping rope, and swimming.

AGE GROUP: 5 - 17 YEARS OLD

TARGET POPULATION

These guidelines are relevant to all children aged 5–17 years unless specific medical conditions indicate to the contrary. Children and youth should be encouraged to participate in a variety of physical activities that support the natural development and are enjoyable and safe.

Whenever possible, children and youth with disabilities should meet these recommendations. However they should work with their health care provider to understand the types and amounts of physical activity appropriate for them considering their disability.

These recommendations are applicable for all children and youth irrespective of gender, race, ethnicity, or income level. However the communication strategies, dissemination and messaging of the recommendations may differ so as to be most effective in various population subgroups.

The recommended levels of physical activity for children and youth included in this section, should be achieved above and beyond the physical activity accumulated in the course of normal daily non-recreational activities.

All children and youth should be physically active daily as part of play, games, sports, transportation, recreation, physical education, or planned exercise, in the context of family, school, and community activities.

For inactive children and youth, a progressive increase in activity to eventually achieve the target shown below is recommended. It is appropriate to start with smaller amounts of physical activity and gradually increase duration, frequency and intensity over time. It should also be noted that if children are currently doing no physical activity, doing amounts below the recommended levels will bring more benefits than doing none at all.

NARRATIVE SUMMARY OF SCIENTIFIC EVIDENCE *(9–11)*

The scientific evidence available for the age group 5–17 years supports the overall conclusion that physical activity provides fundamental health benefits for children and youth. This conclusion is based on findings of observational studies in which higher levels of physical activity were found to be associated with more favourable health parameters as well as experimental studies in which physical activity interventions were associated with improvements in health indicators. The documented health benefits include increased physical fitness (both cardiorespiratory fitness and muscular strength), reduced body fatness, favourable cardiovascular and metabolic disease risk profiles, enhanced bone health and reduced symptoms of depression. *(9-11)*

Physical activity is positively related to cardiorespiratory and metabolic health in children and youth. To examine the relation between physical activity and cardiovascular and metabolic health, the guideline group reviewed literature from the CDC Literature review (2008) and the evidence reviews from Janssen (2007) and Janssen, Leblanc (2009). *(9-11)*

A dose-response relationship appears to exist, in that greater doses of physical activity are associated with improved indicators of cardiorespiratory and metabolic health. Taken together, the observational and experimental

evidence supports the hypothesis that maintaining high amounts and intensities of physical activity starting in childhood and continuing into adult years will enable people to maintain a favourable risk profile and lower rates of morbidity and mortality from cardiovascular disease and diabetes later in life. Collectively, the research suggests that moderate- to vigorous-intensity physical activity for at least 60 minutes per day would help children and youth maintain a healthy cardiorespiratory and metabolic risk profile. In general it appears that higher volumes or intensities of physical activity are likely to have greater benefit, but research in this area is still limited. *(9-11)*

Physical activity is positively related to cardiorespiratory fitness in children and youth, and both preadolescents and adolescents can achieve improvements in cardiorespiratory fitness with exercise training. In addition, physical activity is positively related to muscular strength. In both children and youth, participation in muscle-strengthening activities 2 or 3 times per week significantly improves muscular strength. For this age group, muscle-strengthening activities can be unstructured and part of play, such as playing on playground equipment, climbing trees or pushing and pulling activities. *(9-11)*

Normal-weight youth who have relatively high levels of physical activity tend to have less adiposity than youth with low levels. Among overweight and obese youth, interventions that increase the levels of physical activity tend to show beneficial effects on health.

Bone-loading physical activity increases bone mineral content and bone density. Targeted weight-loading activities that simultaneously influence muscular strength, performed 3 or more days per week are effective. For this age group, bone-loading activities can be performed as part of playing games, running, turning or jumping. The literature used for the rationale and dose-response pattern related to bone health was obtained from the CDC literature review (2008), and the evidence reviews from Janssen (2007) and Janssen, Leblanc (2009). *(9-11)*

The review of the literature relating muscular strength to the relation and dose-response pattern included literature from the CDC literature review (2008), and the evidence reviews from Janssen (2007) and Janssen, Leblanc (2009).

An overall evaluation of the evidence suggests that important health benefits can be expected to accrue in most children and youth who accumulate 60 or more minutes of moderate to vigorous physical activity daily. *(9-11)*

The concept of accumulation refers to meeting the goal of 60 minutes per day by performing activities in multiple shorter bouts spread throughout the day (e.g. 2 bouts of 30 minutes), then adding together the time spent during each of these bouts. Furthermore, certain specific types of physical activity must be included in an overall physical activity pattern in order for children and youth to gain comprehensive health benefits *(9-11)*.

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, cardiovascular risk factors and other metabolic disease risk factors; weight-loading activities to promote bone health.

These specific types of physical activity can be integrated to achieve 60 minutes or more per day of health and fitness promoting activity.

A detailed reference of the literature used by the guidelines group to develop these recommendations can be found in Appendix 2.

RECOMMENDATIONS

For children and young people, physical activity includes play, games, sports, transportation, recreation, physical education, or planned exercise, in the context of family, school and community activities.

The guidelines group reviewed the above cited literature and recommended that in order to improve cardiorespiratory and muscular fitness, bone health, cardiovascular and metabolic health biomarkers and reduce symptoms of anxiety and depression:

1. Children and youth aged 5–17 should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily.
2. Amounts of physical activity greater than 60 minutes provide additional health benefits.
3. Most of the daily physical activity should be aerobic. Vigorous-intensity activities should be incorporated, including those that strengthen muscle and bone, at least 3 times per week.

INTERPRETATION AND JUSTIFICATION

There is conclusive evidence that the physical fitness and health status of children and youth are substantially enhanced by frequent physical activity. Compared to inactive young people, physically active children and youth have higher levels of cardiorespiratory fitness, muscular endurance and muscular strength, and well-documented health benefits include reduced body fat, more favourable cardiovascular and metabolic disease risk profiles, enhanced bone health, and reduced symptoms of anxiety and depression.

Aerobic-type activities should make up the majority of the daily discretionary physical activity.

These recommendations represent a minimum target for daily physical activity that allows for health enhancement and prevention of NCDs.

The costs of adopting these recommendations are minimal and essentially related to the translation into country settings, communication and dissemination. Implementation of comprehensive policies that facilitate the achievement of the recommended levels of physical activity will require additional resource investment.

The benefits of being physically active and implementing the above recommendations outweigh the harms. Any existing risk can be significantly reduced by a progressive increase in the activity level, especially in children who are inactive.

In order to reduce the risk of injuries, the use of protective equipment, such as helmets, should be encouraged in all types of activity that can potentially pose these risks *(12)*.

It should be noted that in populations that are already active, the national physical activity guidelines should not promote a physical activity target that would encourage a reduction in current levels.

AGE GROUP: 18 - 64 YEARS OLD

TARGET POPULATION

These guidelines are relevant to all healthy adults aged 18–64 years unless specific medical conditions indicate to the contrary. The guidelines also apply to individuals in this age range with chronic noncommunicable conditions not related to mobility such as hypertension or diabetes. Pregnant, postpartum women and persons with cardiac events may need to take extra precautions and seek medical advice before striving to achieve the recommended levels of physical activity for this age group.

Inactive adults or adults with disease limitations will have added health benefits if moving from the category of "no activity" to "some levels" of activity. Adults who currently do not meet the recommendations for physical activity should aim to increase duration, frequency and finally intensity as a target to achieving the recommended guidelines.

These recommendations are applicable for all adults irrespective of gender, race, ethnicity or income level. However, to be most effective, the type of physical activity, the communication strategies, dissemination and messaging of the recommendations, may differ in various population groups. The retirement age, which varies from country to country, should also be taken into consideration when implementing interventions to promote physical activity.

These recommendations can be applied to adults with disabilities. However they may need to be adjusted for each individual based on their exercise capacity and specific health risks or limitations.

NARRATIVE SUMMARY OF SCIENTIFIC EVIDENCE *(11, 13–19)*

The review of the literature relating cardiorespiratory fitness, muscular strength, metabolic health and bone health to the rationale for relation and dose response patterns was based on an evaluation from the CDC literature review (2008), the evidence reviews from Warburton et al (2007 and 2009) and the review by Bauman et al (2005). *(11, 13–19)*

The dose-response pattern related to depression was reviewed from the CDC literature review (2008). *(11)*

There is a direct relationship between physical activity and cardiorespiratory health (risk reduction of CHD, CVD, stroke, hypertension). Physical activity improves cardiorespiratory fitness. Fitness has direct dose-response relations between intensity, frequency, duration and volume. There is a dose-response relation for CVD and CHD. Risk reductions routinely occur at levels of 150 minutes of at least moderate-intensity activity per week. *(11, 13–19)*

Literature from Cook (2008) and Steyn (2005) related to The INTERHEART Africa Study and Nocon (2008) and Sofi (2008) related to cardiovascular disease and mortality were also considered during the peer review process and related specifically to the context of Africa and cardiovascular disease. *(14-17)*

There is a direct relationship between physical activity and metabolic health, including reduction of risk of diabetes and metabolic syndrome *(11, 13–19)*. Data indicate that 150 minutes per week of moderate- to vigorous-intensity physical activity bring significantly lower risks.

