



ROYAL  
COLLEGE OF  
PHYSICIANS  
OF IRELAND

# PHYSICAL ACTIVITY: A PRESCRIPTION FOR A WONDER DRUG

## THE EVIDENCE

Policy Group on Physical Activity  
September 2016



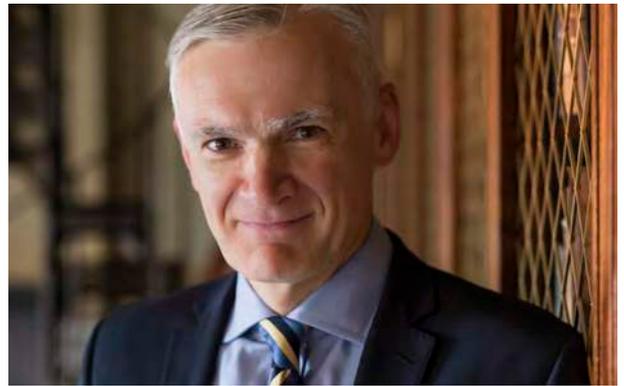
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# INTRODUCTION

Chronic diseases are major drivers of healthcare costs. Of our total healthcare costs 90 percent is spent on the 30 percent of the population with chronic diseases. Many of these diseases are caused or worsened by risk factors such as tobacco use, overweight and obesity, alcohol consumption and physical inactivity.<sup>1</sup>

The Royal College of Physicians of Ireland (RCPI), recognises that many of the determinants of ill-health lie outside of the healthcare system, and has a longstanding record of leadership in the area of public health policy.

RCPI convenes policy groups comprised of members, fellows and trainees from a range of medical specialities within RCPI, representatives from other medical and healthcare professions, and relevant advocacy organisations. These groups review evidence and develop recommendations to prevent illness and to promote wellbeing amongst the public.

In 2015, a Policy Group on Physical Activity was established to discuss the preventative and treatment role of physical activity, to promote the positive health impact of regular physical activity and to advocate for national policy measures to increase physical activity levels.

## **Policy context**

In drafting this policy statement, the policy group sought to develop and place its recommendations in the context of relevant national and international policy. The 2016 National Physical Activity Plan<sup>2</sup>, which arises from the Healthy Ireland Framework<sup>3</sup> is an important reference. Other national policies of note include the Smarter Travel Framework<sup>4</sup> and the National Cycle Policy Framework<sup>5</sup>.

The topic of physical activity has also been on the agenda of the medical profession in the UK. The Academy of Medical Royal Colleges<sup>6</sup>, the Royal College of Physicians London<sup>7</sup> and Public Health England<sup>8</sup> have published comprehensive policy documents in recent years and the National Institute for Health and Care Excellence (NICE) has also published extensive guidance on physical activity; both within the health sectors and in other areas.

The Irish National Physical Activity Plan is broadly aligned with International Policies such as the World Health Organisation Physical Activity Strategy for the European Region<sup>9</sup>, and the 'Toronto Charter for Physical Activity: A global call for action'<sup>10</sup>

## **Royal College of Physicians of Ireland**

RCPI has published recommendations on obesity; 'The Race We Don't Want to Win' in 2014 and an 'Expert Report on Clinical management and Treatment of Obesity' in 2015. Physical activity recommendations from these include: a built environment that encourages exercise, play and active travel; integration of physical activity into the education setting from pre-school years; and for health professionals to encourage women to be active during pregnancy.

While acknowledging the importance of physical activity in weight management, this policy statement on physical activity aims to emphasise the broad benefits of physical activity over and above that of weight loss.

# THE EVIDENCE

## HEALTH BENEFITS

Physical inactivity has been identified as the fourth leading risk factor for global mortality. In Ireland it is responsible for 8.8 percent of the disease burden from coronary heart disease; 10.9 percent of type 2 diabetes; 15.2 percent of breast cancers and 15.7 percent of colon cancers.<sup>12</sup>

Despite evidence that health improvements resulting from physical activity are greater than for many drugs it has traditionally been neglected as a therapeutic intervention in favour of pharmacotherapy.<sup>6 13</sup>

Even small increases in physical activity can extend life<sup>14 15</sup>, or result in improvements to health.<sup>16 17 18</sup> Regular physical activity has been shown to reduce all-cause mortality by up to 30 percent<sup>19</sup> and even greater levels of physical activity result in greater benefits. It can reduce the risk of developing many chronic conditions such as cardiovascular diseases, stroke, diabetes and certain malignancies such as colon and breast cancer.<sup>19 21</sup> Some reports estimate that a move to active travel alone across a population could reduce heart disease by 10 percent.<sup>6</sup>

Several systematic reviews have found risk reductions of 25 to 50 percent or more in many major chronic diseases for those engaged in 150 minutes of moderate to vigorous physical activity per week.<sup>22 23 24 21 25</sup>

