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# Physical activity as a key issue for promoting human health on a local and global scale: evidences and perspectives

M. Scatigna[1], S. D'Eugenio[1], V. Cesarini[1], L. Coppola[2], P. Lemma[3], L. Fabiani[1], V. Romano Spica[4,5]

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**Abstract**

*Physical inactivity represents the fourth leading risk factor with the highest epidemiological impact on population health worldwide, as estimated by the epidemiological measures used in global surveillance systems as the Global Burden of Disease Study. Scientific research has provided compelling evidence to establish and clarify the causal relationships and to devise effective intervention strategies, including the development of both national and international recommendations and the planning of whole-of-system and integrated actions. Over the last few years, new paradigms have been identified, such as the distinction between physical inactivity and sedentary behaviour, the different methods to integrate enough levels of physical activity in daily life, and the relevance of sleep in normal lifestyle activities. The experience in programs planning and in their assessments has led to the definition of a whole-of-system and global approach for the promotion of an active lifestyle, specifically the Global Action Plan on Physical Activity 2018 – 2030 by the World Health Organization, with the definition of overlapping areas with further objectives of public health as established by the 2030 Agenda for Sustainable Development. Thus, the action plan aims to ensure access to inclusive and equitable opportunities for people to be physically active in their daily life (with reference to more socially disadvantaged groups, such as women, people with disabilities, people of low socioeconomic status) and to improve planetary health.*

## Introduction

The risk factors correlated with chronic diseases are mainly associated with unhealthy lifestyles, such as smoking, excessive alcohol consumption, imbalanced diet, and lack of physical exercise. These unhealthy behaviors, although identified as common modifiable risk factors, are heavily influenced by the economic, social and physical environmental contexts in which people live and work, and they are often established during childhood and adolescence (1). Physical activity is considered one of the most important

[1] *Department of Life, Health and Environmental Sciences, University of L'Aquila, L'Aquila, Italy*
[2] *Welfare General Directorate, Lombardy Region, Milan, Italy*
[3] *Department of Public Health and Paediatrics, University of Torino, Torino, Italy*
[4] *Department od Movement, Human and Health Sciences, University of Rome "Foro Italico", Rome, Italy*
[5] *WDPP, Working Group Doping Prevention Project: T. Trenti, C. Pasquarella, G. Liguori, P. Fallace*

protective factors in the prevention of the major Non-Communicable Diseases (NCDs).

In 1953, The Lancet journal published a seminal study by the epidemiologist Jerry Morris and colleagues on the associations between physical activity and the risk of coronary heart disease (2). In 1994, Morris described physical activity as the 'the best buy' in public health (3). In 2012, an international team of experts released its first series on physical activity, Lancet Series: "Physical Activity 2012" (4) with the aim to draw global attention on physical inactivity, which is as important a modifiable risk factor for chronic diseases as obesity and tobacco, in the prevention of chronic degenerative diseases (5). Subsequently, strong evidence showed the pandemic of physical inactivity and the need for major global efforts to counteract this problem for public health (6). In their editorial, Das & Horton stated that "Physical activity is a neglected dimension of prevention and intervention worldwide, especially in low-income and middle-income countries" (7). In 2016, the second Lancet Series: Physical Activity 2016: Progress and Challanges' presented an update of the field, with a focus on low-income and middle-income countries (8). The research carried out by the scientific team who contributed to the publication of the two series led first to the Lancet Physical Activity Observatory and, in 2015, to the Global Observatory for Physical Activity (9), a working group within the Scientific Committee of the International Society for Physical Activity and Health (10) with epidemiological, scientific, practical goals, and with a global action plan.

After almost 70 years, the use of the scientific method for the development of tools for the observation and the analysis of the causal relationship between physical activity and health outcomes provided compelling evidence that regular physical activity has substantial benefits on health, and the advance of knowledge from the Fifties thus far, as summarized in Figure 1, represents the scientific basis of the current action plans on physical activity promoted by national and international health institutions (11).

The aim of this article is to provide an update regarding the evidence and actions under way at different levels for the promotion of health through physical activity. We identified five key issues which are associated with the following objectives:

1. epidemiologic impact, measuring tools and evaluation systems;
2. new paradigms built upon recent evidence;
3. review of the recommendations for the population;
4. global and whole-of-system approach in the action plans for the promotion of an active lifestyle;
5. overlapping areas with other objectives of public health and sustainable development.

### *Key-issue 1. Epidemiologic impact ascribable to physical activity, measuring instruments and evaluation systems*

The epidemiologic impact of physical activity is assessed through different measures. In terms of population attributable fractions (i.e. the proportion of new cases of diseases in the population that would be averted following elimination of the exposures to a risk factor) in the first Lancet series physical inactivity was estimated to cause worldwide 6% of the burden of disease from coronary heart disease (ranging from 3.2% in southeast Asia to 7.8% in the eastern Mediterranean region), 7% (3.9–9.6%) of type 2 diabetes, 10% (5.6–14.1%) of breast cancer, and 10% (5.7–13.8%) of colon cancer. Moreover, inactivity is responsible for 9% of premature mortality (range 5.1–12.5%), or to cause more than 5 million deaths worldwide, which makes inactivity comparable to the established risk factors of smoking and obesity. The elimination of physical inactivity