There is a favourable and consistent effect of aerobic physical activity on achieving weight maintenance. Accumulation of energy expenditure due to physical activity is what is important to achieving energy balance. Accumulation of physical activity can be obtained in short multiple bouts of at least 10 minutes, or one long bout to meet physical activity expenditure goals for weight maintenance. The evidence is less consistent for resistance training, in part, because of the compensatory increase in lean mass, and the smaller volumes of exercise employed. There is substantial inter-individual variability with physical activity and weight maintenance; more than 150 minutes of moderate-intensity activity per week may be needed to maintain weight. Data from recent well-designed randomized control trials lasting up to 12 months indicate that aerobic physical activity performed to achieve a volume of at least 150 minutes per week is associated with approximately 1–3% weight loss, which is generally considered to represent weight maintenance. *(11)*

Physically active adults are likely to have less risk of a hip or vertebral fracture. Increases in exercise training can minimize the decrease in spine and hip bone mineral density. Increases in exercise training enhance skeletal muscle mass, strength, power, and intrinsic neuromuscular activation. *(11, 13, 18, 19)*

Weight-bearing endurance and resistance types of physical activity (i.e. exercise training) are effective in promoting increases in bone mass density (e.g. moderate- to vigorous-intensity activity performed 3–5 days per week, 30–60 minutes per session).

Regular practice of physical activity is linked to prevention of breast and colon cancer. Data indicate that moderate- to vigorous-intensity physical activity performed at least 30–60 minutes per day is needed to see significantly lower risks of these cancers.

Overall, strong evidence demonstrates that compared to less active adult men and women, individuals who are more active have lower rates of all-cause mortality, coronary heart disease, high blood pressure, stroke, diabetes, metabolic syndrome, colon cancer, breast cancer, and depression. Strong evidence also supports the conclusion that, compared to less active people, physically active adults and older adults exhibit a higher level of cardiorespiratory and muscular fitness, have a healthier body mass and composition, and a biomarker profile that is more favourable for preventing cardiovascular disease and type 2 diabetes and for enhancing bone health.

A detailed reference of the literature used by the guidelines group to develop these recommendations can be found in Appendix 2.

RECOMMENDATIONS

In adults aged 18–64, physical activity includes leisure time physical activity, transportation (e.g. walking or cycling), occupational (i.e. work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities.

The guidelines group reviewed the above cited literature and recommended that in order to improve cardiorespiratory and muscular fitness, bone health, reduce the risk of NCDs and depression:

1. Adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
2. Aerobic activity should be performed in bouts of at least 10 minutes duration.
3. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity.
4. Muscle-strengthening activities should be done involving major muscle groups on 2 or more days a week.

INTERPRETATION AND JUSTIFICATION

Conclusive scientific evidence, based on a wide range of well-conducted studies, shows that physically active people have higher levels of health-related fitness, a lower risk profile for developing a number of disabling medical conditions, and lower rates of various chronic noncommunicable diseases than do people who are inactive.

There are multiple ways of accumulating the total of 150 minutes per week. The concept of accumulation refers to meeting the goal of 150 minutes per week by performing activities in multiple shorter bouts of at least 10 minutes each, spread throughout the week then adding together the time spent during each of these bouts: e.g. 30 minutes of moderate-intensity activity 5 times per week.

Evidence of acute effects on biomedical markers points to benefits of undertaking regular physical activity throughout the week (such as 5 or more times per week). Moreover this has the potential to encourage integrating physical activity as part of daily lifestyle such as active travel through walking and cycling.

The recommendations listed above are applicable to the following health conditions: cardiorespiratory health (coronary heart disease, cardiovascular disease, stroke and hypertension); metabolic health (diabetes and obesity); bone health and osteoporosis; breast and colon cancer and depression.

The volume of physical activity associated with the prevention of different chronic NCDs varies. However, the evidence is currently insufficiently precise to warrant separate guidelines for each specific disease, but it is strong enough to cover all health outcomes selected.

Higher volumes of activity (i.e. greater than 150 minutes per week) are associated with additional health benefits. However the evidence is not available to identify additional or increased benefits for volumes greater than 300 minutes per week.

The costs of adopting these recommendations are minimal and essentially related to the translation into country settings, communication and dissemination. Implementation of comprehensive policies that will facilitate the achievement of the recommended levels of physical activity will require additional resource investment.

These recommendations are applicable in low- and middle-income countries. However national authorities need to adapt and translate them into culturally appropriate forms for country level, taking into consideration, among other factors, the need to identify and adapt to the physical activity domain which is most prevalent at the population level (e.g. leisure time, occupational or transportation physical activity).

Activity-related adverse events such as musculoskeletal injuries are common but are usually minor especially for moderate-intensity activities such as walking. Overall, the benefits of being physically active and implementing the above recommendations outweigh the harms. The inherent risk of adverse events can be significantly reduced by a progressive increase in the activity level, especially in inactive adults. Selecting low-risk activities and adopting prudent behaviour while doing any activity can minimize the frequency and severity of adverse events and maximize the benefits of regular physical activity. In order to reduce the risk of injuries, the use of protective equipment, such as helmets, should be encouraged.

It should be noted that, in populations that are already active the national physical activity guidelines should not promote a physical activity target that would encourage a reduction in current levels.

AGE GROUP: 65 YEARS OLD AND ABOVE

TARGET POPULATION

These guidelines are relevant to all healthy adults aged 65 years and above. They are also relevant to individuals in this age range with chronic NCDs. Individuals with specific health conditions, such as cardiovascular disease and diabetes, may need to take extra precautions and seek medical advice before striving to achieve the recommended levels of physical activity for older adults.

These recommendations are applicable for all older adults irrespective of gender, race, ethnicity or income level. However, the communication strategies, dissemination and messaging of the recommendations may differ in various population groups in order to be most effective.

The recommendations can be applied to older adults with disabilities however they may need to be adjusted for each individual, based on their exercise capacity and specific health risks or limitations.

NARRATIVE SUMMARY OF SCIENTIFIC EVIDENCE *(11, 13, 20, 21)*

The review of the literature relating cardio respiratory fitness, muscular strength, metabolic health and bone health to the rationale for relation and dose response patterns was based on an evaluation from the CDC literature review (2008) the evidence reviews from Warburton et al (2007 and 2009), the review by Bauman et al (2005) and the systematic reviews by Paterson et al (2007 and 2009). *(11, 13, 20, 21)*

There is strong scientific evidence that regular physical activity produces major and extensive health benefits in both adults aged 18–64 and in older adults aged 65 and above. In some cases the evidence of health benefits is strongest in older adults because the outcomes related to inactivity are more common in older adults. This results in an increased ability of observational studies to detect the protective effect of physical activity in this age group. Overall, conclusive evidence shows that both moderate-intensity and vigorous-intensity activity provide similar health benefits in both adult age groups. *(11, 13, 20, 21)*

The overall evidence for adults aged 65 years and above demonstrates that, compared to less active individuals, men and women who are more active have lower rates of all-cause mortality, coronary heart disease, high blood pressure, stroke, type 2 diabetes, colon cancer, breast cancer, a higher level of cardiorespiratory and muscular fitness, healthier body mass and composition, and a biomarker profile that is more favourable for the prevention of cardiovascular disease, type 2 diabetes and the enhancement of bone health. *(11, 13, 20, 21)*

These benefits are observed in adults in the older age range, with or without existing NCDs. Hence inactive adults of the 65 years and above age group, including those with NCDs, are likely to gain health benefits by increasing their level of physical activity. If they cannot increase activity to levels required to meet guidelines, they should be active to the level their abilities and health conditions allow. Older adults who currently do not meet the recommendations for physical activity should aim to increase physical activity gradually, starting with increasing duration and frequency of moderate-intensity activity before considering increasing the intensity to vigorous-intensity activity. In addition, strong evidence indicates that being physically active is associated with higher levels of functional health, a lower risk of falling, and better cognitive

function. There is observational evidence that mid-life and older adults who participate in regular physical activity have reduced risk of moderate and severe functional limitations and role limitations. In older adults with existing functional limitations, there is fairly consistent evidence that regular physical activity is safe and has a beneficial effect on functional ability. However, there is currently little or no experimental evidence in older adults with functional limitations that physical activity maintains role ability or prevents disability. The CDC literature Review (2008) and the systematic reviews by Paterson (2007) and Patterson and Warburton (2009) were used to develop the recommendation related to limited mobility due to health conditions. The dose-response pattern related to depression and cognitive decline were reviewed from the CDC Literature review (2008). *(11, 20, 21)*

In older adults with poor mobility, there is consistent evidence that regular physical activity is safe and reduces risk of falls by nearly 30%. For prevention of falls, most evidence supports a physical activity pattern of balance training and moderate-intensity muscle-strengthening activities three times per week. There is no evidence that planned physical activity reduces falls in adults and older adults who are not at risk of falls. Evidence specific for this age group related to the maintenance or improvement of balance for those at risk of falling was reviewed from the systematic reviews by Paterson (2007) and Patterson and Warburton (2009). *(20, 21)*

A more detailed reference of the literature used by the guidelines group to develop these recommendations can be found in Appendix 2.

RECOMMENDATIONS

In older adults of the 65 years and above age group, physical activity includes leisure time physical activity, transportation (e.g. walking or cycling), occupational (if the individual is still engaged in work), household chores, play, games, sports or planned exercise, in the context of daily, family and community activities.

The guidelines group reviewed the above cited literature and recommended that in order to improve cardiorespiratory and muscular fitness, bone and functional health, reduce the risk of NCDs, depression and cognitive decline:

1. Adults aged 65 years and above should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
2. Aerobic activity should be performed in bouts of at least 10 minutes duration.
3. For additional health benefits, adults aged 65 years and above should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate-and vigorous-intensity activity.
4. Adults of this age group, with poor mobility, should perform physical activity to enhance balance and prevent falls on 3 or more days per week.
5. Muscle-strengthening activities should be done involving major muscle groups, on 2 or more days a week.
6. When adults of this age group cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow.