Physical activity plays a role in management and secondary prevention<sup>b</sup> of many chronic diseases such as COPD, heart disease, hypertension, high cholesterol, obesity, depression, peripheral vascular disease, diabetes, osteoarthritis, chronic pain, fibromyalgia, cancer and dementia.<sup>19 26</sup>

*Table 1: Long term benefits -evidence of reduction of risk of common conditions (primary prevention) adapted from<sup>19</sup>*

Condition	Reduction in chance of developing condition by engaging in physical activity
<b>All-Cause Mortality</b>	30 percent risk reduction comparing most with least active.
<b>Heart Disease, Stroke, Cardiovascular Disease</b>	Studies vary as to the magnitude of the risk reduction, but there is consistent evidence which shows that being more physically active reduces your risk of developing CVD, Heart Disease and Stroke.
<b>Type 2 Diabetes</b>	Consistent evidence that being more physically active reduces your risk of developing Type 2 diabetes.
<b>Breast Cancer, Colon Cancer</b>	Risk of disease decreases with increasing amounts of physical activity.
<b>Depression</b>	20-30 percent lower risk of depression.
<b>Dementia</b>	20-30 percent lower risk of dementia
<b>Falls in elderly</b>	30 percent lower risk of falls
<b>Hip Fractures</b>	36-68 percent reduced risk of hip fracture

<sup>b</sup>Reducing impact

**Sedentary time**

Daily hours spent being sedentary increase the risk of diabetes, cardiovascular disease, some cancers and premature mortality.<sup>27 28 29 30 31 32 33</sup>

High levels of physical activity (60-75 minutes per day moderate intensity physical activity) seem to eliminate an increased mortality risk associated with high sitting time (> 8hrs per day). Lower levels of physical activity reduce this risk, but do not eliminate it.<sup>34</sup>

**“Screen Time”<sup>c</sup>**

Prolonged<sup>d</sup> television viewing (more than three hours daily) is associated with increased risk of type 2 diabetes, cardiovascular disease and all-cause mortality.<sup>35</sup>

These associations may, however, be lessened or eliminated in people who undertake regular moderate to vigorous physical activity. However, for those viewing TV for more than five hours a day, high physical activity lessens but does not eliminate the risk.<sup>34</sup>

Screen-based sedentary behaviour is associated with a range of negative health effects in children and adolescents, including physical fitness, blood pressure, social behavioural problems, self-esteem<sup>32</sup>, sleep problems, musculoskeletal pain and depression.<sup>37 32</sup> A recent Irish study found an association between ‘screen time’ and overweight and obesity in Irish children<sup>38</sup>, although overall evidence in this area is inconsistent.<sup>39</sup>

**Older people**

Exercise is an important means of reducing disability and increasing the likelihood of people living independently in older age.<sup>40</sup> Active mid-life and older individuals have a 30 percent lower risk of moderate or severe functional limitations or role limitations compared with inactive counterparts.<sup>19</sup>

One of the main benefits of exercise in older people is fall prevention. Of people over 65 years old, 35 percent fall each year. This increases to 50 percent in those aged 80 years and over. Physical activity programmes for older people that focus on balance training, coordination and muscle strengthening can reduce the risk of falls by 30-50 percent.<sup>41 42 43</sup>

Some research has shown that older people who walk outdoors at least four times weekly for at least 15 minutes per walk may have a three-year increase in life expectancy, compared to those who are less active.<sup>44</sup>

A 2016 report from The Irish Longitudinal Study on Ageing (TILDA) found that middle aged and older adults with high levels of physical activity reported greater participation in social activities, better self-rated health, better quality of life and lower loneliness scores compared to those with low physical activity levels. It found that people who exercise regularly have better mental health profiles and suffer less from depression.<sup>41</sup>

Regular physical activity has been shown to improve cognitive function and reverse brain atrophy, reducing the risk of dementia and Alzheimer’s disease and delaying its progression.<sup>45 46</sup>

**Children**

Exercise promotes wellbeing and resilience in childhood, helping young people to cope with the stresses and challenges of life.<sup>6</sup> Being active plays an important role in brain development in early childhood and there is some emerging evidence that supports a positive association between physical activity and academic performance.<sup>47 48</sup>

Declining physical activity levels are recognised as a major contributor to the obesity epidemic. Among Irish children 1 in 4 are overweight or obese and therefore at risk of developing diabetes, respiratory, cardiovascular and orthopaedic problems as well as social isolation and psychological effects.<sup>49 50</sup>

<sup>c</sup> This refers to time spent using a device such as a computer, television or a games console.

<sup>d</sup> Risk of type 2 diabetes and cardiovascular disease with TV watching has been shown to be linear, but risk of all-cause mortality increased with TV duration of more than 3 hours per day.