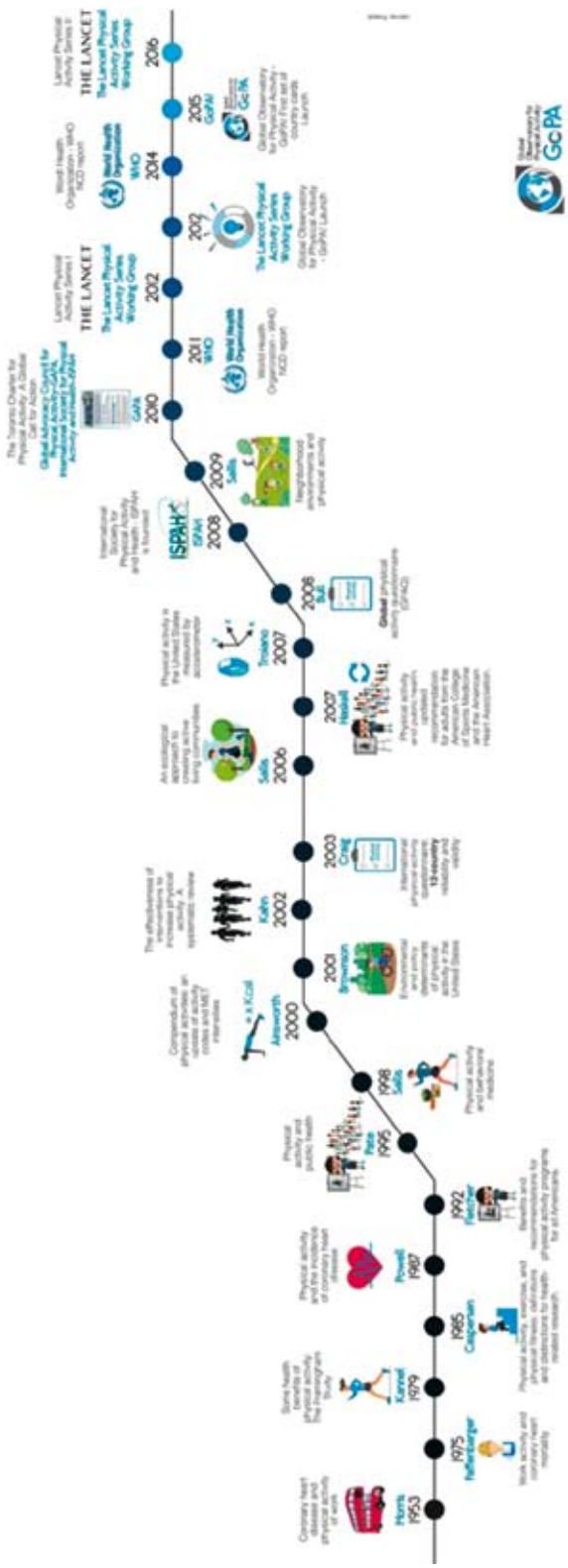


Figure 1 - Milestones in the knowledge of the relationship between physical activity and health (11), Ramirez A. Global Observatory for Physical Activity – GoPA – Coordinator. (Authorized)

would increase the life expectancy of the world population by 0.68 (range 0.41–0.95) years (5). Physical inactivity was included only in 2010 among the risk factors studied in the Global Burden of Disease Study (GBD), the most comprehensive worldwide observational epidemiological study to date. It describes mortality and morbidity from major diseases, injuries and risk factors for health at global, national and regional level (12) examining trends from 1990 to the present using standardized methods, such as the DALY, "Deaths and Disability-Adjusted Life Years", computed as the sum of years of life lived with disability [YLD] and years of life lost [YLL], attributable to the independent effect of each risk factor or group of factors. Physical inactivity has a major impact on five adverse health conditions. The data reported in the Global Burden of Disease Study 2017, estimated the following attributable burden of disease for Italy: ischemic heart disease (11.1% of total DALYs in men and 12.8% of the total DALYs in women); ischemic stroke (5.6% of total DALYs in men and 6.8% of total DALYs in women); type 2 diabetes (3.4% of total DALYs in men and 3.6% of total DALYs in women); colon cancer (3.9% of total DALYs in men and 4.2% of total DALYs in women); breast cancer (2.0% of total DALYs) (13).The 34.5% of Italian adult population is reported to be inactive (14). Thus, Italy results to have a greater percentage compared to the world estimate of 27.5% as reported in one of the most comprehensive studies conducted through a pooled analysis from 358 surveys across 168 countries (15). Global prevalence of insufficient physical activity showed a relevant gender gap in most of the surveyed countries, with women being less active than men, as also highlighted for the Italian population: 36.4 % vs 32.5% (14). Moreover, a strong gradient was recorded with respect to the national median income: in high-income countries the prevalence of insufficient activity is more than twice as in low-income countries (15).