JUSTIFICATION AND INTERPRETATION

Despite the similarities between the recommendations for adults aged 18–65 and for adults aged 65 and above, separate recommendations should be adopted and implemented. Promoting and facilitating the regular practice of physical activity in older adults is especially important because this population group is very often the least physically active. Efforts to promote physical activity in older adults will generally place less emphasis on attaining high volumes of activity, or engaging in vigorous-intensity activity. However, the health status and abilities of older adults vary widely, and some older adults are capable of, and regularly perform, high volumes of moderate- and vigorous-intensity activity.

Conclusive scientific evidence based on a wide range of well-conducted studies shows that adults of the 65 years and above age group, who are physically active, have higher levels of cardiorespiratory fitness, a lower risk profile for developing a number of disabling medical conditions, and lower rates of various chronic noncommunicable diseases than do those who are inactive.

If an individual has a low exercise capacity (i.e. low physical fitness), the intensity and amount of activity needed to achieve many health-related and fitness benefits are less than for an individual who has a higher level of activity and fitness. Because the exercise capacity of adults tends to decrease as they age, older adults generally have lower exercise capacities than younger persons. They therefore need a physical activity plan that is of lower absolute intensity and amount (but similar in relative intensity and amount) than is appropriate for people of greater fitness, especially when they have led sedentary lifestyles and are starting out on an activity programme.

As with adults of the 18–65 age group, there are a number of ways older adults can accumulate the total of 150 minutes per week. The concept of accumulation refers to meeting the goal of 150 minutes per week by performing activities in multiple shorter bouts of at least 10 minutes each spread throughout the week then adding together the time spent during each of these bouts: e.g. 30 minutes of moderate-intensity activity 5 times per week.

It is worth noting that the recommended moderate- to vigorous-intensity activity is relative to the capacity of the individual to perform such activities.

Evidence of acute effects on biomedical markers points to benefits of undertaking regular physical activity throughout the week (such as 5 or more times per week). This also has the potential to encourage integrating physical activity as part of daily lifestyle such as active travel through walking and cycling.

The recommendations listed above are applicable to the following health conditions: cardio-respiratory health (coronary heart disease, cardiovascular disease, stroke and hypertension); metabolic health (diabetes and obesity); bone health and osteoporosis; breast and colon cancer and prevention of falls, depression and cognitive decline.

The volume of physical activity associated with the prevention of different chronic NCDs varies. Although the current evidence is insufficiently precise to warrant separate guidelines for each specific disease, it is sufficiently sound to cover all the health outcomes selected.

Higher levels of activity (i.e. greater than 150 minutes per week) are associated with additional health benefits. However the evidence suggests there is decreasing marginal benefit from engaging in physical activity above volumes equivalent to 300 minutes per week of moderate-intensity activity, and an increased risk of injuries.

The costs of endorsing these recommendations are minimal and essentially related to the translation into country settings, communication and dissemination. Implementation of comprehensive policies that will facilitate the achievement of the recommended levels of physical activity will require additional resource investment.

These recommendations are applicable in low- and middle-income countries. However, national authorities need to adapt and translate them into culturally appropriate forms for country level taking into consideration, among other factors, the physical activity domain which is more prevalent at population level (i.e. leisure time, occupational or transportation physical activity).

Overall, the benefits of being physically active and implementing the above recommendations outweigh the harms. Activity-related adverse events such as musculoskeletal injuries are common but are usually mild, especially for moderate-intensity activities such as walking. The inherent risk of adverse events can be significantly reduced by a progressive increase in the activity level, especially in sedentary older adults. A series of small increments in physical activity, each followed by a period of adaptation, is associated with lower rates of musculoskeletal injuries than is an abrupt increase to the same final level. For sudden cardiac adverse events, intensity of activity, rather than frequency or duration appears to have more adverse effect. The selection of low-risk activities, and prudent behaviour while performing any activity, can minimize the frequency and severity of adverse events and maximize the benefits of regular physical activity.

It should be noted that in populations that are already active, the national physical activity guidelines should not promote a physical activity target that would encourage a reduction in their current levels.

4.5 FUTURE REVIEW OF RECOMMENDATIONS AND RESEARCH GAPS

Results expected in the following few years regarding objectively measured physical activity levels, and the scientific knowledge being accumulated in areas such as sedentary behaviours, will necessitate a review of these recommendations by the year 2015.

The following are research areas that require further investigation:

1) Sedentary behaviour contributing to disease risk profile.
2) Health-enhancing physical activity in children under 5 years old.
3) Health-enhancing physical activity in pregnant women.
4) Physical activity and disabilities.
5) Weight loss or maintenance of weight loss.
6) Physical activity doses for the clinical treatment of people with an NCD (e.g. cardiovascular disease, diabetes, cancer, obesity, mental health conditions, etc.).

5 HOW TO USE THE RECOMMENDED LEVELS OF PHYSICAL ACTIVITY FOR HEALTH

5.1 INTRODUCTION

This section includes general principles for using the recommended levels of physical activity for health in the development of national policies, and highlights issues to be considered by policy-makers in the process of adaptation to the national context.

The *Global Recommendations on Physical Activity for Health* outlined in this document can play an important role in guiding the overall efforts on promotion of health-enhancing physical activity. Additionally these can:

- support the development of physical activity policy;
- be used by all relevant stakeholders to communicate valid and consistent messages on the frequency, duration, intensity, type and total amount of physical activity for health;
- be used by health professionals to inform patients;
- have the potential to become a tool to link communication between scientists, health professionals, journalists, interest groups and the general public and represent the translation of research findings into actionable, achievable and measurable messages for practitioners, policy-makers and communities;
- be used as benchmarks for public health monitoring and surveillance purposes.

5.2 NATIONAL ADAPTATION OF THE GLOBAL RECOMMENDATIONS

The Global Recommendations should be understood as an evidence-based starting point for policy-makers looking to promote physical activity at national level.

Policy-makers at national level are encouraged to adopt the recommended levels of physical activity for health proposed in this document.

Policy-makers are encouraged to incorporate the global recommended levels of physical activity for health to national policies, taking into consideration the most adequate and feasible options according to their needs, characteristics, physical activity domain and national resources while aiming to be participatory and socially inclusive, particularly of the most vulnerable groups.

In addition, the adaptation and translation of the recommended levels of physical activity at national level must take into consideration the cultural background, gender issues, ethnic minorities and burden of disease relevant to the country. Listed below are additional issues to be considered by policy-makers when using the global recommended levels of physical activity for health in national or local interventions:

- Social norms.
- Religious values.
- Security situation at national and/or local levels.
- Availability of safe spaces for the practice of physical activity.
- Geographical settings, seasons and climate.
- Gender issues.
- Involvement of all concerned sectors and actors.
- Role of municipalities and local leadership.
- Access and attendance to schools and worksite, especially with regard to girls and women.
- Existing transport infrastructures, sports and recreational facilities and urban design.
- Patterns of participation in all domains of physical activity (leisure, transportation and occupational).

5.2.1 LOW-AND-MIDDLE INCOME COUNTRIES

In many low- and middle-income countries, the levels of participation in leisure time physical activity may be limited, and moderate to vigorous physical activity may be performed in the context of transport and/or occupational and/or domestic activities. These characteristics and patterns of physical activity must be taken into consideration for a more tailored and targeted implementation of interventions aiming at promoting the global recommended levels of physical activity for health.

In countries with high levels of occupational and transportation physical activity, policy-makers need to acknowledge that, although these high levels of activity may not be the result of efforts to improve health, such levels of activity provide major health benefits for the population. Caution is therefore needed when implementing policies and infrastructure changes which may lead to a reduction in the levels of physical activity in any domain.

For those communities who currently do not achieve the global recommendations of physical activity for health, science supports health benefits for both moderate- and vigorous-intensity activity. However the net health benefit (benefits versus risks) in community-based programmes is likely to be higher if the main focus is on moderate-intensity activity. Moderate-intensity activity is more relevant to the public health goals of policy implementation than vigorous-intensity activity because of the lower risk of orthopaedic injuries and other medical complications potentially acquired during moderate-intensity activity. If the focus of policy implementation is in promoting vigorous-intensity activity, issues related to potential risks, especially for older adults and populations with various morbidities, need to be taken into consideration. For both levels of intensity, the use of appropriate protective equipment should always be encouraged.

5.3 SUPPORTIVE POLICIES IN PROMOTING PHYSICAL ACTIVITY

National guidelines or recommendations on physical activity for the general population are needed to inform the population on the frequency, duration, intensity, types and total amount of physical activity necessary for health. However, increasing levels of physical activity in the population demands a population-based, multisectoral, multidisciplinary, and culturally relevant approach. National policies and plans on physical activity should comprise multiple strategies aimed at supporting the individual and creating supportive environments for physical activity to take place. *(3,5)*

Current evidence shows that environmental policies that impact on the mode of transport people use or that increase public space for recreational activities have the potential to increase physical activity levels in the population and consequently provide significant health benefits. This is of particular relevance to LMIC. *(3, 22)*

Possible physical activity promoting interventions include:

- reviewing urban and town planning and environmental policies at national and local level to ensure that walking, cycling and other forms of physical activity are accessible and safe;
- providing local play facilities for children (e.g. building walking trails);
- facilitating active transport to work (e.g. cycling and walking) and other physical activity strategies for the working population;
- ensuring that school policies support the provision of opportunities and programmes for physical activity;

- providing schools with safe and appropriate spaces and facilities so that students can spend their time actively;
- providing advice or counsel in primary care; and
- creating social networks that encourage physical activity. *(3, 22, 23)*

5.4 STRATEGIES FOR COMMUNICATING THE GLOBAL RECOMMENDATIONS AT NATIONAL LEVEL

Adopting the global recommendations and integrating them to national policies, programmes and interventions is an important initial step in communicating physical activity levels to communities and the public. However, in order to encourage acceptance, uptake and adherence to physical activity promotion activities by the target populations, nationally adapted messages need to be developed and widely disseminated to all relevant stakeholders, professional groups and to the general community.