### Pregnancy

Exercise in pregnancy has been proven to be safe for mother and baby with benefits to both, in women with uncomplicated pregnancies.<sup>51 52 53 54 55 56 57 58</sup>

However, both self-reported and objectively-measured physical activity have been shown to decline during pregnancy.<sup>59 60</sup>

Benefits to mother include improved fitness<sup>61</sup> and prevention of: excessive weight gain<sup>62</sup>; obesity and weight retention<sup>63</sup>; gestational diabetes and its adverse effects<sup>64 65</sup>; hypertension<sup>66 62</sup>; maternal depression<sup>67</sup>; and reduction in caesarean section rates<sup>62 68</sup>. Maternal exercise has been associated with appropriate foetal weight gain<sup>69</sup>, prevention of macrosomia<sup>e</sup><sup>66</sup> and prevention of chronic disease development in the offspring.<sup>70</sup>

### Overweight and obesity

There is a consistent effect of aerobic physical activity on achieving weight maintenance.<sup>19</sup> However, physical activity offers significant health benefits that are independent and in addition to those achieved from weight loss.

### Disability

Irish data indicates that people with a disability who are more physically active are more likely to report a good quality of life, visit their doctor less and have fewer medical complications and hospitalisations than those with disabilities who are sedentary.<sup>71</sup>

### Mental health

People with severe mental illness die 15 to 20 years earlier than the rest of the population.<sup>72 73</sup> Exercise has been shown to be of benefit in both the prevention and treatment of mental illness as well as improving physical outcomes in this population.<sup>74</sup> There is evidence that physical activity prevents depression<sup>75</sup> and improves symptoms of depression, schizophrenia and ADHD.<sup>f 76 77 78 79</sup>

Table 2: Evidence of Improvement in health for those with chronic conditions (secondary and tertiary prevention). (Adapted from <sup>6</sup>)

Condition	Improvement with physical activity
<b>COPD</b>	Physical Activity improves Cardiorespiratory Health
<b>Heart Disease/Heart Failure/Angina</b>	All studies show clear improvement in cardiovascular health with moderate exercise.
<b>Hypertension</b>	Initiation of regular physical activity in hypertensives can lead to a sustained reduction in blood pressure by an average of 6.9 mmHg
<b>Cholesterol</b>	There is clear evidence that exercise leads to lowered cholesterol or improvements in lipid profile.
<b>Obesity</b>	Moderate effect in reducing obesity and has a consistent effect on maintaining a healthy body weight.
<b>Depression</b>	Consistent evidence showing beneficial effects of exercise in management of depression.
<b>Peripheral Vascular Disease</b>	Exercise leads to a moderate improvement in peripheral vascular disease.
<b>Diabetes</b>	Statistically and clinically significant beneficial effect on glycaemic control and the metabolic state-particularly for Type 2 diabetes.
<b>Osteoarthritis</b>	Improves symptoms of osteoarthritis including pain relief.
<b>Dementia</b>	Improves cognitive function and consistently reverses brain atrophy.
<b>Cancer</b>	Exercise helps with side effects of treatment, improves mood, fatigue and stamina.
<b>Other conditions</b>	There is evidence to support benefit of physical activity in a range of other conditions including chronic pain, fatigue, and fibromyalgia.

<sup>e</sup> New-born whose weight is significantly larger than normal

<sup>f</sup> Attention Deficit Hyperactivity Disorder

**Inequalities**

There is growing evidence that physical activity is a 'major causative physical link' between ill health and social inequality.<sup>80</sup>

**Environment**

Physical activity can have a positive environmental impact. Provision of active transport options and increased access to green spaces can reduce urban pollution and greenhouse gas emissions.<sup>81</sup> In addition to the threat of climate change, air pollution from petrol and cars has been linked to cancer, asthma, stroke and heart disease, diabetes, obesity, and changes linked to dementia.<sup>82</sup>

As levels of active travel increase, rates of road traffic injuries have been observed to decline, according to figures from the UK, the Netherlands, and Denmark.<sup>83</sup> Increased levels of active travel can reduce noise levels, which at prolonged or excessive exposure has been found to cause hypertension; increased cardiovascular risk; increased risk of stroke among elderly people; and a negative effect on children's ability to study and learn.<sup>83</sup>

**Economic benefits**

There are significant economic benefits to increasing physical activity at a population level. In Ireland, inactivity may cost up to €1.5bn per year.<sup>84</sup>

Employers and by extension, the economy, can benefit from a workforce that is more physically active and in better physical and mental health, with lowered absence rates due to ill-health and greater productivity. In 2011 in Ireland, over half a million working days (595,951) were lost due to specific work-related illness.<sup>85</sup> Data from the UK indicates that mental health problems are also found to cause significant productivity loss, often in the form of 'presenteeism'<sup>86</sup>.