In the last two decades, the progress made in physical activity surveillance have been pivotal for the development, the implementation, and the assessment of local national and global action plans, also due to the adoption of standardized self-report tools such as the International Physical Activity Questionnaire and the Global Physical Activity Questionnaire proposed by the World Health Organization and used in the global surveillance and prevention of chronic diseases (16). The next steps should involve the use of objective assessment tools, such as accelerometers, emerging technologies and innovative data collection systems, such as the mobile apps, as already used by the in U.S. National Health and Nutrition Examination Survey (17). Additionally, further measurements should be taken into consideration for the assessment of other elements of physical activity, such as muscular strengthening and balance activities in compliance with the new recommendations for the population (18, 19). A 'comprehensive' surveillance should also include indicators for the macro-level determinants such as the government support, the national policies, the infrastructures for physical activity. In December 2015, the Global Observatory for Physical Activity – GoPA! published the first Almanac which included the so-called 'country cards' for 139 countries (representing 64% of world's countries), with a novel global approach to the observation of the current state of physical activity, including the surveillance data, but also the public health policies and the research activity conducted in each country, with the aim to compare the different status of physical activity for each country of the world through standardized assessment methods. Figure 2 summarizes the Italian GoPA indicators for the year 2013 (11, 20). 'Global' surveillance systems like the Global Observatory for Physical Activity

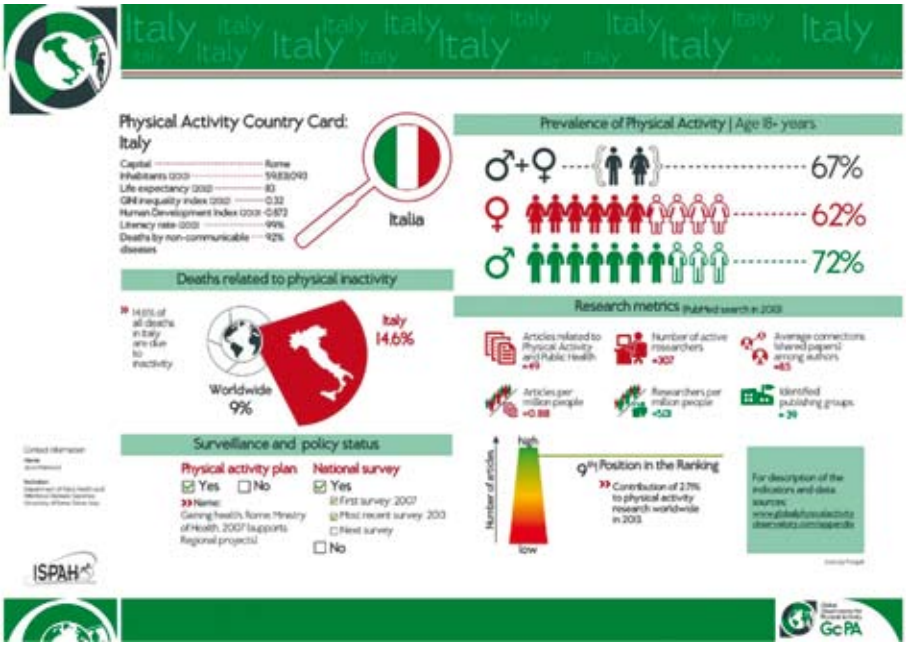


Figure 2 - Country card of Italian Physical Activity [GoPA, 2016; Mannocci et al, 2016] (11, 20), Ramirez A. Global Observatory for Physical Activity – GoPA – Coordinator. (Authorized).

– GoP represents an important advance towards systems that deliver and support the actions to reverse the pandemic of physical inactivity (18).

***Key issue 2. New paradigms built upon the most recent evidence***

The risk profile of a person with respect to the 'physical activity' factor is difficult to be defined since it is the determinant of a complex matrix of behaviors within an environmental, physical and social context, each having a set of correlated explicative factors. Moreover, the 'physical activity' construct can be operationalized in different dimensions: domain (leisure, sports, work, at home, transport); type (i.e. spontaneous, organized); amount or volume established by intensity (light, moderate, vigorous); by frequency and duration; by the exercise physiology/metabolism (aerobic, anaerobic); by the fitness health-related component (aerobic capacity, muscular strength, balance, flexibility) and regularity (e.g. more days per week).

'Physical activity' was originally defined by Caspersen in 1985, amongst the first epidemiologist to distinguish the concepts of 'physical activity', 'physical exercise' and 'physical fitness' (21). Scientific paradigms in this field have been revised and new guidelines and interventions have been developed with some important novelties, as described below.

*2.1. 'Inactive' behaviour and 'sedentary' behaviour*

The term 'sedentary' has been and is still used in different contexts and with different interpretations. In 2012, the Sedentary Behavior Research Network proposed a distinct definition of behaviors aimed at clarifying differences between sedentary behavior and physical inactivity (22):

- Sedentary Behavior involves activities characterized by low energy expenditure (at

the level of 1.0–1.5 metabolic equivalent units - METs) performed in a sitting or supine position (e.g. TV viewing, computer use, reading, working, etc., while sitting). Under this definition, any activity done while standing (except those cases where individuals are absolutely motionless) is classified as 'non-sedentary'. Thus, an individual can be defined as 'sedentary' if he performs several tasks which are actually sedentary. Sitting behavior is considered a marker of the 'sedentary' profile.

- Inactive Behavior is characterized by an insufficient level of moderate- to vigorous-intensity physical activity (Moderate to Vigorous Physical Activity, MVPA). Several experimental studies focused on programs of physical exercise involve a 'sedentary control group' or they define the participants in a study as recruited from a 'sedentary population' simply because they do not reach the recommended MVPA thresholds without actually measuring their sedentary behaviors (22).