Effective dissemination of the recommended levels of physical activity for health requires strategic planning, strong collaborations between various groups and resources for supporting communication and dissemination efforts *(3, 24)*.

Countries with differing levels of physical activity will likely need to communicate and disseminate different strategies and messages to their communities and to the public. Consequently, when taking into consideration national and subnational cultural and environmental factors, it is advisable to develop a comprehensive, communication strategy for effective dissemination of the global recommended levels of physical activity for health, which addresses all possible variance.

It is similarly advisable to adopt a communication strategy that includes simple, understandable and adaptable messages which are culturally sensitive. It should be highlighted, however, that while the messages used may vary from country to country, or may even differ within the same country, policy-makers and communication experts should aim to retain the core recommended levels of physical activity for health outlined in the previous section.

Appendix 3 gives examples of messages consistent with the recommended levels of physical activity for health which have been used to promote physical activity in various countries, and can be used as guidance for LMIC when developing their national communication strategies.

5.5 MONITORING AND EVALUATION

Evaluation and ongoing monitoring of the process and outcomes of actions for the promotion of physical activity is necessary in order to:

- examine programme success and to identify target areas for future plans of action;
- ensure the policy, plan or programme is being implemented as intended;
- contribute to ongoing learning and continuous improvement of the actions implemented;
- assist policy-makers in decision-making regarding existing policies, plans and programmes, including the development of new ones; and
- facilitate transparency and accountability. *(25)*

(Additional resources for monitoring and evaluation processes are included in the following section.)

6

RESOURCES

INTRODUCTION

The development and dissemination of national physical activity guidelines should be seen as one element of a broader policy and planning process to promote physical activity. To achieve effective change in awareness and set the agenda for behaviour and environmental change, it is necessary to integrate the guidelines into a national physical activity policy and plan of action.

In some countries it might also be necessary to link physical activity guidelines to other public health and prevention issues. For example, in the health sector, guidelines might be linked to the prevention and control of noncommunicable diseases, or to specific health issues such as diabetes or obesity. In the sport sector, physical activity guidelines might be linked to community participation in organized and non-organized sport and leisure pursuits. Greater gains can be achieved by positioning physical activity guidelines as part of a comprehensive planning of noncommunicable diseases prevention and control or other public health issues, such as framing the guidelines as part of objectives setting, intervention selection and implementation, and monitoring and surveillance.

Listed below are some of the key resources available to WHO to support Member States in the development, implementation, monitoring and evaluation of policies related to physical activity promotion:

POLICY DEVELOPMENT AND IMPLEMENTATION:

- A guide for population-based approaches to increasing levels of physical activity: implementation of the Global Strategy on Diet, Physical Activity and Health *(3)*: http://www.who.int/dietphysicalactivity/PA-promotionguide-2007.pdf.
- Report of joint WHO/World Economic Forum event on prevention of noncommunicable diseases in the workplace *(26)*: http://www.who.int/dietphysicalactivity/workplace.
- A school policy framework focusing on diet and physical activity *(23)*: http://www.who.int/dietphysicalactivity/schools.
- Interventions on Diet and Physical Activity: What Works. Implementation of the Global Strategy on Diet, Physical Activity and Health *(22)*: http://www.who.int/dietphysicalactivity/whatworks.
- Pacific Physical Activity Guidelines for Adults: Framework for Accelerating the Communication of Physical Activity Guidelines *(24)*: http://www.wpro.who.int/NR/rdonlyres/6BF5EE82-8509-4B2F-8388-2CE9DBCCA0F8/0/PAG_layout2_22122008.pdf.

SURVEILLANCE, MONITORING AND EVALUATION:

- The WHO STEPwise approach to surveillance (STEPS): http://www.who.int/chp/steps/en.
- The Global school-based student health survey (GSHS): http://www.who.int/school_youth_health/assessment/gshs/en.
- The WHO Global InfoBase: WHO global comparable estimates: http://infobase.who.int.
- The Global Questionnaire on Physical Activity for Health (GPAQ): http://www.who.int/chp/steps/GPAQ.
- A framework to monitor and evaluate implementation: Global Strategy on Diet, Physical Activity and Health *(25)*: http://www.who.int/dietphysicalactivity/DPASindicators.

7

APPENDICES

APPENDIX 1

DETAILED DESCRIPTION OF THE METHODOLOGY USED FOR DEVELOPING THE GLOBAL RECOMMENDATIONS ON PHYSICAL ACTIVITY FOR HEALTH

The following steps summarize the actions by the WHO Secretariat for the development of the *Global Recommendations on Physical Activity for Health*:

First phase: Scope and target audience

1) A global expert meeting was arranged in January 2008 in Mexico to examine the scientific evidence available on physical activity and health and to assess the need to develop global recommendations on physical activity for health. The experts who participated in this meeting concluded that there was the need and enough evidence for WHO to develop global recommendations on physical activity for health. Moreover, it was highlighted that the comprehensive review being prepared by the CDC, included in *Physical Activity Guidelines Advisory Committee Report*, 2008 (11), should be part of the bulk of scientific evidence considered for the development of the *Global Recommendations on Physical activity for Health*. In addition, the scope, content and target audience of the global recommendations were defined by the participating experts by discussion and consensus.

Second phase: Evidence collection and analysis

1) Evidence collection: A vast and strong body of evidence has been used for the development of the first draft. This includes:

- the 2008 CDC literature Review presented in the report to the USA Secretary of Health and Human Services titled "Physical Activity Guidelines Advisory Committee Report" *(11)*;
- Bauman et al 2005: the 2005 systematic review of the evidence on "The Health Benefits of Physical Activity in Developing Countries" which has been carried out by the Centre for Physical Activity and Health, University of Sydney) *(13)*;
- Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(9, 10, 18- 21)*;
- a review of the relevant literature in Chinese and Russian using the same search framework that had been used by the 2008 CDC literature review.

Table 1. Overview of evidence documents used

Source of evidence used by WHO secretariat and guideline group	Rational for selecting this review	Considerations by guideline group
The 2008 CDC Literature Review presented in the report to the USA Secretary of Health and Human Services titled "Physical Activity Guidelines Advisory Committee Report" *(11)*	This publication was a result of the search of the Medline literature - covering the period of January 1, 1995 -November 2007 - 14,472 abstracts were triaged, and of these, 1,598 papers were reviewed. The review included: cohort studies, case control studies, randomized control trials, non randomized control trial, meta analysis, observational studies, prospective studies and cross sectional studies. All cause mortality, cardiorespiratory health, metabolic health, musculo-skeletal health, functional health, cancer, mental health and adverse events. The populations studied were children and youth, adults and older adults. This is an extensive, global, high quality and up to date review which covers the outcomes of interest.	Study design, limitations of the studies, sample size, statistical power, precision of results, measurement methods, follow-up, adherence were considered to conclude that this review provided strong evidence for the development of the global recommendations.
The 2005 systematic review of the evidence on "The Health Benefits of Physical Activity in Developing Countries" - Centre for Physical Activity and Health, University of Sydney *(13)*	This is a global review, focusing on grey and peer reviewed literature from low and middle income countries. To identify relevant published epidemiological studies on physical activity and health in developing countries multiple electronic databases were searched. These included NIH Pub Med, Medline, Psycinfo and two evidence based directories, The Cochrane Library and DARE. Additional papers were identified via hand searching. The search strategy was restricted to English language papers published from January 1980 – March 2007. 47 studies conducted in low and middle income countries, with different designs were included in this review: cross sectional surveys (descriptive and analytic), cohort studies, randomized control trials and case control studies. They covered all cause mortality, cardiovascular disease diabetes, cancers, injuries and bone health, mental health and associated risk factors.	The strength of dose-response relationships is assessed based on the volume of data available and the level of consistency between the various study findings. This was considered to provide strong evidence for the development of the global recommendations.

2007 evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(9, 18, 20)*	These reviews of the literature provide an analysis of the epidemiology related to physical activity for health, and the strength of the relationship between physical activity and specific health outcomes is evaluated, with particular emphasis on minimal and optimal physical activity requirements. Meta analysis, systematic reviews, epidemiological studies and randomized control trials were included in this review. Cardiorespiratory health, hypertension, breast and colon cancer, diabetes, adiposity, mental health osteo-musculoskeletal health, osteoporosis, injuries and asthma were health outcomes included in these reviews. These are comprehensive and high quality reviews which cover the outcomes of interest and the relevant age groups.	The strength of dose-response relationships is assessed based on the volume of data available and the level of consistency between the various study findings. This was considered to provide strong complementary evidence for the development of the global recommendations.
2009 Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(10, 19, 21)*	For all 3 papers, the literature was obtained through searching electronic databases. All articles included in these reviews were reviewed to complete standardized data extraction tables, and assess study quality. An established system of assessing the level and grade of evidence for the recommendations was employed by the research groups. Various study types were included in this review: prospective cohort studies randomized control trials, and non-RCT study types 86 studies were included in the review focusing on children and youth. The volume, intensity, and type of physical activity were considered. A total of 254 articles met the eligibility criteria for the review focusing on adults. 100 studies were included in the review focusing on older adults.	Study design, limitations of the studies, sample size, statistical power, precision of results, measurement methods, follow-up, adherence were considered to conclude that the three age specific reviews provided strong evidence for the development of the global recommendations.
The systematic research of the literature to search for evidence published in Chinese and Russian (the same inclusion and exclusion criteria and the same time frame of research used in the CDC review were used to conduct this additional search).	This ensured that all studies relevant to the outcomes of interest and published in languages other than English will be included in the evidence, strengthening its global coverage. The additional evidence from other languages was assessed using the same criteria that have been used for the CDC systematic review. 10 articles in the Russian language and 164 articles in Chinese were retrieved. Three articles in Russian and 71 in Chinese were considered relevant to the outcomes.	The evidence found was consistent with the other literature reviews and added no extra knowledge for the guideline group to consider.