UK data shows that people who do not participate in sports have 80,000 more hospital in-patient visits a year. It is estimated that that if everyone did 12 minutes more activity a day, savings of £6bn could be made to the NHS, to welfare and in loss of earnings for mental health issues. There is also evidence that a 20 percent increase in cycling would save £107m in reducing premature deaths, £52m in lowered NHS costs and £87m as a result of reduced absenteeism.<sup>87</sup> To put this into context, the direct and indirect costs of inactivity in the UK are estimated to be £20bn a year.<sup>88</sup>

There are other economic advantages associated with active travel. In 2011, research carried out in London town centres showed walkers spent £147 more per month than those travelling by car.<sup>89</sup> Similar trends have been observed in other cities.<sup>90</sup>

**Other Benefits**

In addition to a positive impact on productivity and healthy-life years, engaging in physical activity can increase social cohesiveness and quality of life. Engaging in physical activity and active travel can help to create social networks, increase social capital, reduce isolation and strengthen communities by encouraging social interactions with neighbours and the community.<sup>83</sup>

<sup>8</sup> Attending work while in sub-optimal health

## LEVELS OF PHYSICAL ACTIVITY IN IRELAND

### Children

The Department of Health and Children recommends that all children and young people (aged 2-18) should be active at a moderate to vigorous level, for at least 60 minutes every day.<sup>h</sup> This should include muscle-strengthening, flexibility and bone-strengthening exercises three times a week. However only a minority of primary and post-primary school children meet these guidelines.

Among 9-year-olds, only 1 in 4 meet the recommendation of 60 minutes per day.<sup>49</sup> Only 19 percent of primary and 12 percent of post-primary school children engage in the recommended daily amount of physical activity.<sup>91</sup>

Levels of physical activity decrease with age. Girls in particular show a significant decrease in physical activity as they get older. Among 11-year-old girls, 31 percent were meeting the recommended 60 minutes compared with only 9 percent of 15-year-old girls. There is a drop-off also for boys; from 45 percent at 11 years old to 25 percent at 15 years old.<sup>92</sup>

Research indicates that television viewing<sup>i</sup> among Irish children is lower than international averages. However, with 42 percent of girls and 46 percent of boys aged 11 watching 2 or more hours of TV daily, and combined with time spent playing computer games (31 percent of 11-year-olds play computer games for more than 2 hours daily) it represents a significant period of time engaged in what is usually a sedentary behaviour.<sup>92</sup>

In 2011, 6 out of 10 children were driven to primary school. This has increased annually since 1981 while the number walking and cycling has decreased. In 2011, only 1 in 4 primary school children walked to school, less than 1 in 4 secondary school students walked and only 2 percent of secondary school students cycled.<sup>93</sup>

There are no current Irish guidelines on sedentary behaviour or screen time. Canadian guidelines recommend limiting recreational screen time to no more than two hours per day for children and youth over 5 years, and no screen time for under twos.<sup>94 95</sup>

### Physical Education

The Department of Education recommends a minimum of 60 minutes of physical education weekly at primary and 120 minutes weekly at post-primary level.<sup>96 97</sup>

Based on that recommended minimum, in both absolute and proportionate terms, Ireland lags behind other European countries. At primary level, Ireland has fewer hours of recommended PE than any other European country, with the teaching time earmarked for PE in a school year at just 37 hours in Ireland, while at the top of the scale, it was 108 hours in France.<sup>98</sup>

In 2009, only 35 percent of primary pupils and 10 percent of post primary pupils received the Department of Education recommended minimum minutes of physical education per week, with less girls than boys receiving the recommended minimum.<sup>91</sup>

<sup>h</sup> This is also the WHO recommendation

<sup>i</sup> Watching television, videos (including YouTube or similar services), DVDs and other screen entertainments (not including computer games)

Table 3: National Physical Activity Guidelines for Ireland.<sup>99</sup>

Group	Guideline <sup>i</sup>	Examples
<b>Children and Young People (2-18 years)</b>	At least 60 minutes of moderate to vigorous activity every day; Muscle strengthening, flexibility and bone strengthening exercises 3 times a week	Aerobic- moderate intensity: Bike riding, hiking, PE class, skateboarding, roller blading, brisk walking Aerobic –Vigorous: Running and chasing games; martial arts; sports- gaelic football, soccer, swimming and tennis Muscle strengthening: Games like tug-of-war, rope climbing, climbing walls, resistance exercise Bone strengthening: Hopping skipping jumping; running; sports- gymnastics, basketball, tennis.
<b>Adults</b>	At least 30 minutes a day of moderate activity on 5 days a week (or 150 minutes a week). Or 75 minutes of vigorous activity  (You can count shorter bouts of activity lasting for at least 10 minutes)	Aerobic- moderate intensity: Brisk walking; gardening, medium paced swimming, cycling less than 10 miles per hour, ballroom dancing, doubles tennis. Aerobic –Vigorous: Jogging or running a mile in 10 mins; active sports- football soccer, squash, aerobics; circuit training, fast cycling, tennis, dancing, heavy gardening, hill walking with backpack Muscle strengthening: digging lifting and carrying while gardening; circuit training, step aerobics; carrying groceries; exercises with exercise bands, weights Bone strengthening: Tai Chi and yoga, standing on one foot; backwards and sideways walking, walking on heels and toes.
<b>Older Adults (&gt;64 years)</b>	At least 30 minutes a day of moderate intensity activity on five days a week, or 150 minutes a week. Focus on aerobic activity, muscle-strengthening and balance.	Same as for adults
<b>Adults with disabilities</b>	Be as active as your ability allows. Aim to meet adult guidelines of at least 30 minutes of moderate-intensity activity on 5 days a week.	Choose activities appropriate to your ability- see list above under 'adults'