Thus, an individual may be physically active and meet the physical activity recommendations by age groups, although they spend longer sitting bouts during the day (in the workplace, during leisure, commuting). The most recent literature has demonstrated that sedentary behavior represents an independent risk factor for adverse health outcomes (overall mortality, cardiovascular disease, type 2 diabetes, colon, endometrial and lung cancer), with different levels of evidence. Multivariate analyses revealed that the specific effect of sedentary behaviour is moderated by the individual level of physical activity or other determinants, in particular, the weight status (23). Overall, the literature supports the statement that "the sedentary behavior is a paradigm in its own right" (24). Furthermore, associations between sedentary behaviors and different health outcomes during early childhood development (under 5 years old) have been reported, including high levels of adiposity, motor and cognitive skill developmental delays, and adverse psychosocial health outcomes (25).

*2.2. Sleep, physical activity and health*

Over the last few years, studies have focused their attention on the length and quality of sleep as a determinant of physical and mental health considered in association with physical activity levels. Recommendations for sleeping are already included in the guidelines for the early childhood, while they will be included in those for the adult/elderly population under revision by WHO. Strong evidences have demonstrated that both regular physical activity and acute bouts of moderate-to-vigorous physical activity have positive effects on sleep in adult population, also among those who suffer from sleep disorders including insomnia and obstructive sleep apnea. Moderate evidence suggests that an increase in physical activity duration (both regular and acute) also produces better sleep quality scores both in males and females, across different age groups, with the exception of the sleep onset latency (defined as the amount of time elapsed between sleep onset and the first episode of REM sleep), which significantly decreases with age (23).

Compelling evidence has suggested that a shorter sleep duration in early childhood (under 5 years old) is associated with higher levels of adiposity, with adverse regulation of emotion and cognitive development; sedentary screen time was found to be associated with worse sleep quality; conversely, active play and levels of moderate-to-vigorous physical activity predicted longer sleep duration and sleep quality (25).

*2.3. Dose, type and distribution of the physical activity*

Some fundamental characteristics can be recognized in the relationship

between physical activity and health for the definition of recommendations, although this relationship may vary based on the type of activity, on the outcomes, and on the population target: the dose-response relationship is curvilinear (not rectilinear) with an initial steep slope, which suggests that the initial increases in the volume of physical activity, moving from 'physical inactivity' to moderate levels of activity below the threshold of current guidelines, correspond to significant decreases in the risk of diseases (in other words, "doing any physical activity is better than doing none"); additionally, there is no higher threshold, although the increase in benefits gradually diminishes; in fact, the risk of damages (trauma and injuries, upper respiratory infections, etc.) increases in those who, for example, do more than two hours of vigorous-intensity physical activity on almost every days of the week (i.e. > 5000 MET minutes per week). The current international and national guidelines suggested that the recommended amount of physical activity for adults and the elderly (defined as 'volume of physical activity', determined by the three components of activity: frequency, duration, and intensity) should be in the range of 500 to 1,000 MET-minutes per week, which can be achieved by doing 150 to 300 minutes of moderate intensity physical activity, or 75 to 150 minutes of vigorous intensity physical activity, or an equivalent combination of both moderate and vigorous activities, each week. The latest international revisions of the national guidelines in various countries (mainly, Australia, USA, Great Britain) have confirmed this paradigm, but they have also highlighted recommendations about potential changes and updates to the current physical activity guidelines based on published international evidence reviews of physical activity, in particular there is now evidence that:

- light physical intensity activity (LPA) may confer substantial benefits (reducing the risk of premature mortality, of the incidence of cardiovascular conditions and of type 2 diabetes (23, 26);

- the duration of any physical activity bouts can be accumulated, even if each bout is less than 10 minutes, as any physical activity bout contributes to the total volume of activity to gain health benefits (23, 26). The minimum bout length was introduced in the previous physical activity guidelines, and it is present in the current WHO guidelines (27);

- physical activity to increase muscle strength in the upper and lower body, and balance training are strongly associated with positive effects on physical and mental health (in particular, anxiety and depression); there is also evidence that one session per week of resistance training may result in meaningful health benefits, in all age groups, and in particular in older adults (26);

- at this stage there is no evidence to determine whether recommendations for physical activity should differ according to sex and ethnicity, although most of the evidence underlying the association between physical activity and health has been derived from studies of male population (26);

- adults with disabilities reported a positive association between physical activity and cardiorespiratory fitness, muscle strength, disease risk prevention, cognitive function, and overall wellbeing (28).

### *2.4 New evidence on health and wellbeing outcomes*

During the last few years, a great deal of new evidence has been accumulated which led to the strengthening of the causal relationships and in particular evidence suggests the protective effect of physical activity on types of cancer other than breast and colon, such as bladder, endometrial, esophagus, kidney, lung and stomach cancer; the benefits on maternal health, such as the prevention of excess gestational weight gain and gestational diabetes, and post-partum

depression; reduced risk of dementia and improvement in the cognitive function in late adulthood and in the elderly; reduced risk of falls and injuries in the elderly; reduced risk of anxiety and depression and reduced symptoms in individuals diagnosed with an anxiety disorder; prevention of weight gain; positive effects during early childhood (3-5 years) in terms of reduced risk of overweight and childhood obesity and bone strengthening; improvement in the quality of life and motor skills with positive effects on daily life (23). Moreover, compelling evidence indicate that a single bout of moderate-to-vigorous physical exercise can have immediate positive effects on blood pressure, insulin sensitivity, sleep quality, cognitive functioning, which may be further improved through a regular exercise regimen (23).