2) Summarizing the evidence collected

The WHO Secretariat reviewed and analysed all the sources of evidence listed above. Based on this body of evidence, narrative descriptions summarizing the evidence available for the relevant health outcomes were prepared.

These narrative descriptions of the evidence included information on: the number and type of studies included in each review, magnitude of effect, the quality of the evidence, characteristics of the physical activity most likely to produce the outcome and the evidence of a dose response for the age group and health outcomes selected.

Third phase: Preparation of the draft for the *Global Recommendations on Physical Activity for Health*

1) After all the evidence had been collected and analysed, the WHO Secretariat led by the Surveillance and Population-based Prevention Unit at WHO-HQ in collaboration with the WHO Regional Offices:

- established the process for developing the Global Recommendations on Physical Activity for Health and cleared it with the WHO Guideline Review Committee;
- established a guideline group (see Appendix 4 for members), which took into consideration: global representation, gender balance and area of expertise both in the subject matter as well as in policy development and implementation;
- prepared a narrative summary of the evidence relevant to the health outcomes previously selected; and
- developed a first draft of the *Global Recommendations on Physical Activity for Health.*

2) The draft of the *Global Recommendations on Physical Activity for Health* was used in a first round of electronic consultations with the guideline group through the online "community

of practice" website. To collect the comments from all the guideline group members, the WHO Secretariat prepared a template with specific questions, The template requested comments on:

- the overall quality of the evidence for major health outcomes and to evaluate the issues of dose response for these outcomes;
- health conditions to which the recommendations are applicable;
- the content and formulation of the recommendations;
- generalizability and applicability of the recommendations in low and middle income countries;
- benefits and harms; and
- costs of developing and endorsing the physical activity recommendations.

All comments made by the guideline group members were compiled by the WHO Secretariat and presented at the meeting of the guideline group.

3) The draft of the *Global Recommendations on Physical Activity for Health* was used in a first round of electronic consultations with the Guideline group. A standard reporting form was used to collect the comments from all the group members in order to focus the discussions of the experts on:

- the scientific evidence used;
- the health conditions to which the recommendations are applicable;
- the content and formulation of the recommendations;
- the applicability of the recommendations in low- and middle-income countries;
- the potential benefits and harms; and
- the costs of developing and endorsing the physical activity recommendations.

Fourth phase: Meeting of the guideline group

The guideline group met on the 23rd Oct 2009 with the aim of:

- reviewing face-to-face the draft *Global Recommendations on Physical Activity for Health* proposed by the Secretariat;
- discussing the comments raised by the different guideline group members during the electronic consultation; and
- finalizing the recommendations.

At the meeting, the Secretariat presented the below information:

- what is expected from the guideline group members during the meeting;
- the expected outcomes for the meeting;
- an overview of the process used for the development of the *Global Recommendations on Physical Activity for Health*;
- a narrative summary of the evidence used to prepared the first draft of the Global Recommendations;
- a summary of the comments received from all guideline group members in the electronic consultation phase.

The meeting was conducted in the format of plenary session. Three main sessions were organized according to the age groups being discussed: children, adults and older adults. At the beginning of each age specific session, the summary of the age specific evidence, comments submitted by the members of the guideline group were presented.

Finalizing the recommendations:

For finalizing each recommendation presented in "Chapter 4", the following steps were followed:

1) The draft recommendations were presented by the WHO Secretariat, with reference to the relevant evidence summary.

2) The evidence was reviewed and discussed by the group. To determine the quality of the evidence, the guideline group considered the types of studies that addressed each specific question, the general quality of these studies (e.g., design, sample size, statistical power, measurement methods, follow-up, adherence) for each major outcome.

3) The draft recommendations were reviewed by the guideline group considering:

- wording formulation considering concepts of: duration/volume, intensity, type, and frequency for physical activity
- health conditions to which each recommendation are applicable
- the balance of evidence for benefits and harms
- costs
- applicability in low and middle income countries
- values, preferences.

4) After the discussion, the draft recommendation was modified (if necessary) and a final recommendation was presented to the guideline group.

The same process was repeated for all recommendations presented in chapter 4.

The finalized recommendations were considered to be applicable in low-middle income countries after the appropriate adaptation and tailoring for implementation by national authorities. Details on the national adaptation of the *Global Recommendations on Physical Activity for Health* are provided in Chapter 5.

Fifth phase: Finalization and dissemination

1) Peer review of the recommendations and consultation with the WHO Regional Offices and relevant departments within WHO-Headquarters (Child and Adolescent Health, Ageing, Health Promotion and Violence and Injury Prevention).

2) Finalization of the recommendations and approval by the WHO Guideline Review Committee.

3) Translation, printing and dissemination.

Sixth phase: Implementation

The *Global Recommendations on Physical Activity for Health* will be integrated in the activities planned for the implementation of the 2008-2013 Action Plan for the Prevention and Control of NCD, and will be integrated as one of the key tools in the "DPAS Implementation Toolbox", which is available on the WHO website. Additionally, these recommendations will be a key component of the regional and sub-regional training and capacity building workshops being held by EURO, EMRO, WPRO and AFRO for 2010; and AMRO/PAHO and SEARO for 2011.

Evidence used for the age group: 5 - 17 years old			
For enhanced cardio-respiratory health[1]:	Supporting evidence in 2008 CDC Literature Review *(11)* (relevant page n°)	2005, "The Health Benefits of Physical Activity in Developing Countries" *(13)*	Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(9,10)*
Frequency & duration	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1-G9-14 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009
Intensity	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1-G9-5 G9-9 - G9-14 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009
Intensity & frequency	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1-G9-5 G9-9 - G9-14 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009
Type & frequency	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1-G9-5 G9-9 - G9-14 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009
For enhanced metabolic health[2]:	Supporting evidence in 2008 CDC Literature Review *(11)* (relevant page n°)	2005, "The Health Benefits of Physical Activity in Developing Countries" *(13)*	Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(9,10)*
Frequency & duration	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1-G9-10 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009
Intensity	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1- G9-10 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009
Intensity & frequency	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1- G9-10 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009
Type & frequency	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1- G9-10 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009

[1]Cardiorespiratory health refers to risk reduction of coronary heart disease, cardiovascular disease, stroke and hypertension
[2]Metabolic Health refers to risk reduction of diabetes and obesity

For enhanced musculo-skeletal health[3]:	Supporting evidence in 2008 CDC Literature Review *(11)* (relevant page n°)	2005, "The Health Benefits of Physical Activity in Developing Countries" *(13)*	Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(9,10)*
Frequency & duration	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1-G9-10 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009
Intensity	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1- G9-10 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009
Intensity & frequency	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1- G9-10 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009
Type & frequency	Part E: E-1 - E- 3 E-17 - E-19 Part G9: G9-1- G9-10 G9-20 - G9-21	Not applicable as the review only included studies with adults	Janssen 2007 Janssen, Leblanc 2009

Evidence used for the age group: 18 - 64 years old

For enhanced cardio-respiratory health[4]:	Supporting evidence in 2008 CDC Literature Review *(11)* (relevant page n°)	2005, "The Health Benefits of Physical Activity in Developing Countries" *(13)*	Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(18,19)*
Frequency, duration and Intensity	Part E: E-1 - E- 3 E-5 - E-6 Part G2: G2-1- G9-40	Section 4.1.2: page 23 Section 4.1.7: page 29 Section 4.2.3: page 34-36 Section 4.2.6: page 38 Section 5: page 41-43	Warburton et al 2007 Warburton et al 2009
Type & frequency	Part E: E-1 - E- 3 E-5 - E-6 Part G2: G2-1- G9-40	Section 4.1.2: page 23 Section 4.1.7: page 29 Section 4.2.3: page 34-36 Section 4.2.6: page 38 Section 5: page 41-43	Warburton et al 2007 Warburton et al 2009

For enhanced metabolic health[5]:	Supporting evidence in 2008 CDC Literature Review *(11)* (relevant page n°)	2005, "The Health Benefits of Physical Activity in Developing Countries" *(13)*	Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(18,19)*
Frequency, duration and Intensity	Part E: E-1 - E- 3 E-6 - E-10 Part G3: G3-9- G3-29 Part G4: G4-1 - G4-8 G4-10 - G4-20	Section 4.1.3: page 24 Section 4.1.7: page 29 Section 4.2.3: page 30-33 Section 4.2.6: pages 39, 40 Section 5: page 41-43	Warburton et al 2007 (20-55 years old) Warburton et al 2009
Type & frequency	Part E: E-1 - E- 3 E-6 - E-10 Part G3: G3-9- G3-29 Part G4: G4-1 - G4-8 G4-10 - G4-20	Section 4.1.3: page 24 Section 4.1.7: page 29 Section 4.2.3: page 30-33 Section 4.2.6: pages 39, 40 Section 5: page 41-43	Warburton et al 2007 (20-55 years old) Warburton et al 2009

[3]For this age group musculo-skeletal health refers to improved bone health
[4]Cardiorespiratory health refers to risk reduction of coronary heart disease, cardiovascular disease, stroke and hypertension
[5]Metabolic Health refers to risk reduction of diabetes and obesity

For enhanced musculo-skeletal health[6]:	Supporting evidence in 2008 CDC Literature Review *(11)* (relevant page n°)	2005, "The Health Benefits of Physical Activity in Developing Countries" *(13)*	Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(18,19)*
Frequency, duration and Intensity	Part E: E-1 - E- 3 E-11 - E-13 Part G5: G5-1- G5-17 Part G5: G5-31 - G5-38	Section 4.1.5: pages 27, 28 Section 4.1.7: page 29 Section 4.2.3: page 36-38 Section 5: page 41-43	Warburton et al 2007 (20-55 years old) Warburton et al 2009
Type & frequency	Part E: E-1 - E- 3 E-11 - E-13 Part G5: G5-1- G5-17 Part G5: G5-31 - G5-38	Section 4.1.5: pages 27, 28 Section 4.1.7: page 29 Section 4.2.3: page 36-38 Section 5: page 41-43	Warburton et al 2007 (20-55 years old) Warburton et al 2009