<sup>i</sup> Moderate- Increased breathing and heart rate, but still able to carry on a conversation. Warm or sweating slightly, comfortable pace. Vigorous- Breathing heavily, cannot keep a conversation going, faster heart rate and sweating, concentrating hard.

**Adults (aged 18 or over)**

The Department of Health guidelines for adults recommend at least 30 minutes of moderate activity on five days a week or 150 minutes a week (table 3).<sup>99</sup>

The 2015 Healthy Ireland Survey reported that just under a third (32 percent) of the adult population can be considered to be highly active<sup>k</sup>, with only a quarter of women (24 percent) compared to 40 percent of men in the highly active category. This indicates an apparent increase in the proportion of the adult population who are highly active since 2007. The 2007 SLÁN survey found that 24 percent of respondents were highly physically active, and 29 percent had a low physical activity score.<sup>100</sup>

The 2015 Healthy Ireland survey also showed that Irish people spend an average of 5.3 hours sitting each weekday and women aged 15-24 spend longer sitting than any other group (6.7 hours).<sup>101</sup>

The most common reason given by respondents who reported low levels of physical activity was having 'no time'. This was true across all social classes, gender and age groups with the exception of those aged 65 and over who pointed to 'injury/disability/ medical condition' as the main reason for physical inactivity. In total 18 percent of respondents cited ill-health as their main reason for inactivity.

According to mid-year results published by the Irish Sports Monitor, in 2015, two thirds of Irish adults (over 16 years) did not meet the national physical activity guidelines and more than 1 in 10 adults were classified as sedentary. In 2015, the most popular form of sporting activity among Irish people was personal exercise (predominantly gym-based activities - 12.2 percent). In terms of other forms of physical activity (recreational walking, and walking or cycling for transport), recreational walking was most popular (67.2 percent), followed by walking for transport (44.9 percent) and cycling for transport (12.6 percent).<sup>102</sup>

A majority of the working population travel to work by car. In 2011, 2 out of every 3 commuters drove to work while only 10.5 percent walked and 2.4 percent cycled. The average commuting time was just less than half an hour, with 1 in 10 people commuting for more than 1 hour. Between 2006 and 2011, there was a 9.6 per cent jump in the number of persons cycling, rising from 36,306 to 39,803. However, close to 20,000 fewer persons cycled to work in 2011 compared with 1986, when the number of cyclists was at its peak. The share of commuters cycling to work was 2.4 percent at the last census, as opposed to 7.2 per cent recorded in 1986.<sup>93</sup> Distances travelled between home and work often preclude active travel alone as a reasonable choice.<sup>83</sup>

**Older people**

For older people, the Department of Health guidelines are the same as for younger adults. Guidelines are 150 minutes of moderate physical activity weekly, or 75 minutes of vigorous physical activity. Levels of physical activity decline with age. In Ireland only 18 percent of the participants over 75 years in the Irish Longitudinal Study on Ageing (TILDA) achieved recommended levels of physical activity compared to 37 percent in participants 60-64 years, with women less likely than men to be sufficiently active.<sup>41</sup>

**People with intellectual & physical disability**

Analysis of the SLÁN data published in 2006 found that levels of physical inactivity were high among those with disabilities. Of those with a disability, 35 percent were inactive, compared to 10 percent of those with no disability.<sup>71</sup>

<sup>k</sup> Those categorised as highly active are meeting minimum physical activity requirements

**People with mental illness**

There is little Irish research on levels of physical activity in people with mental illness, but international data indicates low levels of physical activity in patients with severe mental illness.<sup>103</sup>

**Pregnancy**

An Irish study has shown that women decrease physical activity levels significantly in the third trimester and that most women do not meet the recommended levels either prior to becoming pregnant or during pregnancy.<sup>59</sup>

**Socioeconomic status**

Evidence documented by the World Health Organisation shows a direct link between socioeconomic status and participation in leisure-time physical activity, with poorer people having less free time, poorer access to leisure facilities and living in environments that are not conducive to physical activity.<sup>11</sup>

Analysis of clustering of health behaviours in Ireland found that social classes groups SC 1-2 accounted for a disproportionate share of those in the physically inactive cluster, with SC 1-2<sup>1</sup> the least likely of social classes to fall into this cluster and SC 5-6 the most likely of the social classes to be in this cluster.<sup>104</sup>

The 2007 SLÁN survey found that 30 percent of those in SC 5-6 reported low levels of physical activity, compared with 23 percent in SC 1-2.