*2.5 Evidence on the risks*

Recent evidence has confirmed that the risks associated with physical activity are low and inversely associated with total volume of physical activity, musculoskeletal injury. Adverse cardiac events are associated with volume of regularly performed vigorous activity, especially in individuals who are unaccustomed to exercise, and who should follow a low-impact exercise regimen (26). None of the revised versions of the recommendations reports the potential risk of addictive behaviors and disorders such as the use of ergogenic aids, the abuse of supplements, or deviant behaviors as exercise addiction and eating disorders associated to an unhealthy compulsive exercise, even at recreational level.

***Key issue 3 – Revision of the physical activity recommendations at the population level***

The scientific evidence on the relationship between physical activity and health has little value if people cannot understand it and translate it into actionable messages, thus this implies translating the health objectives into operational objectives, according to the systematic framework of Behavioral Epidemiology, that is to translate complex research evidence into action through the drafting of new, updated guidelines and recommendations, intervention studies and the development of action plans for their implementation (29, 30). The definition of the Physical Activity Guidelines directed to the whole population is an ongoing process started in the 1970s (31). During the last forty years, communication efforts to disseminate guidelines targeted to the general population and to specific groups (e.g. young people, adults, older adults, people suffering from chronic diseases) were undertaken. The field is experiencing a prolific period, where several leading countries have recently updated their National Physical Activity Guidelines, which reflect the most current scientific evidence: Canada in 2011 and in 2017 (32, 33), Australia in 2012 and in 2017 (34, 35), the United States in 2018 (23), Great Britain in September 2019 (36). In April 2019, the World Health organization issued their first Guidelines on physical activity, sedentary behavior and sleep for children under 5 years of age, responding to the requests by the Commission for Ending Childhood Obesity. The guidelines are based on the revision conducted for the respective Canadian and Australian recommendations (33, 35) and on the so-called '24-hour movement behaviors' guidelines, which recommend the right amounts of physical activity, sedentary time and sleep for a healthy 24-hours (37). With regard to other age groups (5-17; 18-64, and +65 years), after almost 10 years, the World Health organization has just started the revision process of the 'Global Physical Activity Recommendations for Health' whose current version dates back to 2010 (27). On 6 June 2019, the announcement regarding the start of the public consultation by 'Guideline Development Group', an

international panel of 26 experts, was published on the WHO official website. In accordance with the above paragraph on the new paradigms emerging from the recent scientific evidence, the announcement reported that 'Over the last nine years the body of evidence on the health impact of different types, amounts and durations of physical activity as well as on the impact of sedentary behaviors and its interrelationship with levels of physical activity and health has increased significantly. Areas of new evidence include the impact of physical activity on mental wellbeing and cognitive health outcomes, health outcomes in older adults and in children under the age of 5 years. These WHO guidelines will provide recommendations on the amount of time children and adolescents, adults, older adults and special populations such as pregnant women and those living with chronic conditions or disabilities, should be physical active and the maximum recommended daily sedentary time for their health" (38).

***Key issue 4 - Whole-of-system and global approach in the action plans for the promotion of an active lifestyle***

The need to promote and improve the physical activity levels requires a multi-sectoral and integrated approach instead of an individual policy for each stakeholder. Thus, the efforts made by each Nation call for a stronger global, regional and national coordination, along with the need for a change in the paradigm of the entire society with regard to the support and the evaluation of those individuals who are regularly active, based on their capacities and throughout their life. In October 2018, the WHO launched the Global Action Plan on Physical Activity (39), during the 7th Congress of the International Society for Physical Activity and Health (ISPAH) held in London. This 'global' plan aims to reduce physical inactivity in adults and adolescents by 15% in the period 2018-2030, to promote fair and safe access to places and spaces to have healthier lifestyles, and to reduce the prevalence of premature mortality from NCDs by 25%. The Global Action Plan "Let's be active" has 4 strategic objectives (and 20 policy actions) to be reached through the effective implementation of more strategies combined with cross-government and multisectoral approach (Table 1). The plan sets out four objectives and recommends 20 policy actions that are universally applicable to all countries and address the multiple cultural, environmental and individual determinants of inactivity, as described in the Figure 3 (39).

***Key issue 5 – Overlapping areas with other public health goals and sustainable development***

The whole-of-system promotion of Physical Activity is a global priority as it is also an important enabler of sustainable development. For the first time, in the 'Health for all by the years 2000' following the 1978 Alma-Ata Conference strategy endorsed by the Health Assembly of the WHO 1979, it was affirmed the necessity of a 'global' approach on the basis of the relation between public health and development (40). However, only in the last few years, the strategy has been defined within a more structural framework at all levels, under the centralized responsibility of the United Nations and the Governments that signed first the Millennium Development Goals (MDGs) (41) and, in 2015, the Sustainable Development Goals (SDGs) (42). Sustainability, which is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs, is the foundation for the SDGs, and it applies to all human activities, for example to nutrition security (with the Declaration on the right to safe and nutritious Food within the Milan Protocol, signed during the International Exposition 2015), and to food safety (with the proclamation of the first ever World Food