For cancer prevention[7]:	Supporting evidence in 2008 CDC Literature Review *(11)* (relevant page n°)	2005, "The Health Benefits of Physical Activity in Developing Countries" *(13)*	Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(18,19)*
Frequency, duration and Intensity	Part E: E-1 - E- 3 E-15 - E-16 Part G7: G7-1 - G7-22	Section 4.1.4: pages 25, 26 Section 5: page 41-43	Warburton et al 2007 (20-55 years old) Warburton et al 2009
Type & frequency	Part E: E-1 - E- 3 E-15 - E-16 Part G7: G7-1 - G7-22	Section 4.1.4: pages 25, 26 Section 5: page 41-43	Warburton et al 2007 (20-55 years old) Warburton et al 2009

For prevention of depression:	Supporting evidence in 2008 CDC Literature Review *(11)* (relevant page n°)	2005, "The Health Benefits of Physical Activity in Developing Countries"[8] *(13)*	Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines[9] *(18,19)*
Frequency, type, duration and Intensity	Part E: E-16 - E- 17 Part G8: G8-1 - G8-12	See footnote 9	See footnote 10

Evidence used for the age group: 65 + years old

For the following outcomes: cardiorespiratory health, metabolic health, musculo-skeletal health, cancer prevention[10] and depression, the supporting evidence to older adults are the same as stated in the 18-64 years old group.

For enhanced functional health[11]:	Supporting evidence in 2008 CDC Literature Review *(11)* (relevant page n°)	2005, "The Health Benefits of Physical Activity in Developing Countries" *(13)*	Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(20,21)*
Frequency, duration and Intensity	Part E: E-1 - E- 3 E-13 - E-15 Part G6: G6-1 - G6-22	Section 4.1.5: pages 27, 28 Section 4.1.7: page 29 Section 4.2.3: page 36-38 Section 5: page 41-43	Paterson 2007 Paterson, Warburton D 2009
Type & frequency	Part E: E-1 - E- 3 E-13 - E-15 Part G6: G6-1 - G6-22	Section 4.1.5: pages 27, 28 Section 4.1.7: page 29 Section 4.2.3: page 36-38 Section 5: page 41-43	Paterson 2007 Paterson, Warburton D 2009

[6]For this age group musculo-skeletal health refers to improved bone health and risk reduction of osteoporosis
[7]Cancer prevention refers to reduction of risk of breast and colon cancer
[8]Section 4.1.6: page 28 states that NO studies examining the relationship between mental health and physical activity in adults living in developing countries were identified
[9]Not applicable as the review did not include any aspect of mental health
[10]Cardiorespiratory health refers to risk reduction of coronary heart disease, cardiovascular disease, stroke and hypertension. Metabolic Health refers to risk reduction of diabetes and obesity. Musculo-skeletal health refers to improved bone health and risk reduction of osteoporosis. Cancer refers to reduction of risk of breast and colon cancer.
[11]Functional Health refers to prevention of falls

Evidence specific for this age group related to maintenance or improvement of balance for those at risk of falling was also found in Paterson 2007 and Paterson, Warburton D 2009.

Limited Ability due to health conditions	Supporting evidence in 2008 CDC literature Review *(11)* (relevant page n°)	2005, "The Health Benefits of Physical Activity in Developing Countries" *(13)*	Evidence reviews conducted as part of the process to update the Canadian physical activity guidelines *(20,21)*
	Part E: E-1 - E- 3 E-13 - E-15 Part G6: G6-1 - G6-22	Not applicable as review didn't focused specifically on older adults	Paterson 2007 Paterson, Warburton D 2009

APPENDIX 3 EXAMPLES OF MESSAGES USED TO PROMOTE PHYSICAL ACTIVITY AT NATIONAL LEVEL AND CONSISTENT WITH THE GLOBAL RECOMMENDATIONS

Age group: 5–17 years

Country/Region	Target population	Messages used
Australia Australia's Physical Activity Recommendations for 5–12 year olds *(27)*.	5–12 years of age	Ideally, your child shouldn't spend more than two hours a day doing these things, particularly at times when they could be enjoying more active pursuits. If your child is just starting to get active, begin with moderate-intensity activity - say 30 minutes a day – and steadily increase. More vigorous activities will make kids "huff and puff" and include organized sports such as football and netball, as well as activities such as ballet, running and swimming laps. Children typically accumulate activity in intermittent bursts ranging from a few seconds to several minutes, so any sort of active play will usually include some vigorous activity. Most importantly, kids need the opportunity to participate in a variety of activities that are fun and suit their interests, skills and abilities. Variety will also offer your child a range of health benefits, experiences and challenges.
Australia Australia's Physical Activity Recommendations for 12–18 year olds *(28)*.	12–18 years of age	• Choose a range of activities you like or think you might like to try. • Be active with your friends. You are more likely to keep active if it's fun and you have people to enjoy it with. • Walk more: to school, to visit friends, to shops, or other places in your neighbourhood. • Try to limit time spent watching TV, videos or DVDs, surfing the net or playing computer games, especially during the day and on weekends. • Take your dog or a neighbour's dog for a walk. • Be active with family members – in the yard and on family outings. • Encourage and support younger brothers and sisters to be active. • Try a new sport or go back to one you have played before. • Take a class to learn a new skill such as yoga, kick boxing, dancing or diving. • Check out the activities at your local recreation centre, clubs or youth centre. • Put on some music and dance.
Canada Canada's Physical Activity Guide for Children, 2002 *(29)*.	Children 6–9 years of age	• Physical activity is fun: At home – At school – At play – Inside or Outside – On the way to and from school – With family and friends. Making physical activity a part of the day is fun and healthy. • Increase time currently spent on physical activity by 30 minutes per day, and progress to 90 minutes more per day. • Physical activity can be accumulated in periods of 5–10 minutes. • The 90 minute increase in physical activity should include 60 minutes of moderate activity and 30 minutes of vigorous activity. • Combine endurance, flexibility, and strength activities to achieve the best results. • Reduce screen time, starting with 30 minutes less daily and progressing to 90 minutes less daily.

Age group: 18–64 years old

Country/Region	Target population	Messages used
Australia National Physical Activity Guidelines for Adults, 2005 *(30)*.	Adults	• Think of movement as an opportunity, not an inconvenience. Where any form of movement of the body is seen as an opportunity for improving health, not as a time-wasting inconvenience. • Be active every day in as many ways as you can. Make a habit of walking or cycling instead of using the car, or do things yourself instead of using labour-saving machines. • Put together at least 30 minutes of moderate-intensity physical activity on most, preferably all, days. You can accumulate your 30 minutes (or more) throughout the day by combining a few shorter sessions of activity of around 10–15 minutes each. • If you can, also enjoy some regular, vigorous activity for extra health and fitness.
USA Be Active Your Way. A Guide for Adults, Based on the 2008 Physical Activity Guidelines for Americans, 2008 *(31)*.	Adults (18–64 years old)	• Be active your way. • Pick an activity you like and one that fits into your life. • Find the time that works best for you. • Be active with friends and family. Having a support network can help you keep up with your programme. • There are many ways to build the right amount of activity into your life. Every little bit adds up and doing something is better than doing nothing. • Start by doing what you can, and then look for ways to do more. If you have not been active for a while, start out slowly. After several weeks or months, build up your activities—do them longer and more often. • Walking is one way to add physical activity to your life. When you first start, walk 10 minutes a day on a few days during the first couple of weeks. • Add more time and days. Walk a little longer. Try 15 minutes instead of 10 minutes. Then walk on more days a week. • Pick up the pace. Once this is easy to do, try walking faster. Keep up your brisk walking for a couple of months. You might want to add biking on the weekends for variety.
Pacific Region Pacific physical activity guidelines *(24)*.	Adults (18–65 years old)	• If you are not physically active (moving much), it's not too late to START NOW! Do regular physical activity and reduce sedentary activities. • Be active every day in as many ways as you can, your way. • Do at least 30 minutes of moderate-intensity physical activity on five or more days each week. • If you can, enjoy some regular vigorous-intensity activity for extra health and fitness benefits.

Age group: 65 years and above

Country/Region	Target population	Messages used
Australia National Physical Activity Guidelines for Older Adults, 2005 *(30)*.	65 years and above (Older adults)	• Think of movement as an opportunity, not an inconvenience. • Be active every day in as many ways as you can. • Put together at least 30 minutes of moderate intensity physical activity on most, preferably all, days. • If you can, also enjoy some regular, vigorous activity for extra health and fitness. • Use appropriate safety and protection equipment to maximise safety and minimize risk of injury during physical activity, for example, use supportive footwear for walking, and a helmet for bicycle riding.
Canada Canada's Physical Activity Guide for Adults, 1999 *(33)*.	Adults 55 years and above	• Be active your way, every day – for life. Age is no barrier. Start slowly and build up. • Accumulate 30–60 minutes of moderate physical activity most days. • Minutes count – add it up 10 minutes at a time. Choose a variety of activities from each of these three groups – endurance, flexibility, strength and balance. Getting started is easier than you think. • Build physical activity into your daily routine. Do the activities you are doing now, more often. Walk wherever and whenever you can. • Start slowly with easy stretching. Move around frequently. • Find activities that you enjoy.