There was little difference in physical activity levels between the social classes for those reporting high levels of physical activity (27 percent in SC1-2 compared with 25 percent in SC 5-6).<sup>100</sup> This was supported by data from the 2015 Healthy Ireland survey.<sup>101</sup>

Results from TILDA have shown an association between socio-economic status and exercise. In the lowest wealth quartile, 40 percent reported low levels of physical activity compared to 25 percent in the highest wealth quartile.<sup>105</sup>

**How active are the health professionals themselves?**

In 2016 RCPI has commenced a research project looking at knowledge and attitudes to physical activity within the medical profession. The project will also look at levels of physical activity.

<sup>1</sup> Social classes: SC1-Professional workers, SC2-Managerial and technical, SC3-Non-manual, SC4-Skilled manual, SC5-Semi-skilled, SC6-Unskilled, SC7-All others gainfully occupied and unknown

## WHAT WORKS

In development of this policy statement, the policy group considered a number of systematic reviews, other studies, reports and public health guidance on effective actions to increase physical activity and reduce sedentary time. This section presents a high level description of these actions.

### **Environment**

There is a wealth of research to show that the built and natural environment can encourage or inhibit physical activity across the life course.<sup>106 107</sup> Walkability, traffic speed and volume, land use mix, residential density and access or proximity to recreation facilities are connected with levels of physical activity in children, while there is a consistent connection between physical activity in adults and recreation facilities and locations, transportation environments and aesthetics.<sup>108 109</sup> In one recent study, participants living in the most activity-friendly neighbourhoods engaged in between 68-89 minutes more physical activity per week than those in the least activity-friendly neighbourhoods.<sup>110</sup>

### **Building physical activity into daily routines**

Lack of time is often given as a reason for low physical activity levels.<sup>100</sup> There are many small opportunities in the day to make physical activity a part of daily life, for example, changing routines at home that lead to less sitting time, and including more walking in the daily routine.

### **Walking and cycling**

Road safety initiatives that increase the use of streets by pedestrians and cyclists include: introduction of traffic-calming measures; better facilities for walking and cycling; urban design sensitive to the needs of non-motorists; restrictions on use of motor vehicles; traffic education; and strict enforcement of traffic regulations.<sup>106</sup> Such initiatives may help to address children and parents' fear of traffic.<sup>106</sup> Greater use of active transport options can also result in both population health benefits and environmental benefits.

Interventions that improve walking and cycling infrastructure have been shown to be cost effective.<sup>109</sup>

There is also some evidence that financial incentives to promote active travel may be effective.<sup>111</sup>

Pedometers have been found to be effective in increasing walking in adults, in the school population and in the workplace. There is also evidence for cost-effectiveness of use of pedometers to increase physical activity levels.<sup>112</sup>

### **Older people**

Older people in particular may find it difficult to be physically active. A 2015 report summarised barriers to physical activity for older adults in Ireland. These included health barriers and psychological barriers such as fear of falling, crime and self-perception<sup>m</sup>. Other barriers included socio-economic status, gender<sup>n</sup>, (increasing) age, lack of time and weak sense of community or social support. Environmental barriers included lack of facilities, an uncondusive neighbourhood, lack of walking spaces and weather conditions. Factors that encouraged physical activity included (younger) age, gender, self-efficacy<sup>o</sup> and environmental factors.<sup>113</sup>

For older adults, social interaction is a strong facilitator of walking for travel or leisure.<sup>112</sup>

For health professionals changing the conversation with older patients may involve focusing on reducing sedentary behaviour and advising patients on how to accumulate time spent in light activity. Examples of these light activities include: getting up from the chair and moving during ad breaks on television; pacing while on the phone; adding gentle five minute breaks during the day; and walking rather than driving for short trips.<sup>114</sup>

<sup>m</sup> For example the idea that as an older person, being physically active is an unattainable goal.

<sup>n</sup> Women report lower levels of physical activity across all ages

<sup>o</sup> The belief in one's own ability to successfully accomplish a task

Whilst numbers of fall-induced injuries have increased considerably in the past five decades with the growing older population, this increase has plateaued and started to decrease in countries such as Finland where the government has pioneered policies to enhance physical activity.<sup>115</sup>

### **Schools**

School-based physical activity interventions have been found to have a positive impact on duration of moderate to vigorous physical activity, television viewing, and improved respiratory function. There is also (limited) evidence to suggest that school-based interventions are effective in increasing the proportion of children who engage in physical activity during school hours.<sup>116</sup> Interventions that involve both the school and family are effective.<sup>117</sup>

School based interventions based outside of physical education lessons can lead to moderate to large increases in physical activity in adolescent girls.<sup>117</sup>

Initiatives such as the Active School Flag<sup>p</sup> and the Green Schools Initiative<sup>q</sup> demonstrate the potential of whole of school approaches to increase physical activity levels in schools.