Table 1 - The four strategic objectives of the Global Action Plan on Physical Activity 2018–2030: more active people for a healthier world [WHO, 2018] (39)

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| 1) Create active societies – social norms and attitudes<br>Conduct campaigns to enhance awareness and understanding of the risks associated with sedentary behaviors and on the multiple benefits of regular physical activity, promote opportunities to increase participation in public spaces, ensuring free access to physical activity including all the cultural and socio-economic groups without forgetting the psychological and recreational aspects of sport. |
| 2) Create active environments – spaces and places<br>One of the objectives is to create and maintain environments that safeguard the rights of all people, of all ages, to have equitable access to safe spaces and infrastructures in their cities and communities, in which to engage in regular physical activity, according to ability. This may be ensured by strengthening and integrating urban transport networks to connect the different areas of the city/community promoting, for example, more walking, cycling, and other forms of mobility involving the use of wheels (including bikes, skates and wheelchairs). Priority should be given to actions that reduce risk for the most vulnerable road users in accordance with the safe systems approach to road safety. Where there is no possibility to dedicate enough time to physical activity, workplaces should support physical activity friendly environments, particularly if with a low energy expenditure. |
| 3) Create active people – programs and opportunities<br>Create and promote access to opportunities and programmes, across multiple settings, to help people of all ages and abilities to engage in regular physical activity as individuals, families and communities. Special attention should be paid to guarantee access to physical education programmes that address disparities in physical activity participation by gender, age, disability, culture, religion or other status. Implement initiatives that stimulate engagement by all stakeholders and optimize a combination of policy approaches, across different settings (from urban planning to culture policies), to promote increased participation in physical activity also by the underprivileged groups (women, people of diverse abilities, people of low socioeconomic position) to reduce sedentary behaviours and to heighten awareness of the multiple health benefits of regular physical activity. |
| 4) Create active systems – governance and policy enablers<br>Strengthen governance systems, at national levels, and the international relationships, to implement the legal aid systems and the workforce training. Regular surveillance of the levels of physical activity and of sedentary behaviors should be performed across all ages and social and cultural groups. Attention should be devoted to the research which studies and promotes novel methods to assess and promote physical activity, also through the development and application of new technologies. |

Safety Day, celebrated on 7 June 2019). The Global Action Plan highlights that physical activity will directly contribute to achieving SDG3 (Good health and Wellness), as well as other 9 Goals, as reported and described in Table 2.

## Conclusions

The issue of physical activity and the relation between health and wellbeing is a paradigmatic example with respect to the major current challenges faced by public health. Physical inactivity has been identified as the fourth leading risk factor associated with overall burden of disease for NCDs, which account for 71% deaths worldwide (43). Physical activity is closely and bi-directionally related to development across high-income, middle-income, and low-income countries worldwide. Physical inactivity and sedentary behavior result from the changes across the different domains of experience (automation, motorized transport, technological advances at home and during leisure time). Moreover, they are influenced by individual, psychosocial and environmental determinants which are associated with the cultural, economic,


Figure 3 - Global Action Plan on Physical Activity 2018–2030: more active people for a healthier world. Geneva:World Health Organization; 2018 (39). Licence: CC BY-NC-SA 3.0 IGO.

technological, urban development of the last century, due to their complex 'behavioral' nature. In a bi-directional manner, however, the change in the direction of health is intrinsically connected to solutions that will yield not only benefits to people but also more sustainable lifestyles and therefore a lower environmental impact.

In recent years, there has been an increasing awareness that the achievement of the highest attainable standard of health, wellbeing, and equity worldwide cannot be separated from judicious attention to the human systems - political, economic, and social - that shape the future of humanity and the Earth's natural systems that define the safe environmental limits within which humanity can flourish. This is the idea of 'planetary health' as defined in the final report published in 2014 by the Rockefeller Foundation - Lancet Commission on Planetary Health (44).

In 2015, during the week of the United Nations General Assembly, all

Table 2 - Overlapping areas between the goals of the Global Action Plan on Physical Activity 2018–2030 and 13 of the Sustainable Development Goals [WHO, 2018] (39).

| SDG | Target | Pathway |
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| **2. Zero hunger** | **2.2** End all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons. | Physical activity can contribute to maintining a healthy weight and prevent excess weight gain. |
| **3. Good health and wellbeing** | **3.4** Reduce by one third premature mortality from non-communicable diseases through prevention and treatment.<br>Promote mental health and wellbeing.<br>**3.6** Halve the number of global deaths and injuries from road traffic accidents.<br>**3.8** Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.<br>**3.9** Reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. | Increased participation in physical activity contributes to the prevention and treatment of NCDs in the general population and at-risk individuals, increased rates of physical activity will also reduce overall mortality, promoting wellbeing and mental health for all.<br>Reducing traffic volumes and speeds and improving infrastructure that enables equitable access to safe walking, cycling and use of public transport contributes to a reduction in road traffic accidents while promoting increased physical activity participation.<br>Physical activity is to prevent and treat NCDs.<br>Quality essential health-care services should include physical activity and a quality physical education.<br>Encouraging a shift from car use to walking, cycling and use of public transport contributes to a reduction in emissions and improved air quality, thereby reducing the numbers of deaths and illnesses from air pollution. |
| **4. Quality education** | **4.1** Ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.<br>**4.2** Ensure that all girls and boys have access to quality early childhood development, care and preprimary education so that they are ready for primary education.<br>**4.A** Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all. | Quality physical education and physical activity opportunities in schools contribute to increased physical activity participation. Increased physical activity participation in all girls and boys can lead to greater ability to concentrate and improved cognitive function, thereby resulting in better academic outcomes.<br>Physical activity programmes in schools help all girls and boys develop physical activity and positive attitudes and habits. Together, these assets can contribute to enhancing children's readiness for primary education and enhance their overall enjoyment of physical activity. Education facilities should include safe, inclusive and accessible places (indoors and outdoors) for children to be physically active and reduce sedentary behaviour, to create better learning environments for all. |