APPENDIX 4 GUIDELINE GROUP MEMBERS

Region/Country	Name	Affiliation	Main role of the expert
AFR (Alger)	Dr Rachid Hanifi	Professor of Medicine of Sports Faculty of Medicine of Alger	Content expertise
AFR (South Africa)	Dr Vicky Lambert	Professor and Researcher on Bioenergetics of exercise Sports Science Institute of South Africa, University of Cape Town, South Africa	Content expertise
AMR (USA)	Dr Janet Fulton	Division of Nutrition, Physical Activity, and Obesity Centers for Disease Control and Prevention, USA	Content expertise
AMR (USA)	Dr William Haskell	Professor, Stanford Prevention Research Center, Stanford University School of Medicine Chair of the US Physical Activity Guidelines Advisory Committee	Content and methodological expertise in developing guidelines related to physical activity
AMR (USA)	Dr David Buchner	University of Illinois, USA	Content and methodological expertise in developing guidelines related to physical activity
AMR (Canada)	Dr Mark Tremblay	Director, Healthy Active Living and Obesity Research (HALO) Scientist and Professor, Department of Pediatrics, University of Ottawa, Canada	Content expertise (specific expertise: 5–17 year olds)
EMR (Kuwait)	Dr Jassem Ramadan Alkandari	Chairman of the Physiology department and the Health Sciences Center Faculty of Medicine, Kuwait University	Content expertise
EMR (Pakistan)	Dr Shahzad Khan	Assistant Professor, Health Systems; Health Services Academy, Ministry of Health, Islamabad, Pakistan	Content expertise
EUR (UK)	Professor Fiona Bull	Researcher, Physical Activity and Health School of Sport & Exercise Sciences, Loughborough University, UK	Methodological expertise in developing guidelines related to physical activity
EUR (Finland)	Dr Pekka Oja	Urho Kaleva Kekkonen Institute for Health Promotion Research, Finland (retired)	Content expertise
SEAR (Thailand)	Dr Grit Leetongin	Division of Physical Activity and Health Ministry of Public Health, Royal Thai Government	End user (policy-maker)
WPR (Australia)	Professor Adrian Bauman*	Director, NSW Centre for Physical Activity & Health School of Public Health, University of Sydney	Methodological expertise in developing guidelines related to physical activity
WPR (China)	Dr T H Leung*	Centre for Health Protection, Department of Health, China, Hong Kong Special Administrative Region	End user (policy-maker)

* Member unable to participate in the meeting held on 23 October 2009 (London, UK).

APPENDIX 5 GLOSSARY

Accumulation: The concept of meeting a specific physical activity dose or goal by performing activity in short bouts, then adding together the time spent during each of these bouts. For example, a goal of 30 minutes per day can be met by performing 3 bouts of 10 minutes each throughout the day *(34)*.

Aerobic physical activity: Activity in which the body's large muscles move in a rhythmic manner for a sustained period of time. Aerobic activity – also called endurance activity – improves cardiorespiratory fitness. Examples include walking, running, and swimming, and bicycling *(34)*.

Balance training: Static and dynamic exercises that are designed to improve an individual's ability to withstand challenges from postural sway or destabilizing stimuli caused by self-motion, the environment, or other objects *(34)*.

Bone-strengthening activity: Physical activity primarily designed to increase the strength of specific sites in bones that make up the skeletal system. Bone-strengthening activities produce an impact or tension force on the bones that promotes bone growth and strength. Running, jumping rope, and lifting weights are examples of bone-strengthening activities *(34)*.

Cardiorespiratory fitness (endurance): A health-related component of physical fitness. The ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity. Usually expressed as measured or estimated maximal oxygen uptake (VO2max).

Dose: In the field of physical activity, dose refers to the amount of physical activity performed by the subject or participants. The total dose or amount is determined by the three components of activity: frequency, duration, and intensity. Frequency is commonly expressed in sessions, episodes, or bouts per day or per week. Duration is the length of time for each bout of any specific activity. Intensity is the rate of energy expenditure necessary to perform the activity to accomplish the desired function (aerobic activity) or the magnitude of the force exerted during resistance exercise *(34)*.

Domains of physical activity: Physical activity levels can be assessed in various domains, including one of more of the following: leisure-time activity, occupational activity, household activity, and commuting activity *(34)*.

Dose-response: The relationship between the dose of physical activity and the health or fitness outcome of interest is considered the dose-response. The dose can be measured in terms of a single component of activity (e.g., frequency, duration, intensity) or as the total amount. This concept is similar to the prescription of a medication where the expected response will vary as the dose of the medication is changed. The dose-response relationship can be linear, exponential, or hyperbolic, and it is likely to vary depending on the primary measure of interest. For example, improvements in cardiorespiratory fitness, bone health, or adiposity are common dose-response measures of interest. A dose of physical activity may exist below that which no effect has been detected as well as a dose above that which no effect has been detected. These seemingly lowest and highest doses of activity may be called "thresholds," but the term should be used with caution as these apparent limits may be more related to limitations of measurement than to true biological limits *(34)*.

Duration: The length of time in which an activity or exercise is performed. Duration is generally expressed in minutes *(34)*.

Exercise: A subcategory of physical activity that is planned, structured, repetitive, and purposeful in the sense that the improvement or maintenance of one or more components of physical fitness is the objective. "Exercise" and "exercise training" frequently are used interchangeably and generally refer to physical activity performed during leisure time with the primary purpose of improving or maintaining physical fitness, physical performance, or health.

Flexibility: A health- and performance-related component of physical fitness that is the range of motion possible at a joint. Flexibility is specific to each joint and depends on a number of specific variables including, but not limited to, the tightness of specific ligaments and tendons. Flexibility exercises enhance the ability of a joint to move through its full range of motion *(34)*.

Frequency: The number of times an exercise or activity is performed. Frequency is generally expressed in sessions, episodes, or bouts per week *(34)*.

Guidelines and Recommendations: A WHO guideline is any document that contains recommendations about health interventions, whether they are clinical, public health or policy interventions. Recommendations provide information about what policy-makers, health care providers, or patients should do. They imply a choice between different interventions that have an impact on health and that have ramifications for resource use *(8)*.

Health-enhancing physical activity: Activity that, when added to baseline activity, produces health benefits. Brisk walking, jumping rope, dancing, playing tennis or soccer, lifting weights, climbing on playground equipment at recess, and doing yoga are all examples of health-enhancing physical activity *(34)*.

Intensity: Intensity refers to the rate at which work is being performed or the magnitude of the effort required to perform an activity or exercise. Intensity can be expressed either in absolute or relative terms:

- Absolute: The absolute intensity of an activity is determined by the rate of work being performed and does not take into account the physiological capacity of the individual. For aerobic activity, absolute intensity typically is expressed as the rate of energy expenditure (e.g. milliliters per kilogram per minute of oxygen being consumed, kilocalories per minute, or METs) or, for some activities, simply as the speed of the activity (e.g. walking at 3 miles an hour, jogging at 6 miles an hour), or physiological response to the intensity (e.g. heart rate). For resistance activity or exercise, intensity frequently is expressed as the amount of weight lifted or moved.
- Relative: Relative intensity takes into account or adjusts to an individual's exercise capacity. For aerobic exercise, relative intensity is expressed as a percentage of an individual's aerobic capacity (VO2max) or VO2 reserve, or as a percentage of an individual's measured or estimated maximum heart rate (heart rate reserve). It also can be expressed as an index of how hard an individual feels he or she is exercising (e.g. on a 0–10 scale).

Leisure-time physical activity: Physical activity performed by an individual that is not required as an essential activity of daily living and is performed at the discretion of the individual. Such activities include sports participation, exercise conditioning or training, and recreational activities such as going for a walk, dancing, and gardening *(34)*.

Maximal oxygen uptake (VO2max): The body's capacity to transport and use oxygen during a maximal exertion involving dynamic contraction of large muscle groups, such as during running or cycling. It is also known as maximal aerobic power and cardiorespiratory endurance capacity. Peak oxygen consumption (VO2peak) is the highest rate of oxygen consumption observed during an exhaustive exercise test *(34)*.

MET: MET refers to *metabolic equivalent* and 1 MET is the rate of energy expenditure while sitting at rest. It is taken by convention to be an oxygen uptake of 3.5 milliliters per kilogram of body weight per minute. Physical activities frequently are classified by their intensity, using the MET as a reference.

Moderate-intensity physical activity: On an absolute scale, moderate intensity refers to the physical activity that is performed at 3.0–5.9 times the intensity of rest. On a scale relative to an individual's personal capacity, moderate-intensity physical activity is usually a 5 or 6 on a scale of 0–10 *(34)*.

Muscle-strengthening activity: Physical activity and exercise, that increases skeletal muscle strength, power, endurance, and mass (e.g. strength training, resistance training, or muscular strength and endurance exercises) *(34)*.

Physical activity: Any bodily movement produced by skeletal muscles that requires energy expenditure *(5)*.

Physical inactivity: An absence of physical activity or exercise.

Primary prevention: Actions that seek to reduce risks in the entire population regardless of each individual's level of risk and potential benefits. The intention of primary prevention interventions is to move the profile of the whole population in a healthier direction. Small changes in risk factors in the majority who are at low to moderate risk can have a significant impact in terms of population-attributable risk of death and disability *(6)*.

Secondary prevention: Focuses actions on the people likely to benefit, or benefit most. Secondary prevention interventions are based on screening exposed populations for the early onset of sub-clinical illnesses and administering treatment *(6)*.

Sport: Sport covers a range of activities performed within a set of rules and undertaken as part of leisure or competition. Sporting activities usually involve physical activity carried out by teams or individuals and are supported by an institutional framework, such as a sporting agency *(24)*.

Vigorous-intensity physical activity: On an absolute scale, vigorous intensity refers to physical activity that is performed at 6.0 or more times the intensity of rest for adults and typically 7.0 or more times for children and youth. On a scale relative to an individual's personal capacity, vigorous-intensity physical activity is usually a 7 or 8 on a scale of 0–10 *(34)*.