The location of schools near residential areas supports active commuting. There is a negative association between distance from home to school and physical activity in young people.<sup>109</sup> School influence over cycling policy and storage facilities has been identified as a barrier to active travel for school children.<sup>118</sup>

### **Children**

Some barriers to physical activity for younger children include an emphasis on team sports and limited opportunities for extra-curricular activity at primary school level. Other barriers which have been noted in studies include gender<sup>r</sup>; financial cost, personal safety; time; and culturally specific barriers. Key facilitators include enjoyment; the positive attitude of parents; and the age of the child.<sup>118</sup>

Key barriers for adolescent girls include social pressure to conform, negative experiences of the school environment, having to perform (display competence) in public and in front of peers and being forced to compete with others. Key facilitators were social and family influences, enjoyment and socialisation, intrinsic and extrinsic rewards and demonstrating competence.<sup>118</sup>

Family social support has been identified as a positive connection to physical activity in children and adolescents<sup>108</sup> and there are some studies indicating that children of parents who are physically active are more likely to be active themselves.<sup>119 120</sup>

<sup>p</sup> An Active School is a school that strives to achieve a physically educated and physically active school community. To achieve the Active School Flag schools must begin by self-evaluating their current provision across PE, Physical Activity and Partnerships. They must then plan and implement improvements across all three areas that will have a real and tangible impact on their school community.

<sup>q</sup> This is a schools environmental education programme, environmental management system and award scheme that promotes and acknowledges long-term, whole school action for the environment. It includes an active travel component

<sup>r</sup> E.g. gender and cultural stereotyping about appropriateness of some sports for particular genders

**Workplace**

Actions in the workplace have the potential to reach many of the 1.9 million Irish people who are employees, working an average of 35 hours per week.<sup>121</sup>

A NICE review of evidence on interventions in the workplace to reduce sedentary time concluded that there was insufficient evidence about effective interventions in the workplace to reduce sedentary time.<sup>122</sup> However, Public Health England has published guidance, based on review of evidence, for employers to promote avoidance of prolonged periods of sedentary work.<sup>123</sup>

- For those occupations that are primarily desk based, workers should aim to accumulate two hours a day of standing and light activity during working hours, eventually progressing to a total accumulation of four hours a day.
- Seated based work should be broken up with standing based work using sit-stand desks or short active standing breaks.
- Companies should raise awareness among staff of the health impacts of prolonged sitting (along with other health promotion goals/health risks).
- Encouraging stair use through signage and improving the physical environment of stairwells can increase the use of stairs in workplaces.<sup>124 122</sup>

Evidence also suggests that workplace health screening and workplace counselling can have a positive impact on physical activity. Involvement of employees in planning and design of interventions can also have a positive effect.<sup>122</sup>

**Guidelines and messages**

Focus on a guideline that may not be achievable for many people (those who are elderly for example) may act as a barrier to physical activity participation for those who stand to gain the most.<sup>125 126</sup>

**In clinical practice**

There is research which shows for example that GPs do not discuss physical activity with all relevant patients.<sup>22 217</sup> Research also indicates that while many health professionals may rate physical activity as important, this does not necessarily lead to patients receiving advice about physical activity and exercise.<sup>128</sup>

*“Research clearly demonstrates that physical inactivity, as a risk factor for chronic disease, is as important as blood pressure, cholesterol level, blood sugar and smoking status, all of which are routinely measured in medical consultations on a daily basis. But more often than not clinicians fail to measure a patient’s weekly exertion levels.”<sup>129</sup>*

Some of the reasons for this are time constraints, scepticism about whether such counselling works and lack of education and training.<sup>128 130</sup>

A cultural change is needed to think of exercise in the same way as other therapeutic agents, where the benefits are balanced with the risks and side effects of a drug, to make an appropriate clinical judgment.<sup>7</sup>

Table 4: Strategies for Integrating Physical Activity Counselling into Clinical Practice<sup>131</sup>

Activity	Team Member
<b>Make physical activity a vital sign at each clinical stage.</b>	Health care professional or clinical staff
<b>Ask if the patient exercises regularly or engages in physical activity; if yes, ask what type, for how many minutes, and how often; if no, ask if the patient is willing to start.</b>	Health care professional or clinical staff
<b>Associate physical activity with reduced risk of heart disease, stroke, diabetes, and many cancers.</b>	Health care professional
<b>Write a prescription for agreed-upon daily physical activity, working up to at least 30 minutes of walking or other moderate-intensity activity daily.</b>	Health care professional
<b>Encourage use of a pedometer and advise record of keeping of a daily activity (mobile device, paper and pencil, Internet or other)</b>	Health care professional or clinical staff
<b>Recognise success and encourage reluctant adopters.</b>	Health care professional and clinical staff

Making physical activity a vital sign is one way to maximise the opportunity inherent in the patient consultation (see table 4).<sup>131</sup> Brief advice and exercise prescription are evidence-based methods of effectively engaging with patients on physical activity.<sup>132</sup>