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| **5. Gender equality** | **5.1** End all forms of discrimination against all women and girls everywhere. | In most countries there is a gender bias in physical activity participation, with males more likely to be active than females. Increased access and opportunities for physical activity in women and girls across the life course contribute to ending discrimination.<br>Sport can be the vehicle in which to combat ideas and imagery that invite discrimination. |
| **8. Decent work and economic growth** | **8.3** Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation.<br>Encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services..<br>**8.5** Achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value.<br>**8.6** Reduce the proportion of youth not in employment, education or training.<br>**8.9** Devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products. | Increasing participation in physical activity can create new jobs for service and programme providers as well as for those involved in training and professional development services.<br>Job creation can contribute to reducing unemployment by providing opportunities for young people, older adults, and persons with disabilities. National and subnational promotion of walking, cycling and mass participation events, suitable for all ages and abilities, can promote tourism and attract both national and international visitors, thereby strengthening local economies by boosting employment and contributing to economic growth. |
| **9. Industry, innovation and infrastructure** | **9.1** Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, with a focus on affordable and equitable access for all. | Sustainable infrastructure should include walking and cycling networks. Improved walking and cycling networks can contribute to increased physical activity participation. Sustainable infrastructure development can also offer employment opportunities and economic development. |
| **10. Reduced inequalities** | **10.2** Empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.<br>**10.3** Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard. | Physical activity programmes and sports promote values such as fairness and inclusion.<br>By offering opportunities to reduce inequality, sport can be a vehicle to create inclusive societies that are free from discriminatory laws and practices |

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| **11. Sustainable cities and communities** | **11.2** Provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.<br>**11.3** Enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries.<br>**11.6** Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.<br>**11.7** Provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities.<br>**11.A** Support positive economic, social and environmental links between urban, peri-urban and rural areas. | Provide safe, affordable, accessible and sustainable transport systems for all, particularly for those in vulnerable situations. Improved transport infrastructure that contributes to increasing physical activity participation can also improve road safety for all users.<br>Sustainable town planning policies tend to support physical activity, as people are more physically active in dense connected urban areas.<br>Improved transport infrastructure contributes to increased walking, cycling and use of public transport. Increased walking, cycling and public transport use leads to reduced automobile use and therefore fewer emissions. Achieving universal and safe access to open green and public spaces facilitates increased use of these spaces for physical activity, which can also generate more demand and preservation of existing spaces. Urban development increases participation in physical activity, particularly through the use of compact local neighbourhood design which increases walking and cycling. |
| **12. Responsible consumption and uction** | **12.8** Ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyle in harmony with nature.<br>**12.C** Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities. | Sustainable development and lifestyles must be prioritized. Increased rates of walking and cycling can contribute to the sustainability and preservation of nature through reduced automobile use and heightened awareness of the environmental impact of individuals. |

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| **13. Climate action** | **13.1** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.<br>**13.2** Integrate climate change measures into national policies, strategies and planning. | Land use and transport policy, combined with fiscal, environmental and educational interventions that support walking, cycling and use of public transport can contribute to less automobile use for transport.<br>Reduced automobile use and increased walking and cycling can contribute to less use of fossil fuels and the consequent emissions, thereby helping to mitigate climate change. |
| **15. Life on land** | **15.1** Ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems.<br>**15.5** Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.<br>. | Increased physical activity participation in natural environments encourages sustainable use, appreciation, conservation and restoration of land, and biodiversity and helps protect/prevent the extinction of threatened species. |
| **16. Peace, justice and strong institutions** | **16.1** Significantly reduce all forms of violence and related death rates everywhere.<br>**16.B** Promote and enforce non-discriminatory laws and policies for sustainable development. | Walking and cycling within and outside of a community setting nurtures positive social values such as inclusion, cooperation and communion, uniting people of different age, gender, socioeconomic status, nationality and political beliefs. An increased sense of community through physical activity can help reduce violence, conflicts, corruption and bribery, while promoting non-discriminatory laws and policies. Increased surveillance through physical activity can therefore contribute to reduction of violence (and related deaths). |
| **17. Partnerships for the goals** | **17.6** Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries. | Working together to implement effective national population-based approaches that promote physical activity can demonstrate and strengthen partnerships between all stakeholders. |

countries committed to invest in health by endorsing the Sustainable Development Goals "Transforming our world: the 2030 Agenda for Sustainable Development" (known as 'Agenda 2030'), to ensure the universal health coverage and to prevent health disparities. The action plan, aimed at increasing levels of physical activity across people of all ages and abilities, is consistent with the concept of health as a universal right and an essential resource in the everyday life, not only to reduce the risk of disease and disability. Moreover, the multiple benefits resulting from an increase in the physical activity levels across the population, for example regular walking, cycling, physical aactivity and recreational sport, are connected and will contribute to the achievement of the goals, of the political priorities, and of the general objectives of the Agenda 2030 (45). The Global Action Plan for Physical Activity, endorsed in 2018 by the World Health Organization, whose name implies the planetary health