Major muscle groups: Major muscle groups include the legs, hips, back, abdomen, chest, shoulders and arms *(34)*.

Type of physical activity: The mode of participation in physical activity. The type of physical activity can take on many forms: aerobic, strength, flexibility, balance.

Volume: Aerobic exercise exposures can be characterized by an interaction between bout intensity, frequency, duration, and longevity of the programme. The product of these characteristics can be thought of as volume and can be represented by the total energy expenditure (EE) of the exercise exposure *(34)*.

APPENDIX 6 LIST OF PEER REVIEWERS (IN ALPHABETICAL ORDER)

Dr Randy Adams (Centre for Health Promotion, Public Health Agency of Canada, Canada)
Ms Frances Cuevas (Department of Health, Philippines)
Dr Luiz Gomez (Fundación FES in Bogotá, Colombia)
Mr Benaziza Hamadi (World Health Organization, Switzerland; retired)
Professor I-Min Lee (Harvard School of Public Health, USA)
Dr Sonja Kahlmeier (Institute for Social and Preventive Medicine of the University of Zurich, Switzerland)
Dr Bill Kohl (University of Texas School of Public Health, Michael & Susan Dell Center for Advancement of Healthy Living USA)
Professor Salome Kruger (Centre of Excellence for Nutrition, North-West University, South Africa)
Dr Jean Claude Mbanya (Department of Internal Medicine and Specialties, University of Yaoundé; International Diabetes Federation, Cameroon)
Dr Karim Omar (Institute for Sport Science and Sport; FA University Erlangen-Nürnberg Germany)
Dr Vincent Onywera (Kenyatta University, Nairobi, Kenya)
Dr Michael Pratt (Centres for Disease Control and Prevention, USA)
Dr Krissada Raungarreerat (Thai Health Promotion Foundation, Thailand)
Professor Nizal Sarrafzadegan (Isfahan Cardiovascular Research Center; Isfahan University of Medical Science Iran)
Dr Trevor Shilton (Australian Heart Foundation, Australia)
Professor Nick Watson (Department of Sociology, Anthropology and Applied Social Sciences University of Glasgow UK)
Dr Wanda Wendel-Vos (Centre for Prevention and Health Services Research; National Institute for Public Health and the Environment, the Netherlands)

APPENDIX 7 WHO REGIONAL OFFICES CONSULTED

AFRO (Dr Hamas Boureima-Sambo; Dr Sidi Allal Louazani; Dr Chandralla Sookram)
AMRO/PAHO (Dr Carl James Hospedales;Dr Enrique R Jacoby)
EMRO (Dr Jaffar Hussain)
EURO (Ms Lideke Middelbeek; Dr Sonia Kahlmeier, until December 2009; Ms Trudy Wijnhoven)
SEARO (Dr Jerzy Leowski)
WPRO (Dr Andrew Colin Bell; Dr Luca Tomaso Cavalli-Sforza; Dr Cherian Varghese)

WHO-HQ
Department of Chronic Diseases and Health Promotion (Dr Gauden Galea; Dr Shanthi Mendis)
Department of Ageing and Life Course (Dr John Beard)
Department of Nutrition for Health and Development (Dr Francesco Branca)
Department of Protection of the Human Environment (Dr Maria Purificacion Neira)
Department of Child and Adolescent Health and Development (Mr Paulus Joannes Bloem)

APPENDIX 8 WHO SECRETARIAT

WHO-HQ Department of Chronic Diseases and Health Promotion: Dr Timothy Armstrong, Ms Vanessa Candeias, Mr Eddy Engelsman, Ms Regina Guthold, Ms Hilda Muriuki, Mr Godfrey Xuereb
WPRO, South Pacific Office: Dr Temo Waqanivalu

REFERENCES

1. *Global health risks: mortality and burden of disease attributable to selected major risks.* Geneva, World Health Organization, 2009.

2. *The global burden of disease: 2004 update.* World Health Organization, Geneva, 2008.

3. *A guide for population-based approaches to increasing levels of physical activity: implementation of the WHO Global Strategy on Diet, Physical Activity and Health.* Geneva, World Health Organization, 2007.

4. *Preventing chronic diseases: a vital investment.* Geneva, World Health Organization, 2005.

5. Resolution WHA57.17. Global Strategy on Diet, Physical Activity and Health. In: *Fifty-seventh World Health Assembly, Geneva, 17–22 May 2004. Resolutions and decisions, annexes.* Geneva, World Health Organization, 2004.

6. *World Health Report 2002: Reducing risks, promoting healthy life.* Geneva, World Health Organization, 2002.

7. *2008–2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases.* Geneva, World Health Organization, 2008.

8. *WHO Handbook for guideline development, October 2009.* Geneva, World Health Organization, 2009.

9. Janssen I. Physical activity guidelines for children and youth. *Applied Physiology Nutrition and Metabolism*, 2007, 32:S109–S121.

10. Janssen I, Leblanc A. Systematic Review of the Health Benefits of Physical Activity in School-Aged Children and Youth. *International Journal of Behavioural Nutrition and Physical Activity*, 2009 [under review for publication].

11. Physical Activity Guidelines Advisory Committee (PAGAC). *Physical Activity Guidelines Advisory Committee Report, 2008.* Washington, DC, US Department of Health and Human Services, 2008.

12. *World report on child injury prevention.* World Health Organization, UNICEF, 2008.

13. Bauman A, Lewicka M, Schöppe S. T*he Health Benefits of Physical Activity in Developing Countries.* Geneva, World Health Organization, 2005.

14. Cook I, Alberts M, Lambert EV. Relationship between adiposity and pedometer-assessed ambulatory activity in adult, rural African women. *International Journal of Obesity*, 2008, 32: 1327–1330.

15. Nocon M et al. Association of physical activity with all-cause and cardiovascular mortality: a systematic review and meta-analysis. *European Journal of Cardiovascular Prevention & Rehabilitation*, 2008, 15:239–46.

16. Steyn K et al. Risk factors associated with myocardial infarction in Africa: the INTERHEART Africa study. *Circulation*, 2005, 112(23):3554–3561.

17. Sofi F et al. Physical activity during leisure time and primary prevention of coronary heart disease: an updated meta-analysis of cohort studies. *European Journal of Cardiovascular Prevention & Rehabilitation*, 2008, 15:247–57.

18. Warburton D et al. Evidence-informed physical activity guidelines for Canadian adults. *Applied Physiology Nutrition and Metabolism*, 2007, 32:S16–S68.

19. Warburton D et al. A systematic review of the evidence for Canada's Physical Activity Guidelines for Adults. *International Journal of Behavioural Nutrition and Physical Activity*, 2009 [under review for publication].

20. Paterson DH, Jones GR, Rice CL. Ageing and physical activity: evidence to develop exercise recommendations for older adults. *Applied Physiology, Nutrition and Metabolism*, 2007, 32:S69–S108.

21. Paterson D, Warburton D. Physical activity and functional limitations in older adults: a systematic review related to Canada's Physical Activity Guidelines. *International Journal of Behavioural Nutrition and Physical Activity*, 2009 [under review for publication].

22. *Interventions on diet and physical activity: what works: summary report.* Geneva, World Health Organization, 2009.

23. *School policy framework: implementation of the WHO global strategy on diet, physical activity and health.* Geneva, World Health Organization, 2008.

24. *Pacific physical activity guidelines for adults: framework for accelerating the communication of physical activity guidelines.* World Health Organization, Western Pacific Region, 2008.

25. *Global Strategy on Diet, Physical Activity and Health: A framework to monitor and evaluate implementation.* Geneva, World Health Organization, 2008.

26. *Preventing noncommunicable disease in the workplace through diet and physical activity. WHO/World Economic Forum report of a joint event.* Geneva, World Health Organization, 2008.

27. *Australia's Physical Activity Recommendations for 5–12 Year olds* [brochure]. Australian Government Department of Health and Ageing, 2005. (http://www.health.gov.au/internet/main/publishing.nsf/Content/9D7D393564FA0C42CA256F970014A5D4/$File/kids_phys.pdf, accessed 23 February 2010).

28. *Australia's Physical Activity Recommendations for 12–18 Year olds* [brochure]. Australian Government Department of Health and Ageing, 2005. (http://www.health.gov.au/internet/main/publishing.nsf/Content/0D0EB17A5B838081CA256F9700136F60/$File/youth_phys.pdf, accessed 23 February 2010).

29. Canada's physical activity guide for children, 2002 (http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/pag-gap/cy-ej/index-eng.php, accessed 24 April 2010).

30. National Physical Activity Guidelines for Adults. Australian Government Department of Health and Ageing, 2005. (http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-phys-act-guidelines, accessed 11 January 2010).

31. *Be Active Your Way: A Guide for Adults.* Based on the 2008 Physical Activity Guidelines for Americans. ODPHP Publication No. U0037. Office of Disease Prevention & Health Promotion, US Department of Health and Human Services, October 2008. (http://www.health.gov/paguidelines/pdf/adultguide.pdf, accessed 11 January 2010).

32. UKK Institute's Physical Activity Pie. UKK Institute, Finland, 2009. (http://www.ukkinstituutti.fi/en/liikuntavinkit/1004, accessed 11 January 2010).

33. *Be Active, Your Way, Every Day for Life!* Canada's physical activity guide for older adults. (http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/pag-gap/pdf/guide-older-eng.pdf, accessed April 2010).

34. *2008 Physical Activity Guidelines for Americans.* Office of Disease Prevention & Health Promotion, US Department of Health and Human Services, October 2008. (www.health.gov/paguidelines, accessed 11 January 2010).

NOTES


978 92 4 159997 9
9 789241 599979