goal ('more active people for a healthier world'), tackles physical activity with a 'global' and 'whole-of-system' approach for effective promotion of physical activity at the national and sub-national level (39). The achievement of the target levels of physical activity across more socially disadvantaged groups (such as women, people with disabilities, people of low socioeconomic status) represents one of the most important challenges. It is an excellent example of application of scientific evidence, not only about the factor-health relationship, but also with respect to the effectiveness of programs and interventions, which involves all the stakeholders, from the recipients to the policy makers. However, the Global Action Plan for Physical Activity makes no references to the potential risks associated with physical activity, both intrinsic to exercise and sports (mainly mechanical injuries and cardiovascular disease), environmental (e.g., exposure to environmental pollutants, mainly atmospheric pollutants), behavioral (use of ergogenic drugs and doping), and psycho-social (e.g., exercise addiction) risks. In Italy, the health protection in sports has been addressed by national legislation and physical activity and sports have been included in the Minister of Health's duties, the Essential Level of Assistance, pursuant to the Italian Law dated 12 January 2017 (46). This important goal at the national level, was reached following the publication of The Erice Charter, a document unanimously approved at the conclusion of the 47th Residential Course "Adapted Physical Activity in Sport, Wellness and Fitness: New Challenges for Prevention and Health Promotion", held on 20-24 April 2015 in Erice, Italy, at the "Ettore Majorana" Foundation and Centre for Scientific Culture, and promoted by the International School of Epidemiology and Preventive Medicine "G. D'Alessandro" and the Study Group on Movement Sciences for Health of the Italian Society of Hygiene, Preventive Medicine and Public Health (47).

From the scientific point of view, some open questions remain, such as the consolidation of knowledge regarding the independent sedentary behavior and physical inactivity, the benefits of light physical activity, the effects of exercise aimed at increasing muscle strength and flexibility on diseases prevention, the effects of the interventions of physical activity promotion for the early years (0-4 years), the effects of physical activity by gender and race, the use of the new technologies for epidemiological monitoring and surveillance, and for the achievement of pervasive and inclusive interventions and, finally, the assessment of the final effect of the accomplishment of the global action plan on sustainable development. These issues define the further direction of the research in this field.

In conclusion, physical activity is a key element for human and planetary health, confirming the studies by the first epidemiologists who defined it 'the best buy for public health'. The accumulated evidence over the last 70 years have highlighted its complexity and the need for the development of multiple scientific contents and research methods, designed for and aimed at different sectors – technical-sports, biomedical, educational, psycho-social, economic, urban, managerial. Therefore, it may represent a field of study of great potential for its inherent complex, multi- and cross-sectoral approach which underlies the health promotion and the intrinsic adherence to its most important principles (sustainability, equity, universality).

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educazione coordinato dai dipartimenti di prevenzione del SSN").
Additional documents and the Italian version is available at: www.sitinazionale.it/BDS/muoversi and/or at link www.progettodoping.it

## Riassunto


### *L'attività fisica quale elemento chiave della promozione della salute su scala locale e globale: evidenze e prospettive*

L'inattività fisica costituisce uno dei quattro fattori a più forte impatto epidemiologico sulla salute mondiale, come stimato dalle misure epidemiologiche utilizzate in sistemi di sorveglianza globale, tra i quali il *Global Burden of Diseases*. L'evidenza scientifica accumulata negli ultimi decenni ha consentito di chiarire le relazioni di causalità e definire modalità di intervento efficaci, a partire dalla stesura di raccomandazioni di livello nazionale e internazionale fino alla programmazione di azioni sistemiche e integrate. Negli ultimi anni nuovi paradigmi sono stati delineati, come la distinzione tra inattività fisica e comportamento sedentario, le modalità diverse di raggiungere una dose di attività fisica efficace per la salute, la necessità di considerare anche il sonno nella scansione quotidiana delle attività. L'esperienza nella realizzazione di interventi e nella loro valutazione ha condotto alla definizione di un approccio sistemico e globale nei piani di azione per la promozione dello stile di vita attivo, in particolare al lancio del *Global Action Plan on Physical Activity* 2018 – 2030 da parte dell'Organizzazione Mondiale della Salute, con l'individuazione di aree di sovrapposizione con altri obiettivi di salute pubblica e la connessione con gli obiettivi di sviluppo sostenibile previsti dall'Agenda 2030 per lo Sviluppo Sostenibile. In questa prospettiva, le azioni in campo sono mirate a mettere in grado le persone di essere fisicamente attive nella loro vita quotidiana, a ridurre le disuguaglianze di salute (con particolare riferimento ai gruppi più svantaggiati, come le donne, persone con disabilità, strati della popolazione a più basso livello socioeconomico) e a migliorare la salute planetaria.


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Corresponding author: Maria Scatigna, Department of Life, Health and Environmental Sciences, University of L'Aquila, Piazzale Salvatore Tommasi 1, 67100 L'Aquila, fraz. Coppito, Italy
e-mail maria.scatigna@cc.univaq.it