### **Brief interventions and brief advice**

Brief advice is an informal conversation of 30 seconds to 3 minutes during which awareness is raised and simple advice is given to the patient. It may or may not involve written or other support or follow up. Brief intervention describes a longer, more structured engagement with the patient, which may include provision of more formal help such as arranging follow-up.<sup>133</sup>

There is evidence from systematic reviews, randomised control trials and other studies that physical activity interventions such as brief advice, prescription of exercise and physician counselling work and are cost effective for both older people<sup>134 127 135</sup> and younger adults.<sup>136 137 138 139 140 141 142</sup>

### **Self-efficacy**

There is evidence that targeting self-efficacy, the belief in one's own ability to successfully accomplish a task, is an effective means of increasing physical activity. Three techniques that have been found to lead to higher levels of self-efficacy and physical activity were action planning, providing instruction and praising or encouraging behaviour change efforts.<sup>143</sup>

Research shows that if older people set their own targets for physical activity, their activity increases more than if goals are set for them.<sup>144</sup>

### **Exercise referral**

Exercise referral schemes, are described in NICE guidelines<sup>145</sup> as consisting of all of the following components:

- Assessment to determine whether someone is sedentary or inactive.

- Referral to a physical activity specialist or service.
- Personal assessment involving a physical activity specialist or service to determine a programme to suit their needs.
- Opportunity to participate in a programme.

NICE recommends structured exercise programmes tailored to individual needs to manage, and for rehabilitation after, certain health conditions, including: myocardial infarction, chronic heart failure chronic obstructive pulmonary disease depression low back pain, chronic fatigue syndrome/myalgic encephalomyelitis (or encephalopathy).<sup>145</sup>

Evidence reviews conducted by NICE suggest that exercise referral schemes for people who are sedentary or inactive without an existing health condition, have only a marginal effect relative to other ways of increasing physical activity (including brief advice, and signposting/providing information on local facilities and opportunities to be physically active).<sup>145</sup>

Therefore, exercise referral to structured exercise programmes are not a cost-effective solution to increase physical activity levels in the general population.

#### **Exercise referral**

*A healthcare professional refers a patient to a physical activity specialist or service, where the specialist or service carries out a personal assessment and determines a programme to suit their needs, with an opportunity to participate in such a programme.*

#### **Exercise prescription**

*In exercise prescription, which may form part of brief advice/ brief intervention, the health professional may prescribe an increase in structured physical activity with reference to frequency, duration, intensity and type.*

**Measurement of physical activity**

There are multiple ways to measure physical activity. Physical activity type, duration, intensity and frequency are the three measures most frequently used, particularly in exercise prescription. While type, duration and frequency are straightforward to measure, intensity is less simple to quantify, and can be done either objectively or subjectively. Some of the objective measures include metabolic equivalents (METs), heart rate, or using a pedometer or activity monitor on a smart phone or watch. Others are subjective and include the 'talk test' and standard physical activity questionnaires.<sup>5</sup>

The aspect of measurement, and the tool used, will depend on the purpose of the information. Some will use information on heart rate and METs during an activity to ensure they are working within safe limits; others may use the 'talk test' to help them determine how the activity they are engaged goes towards meeting the recommended guidelines on vigorous activity. Finally, questionnaires may be used to determine an individual's general level of physical activity, or for researchers to quantify physical activity levels of a cohort.

Currently, there are no international guidelines on physical activity that make recommendations regarding cardio-respiratory fitness. Instead guidelines focus on time, in most cases recommending 150 minutes of moderate to vigorous activity weekly or 75 mins of vigorous activity.<sup>146</sup>

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<sup>5</sup> Such as the International Physical Activity Questionnaire (IPAQ) or Global Physical Activity Questionnaire (GPAQ)

## CONCLUSION

The evidence tells us that the health, environmental, social and economic benefits of physical activity are undeniable. It tells us that regular physical activity can prevent illness, and can help in treatment of many conditions. It can be considered a 'wonder drug' which is underused across the population and the life course.

The evidence also tells us that adults are not exercising enough; our children are not exercising enough. In particular there is a steep drop off in girls' participation in sport as they enter their teenage years. We are not using the active travel option as much as we should. Sedentary work practices have become the norm in many workplaces and we have developed a physical environment that often limits opportunities to be physically active.

There are many opportunities to improve this situation. There are opportunities for policy makers at various levels and settings to create a more supportive environment. This is true in the areas of the built and natural environment; transport; education and schools; workplaces; and in sporting organisations.

We can be doing more as health professionals to engage with patients to increase their levels of physical activity, through exercise advice, prescription and referral. Health professionals in turn need support to ensure they have the knowledge, skills and system supports to do this effectively.

There is a need for recognition among health professionals, the public, patients and policymakers of the huge health, social and economic potential of physical activity and an appreciation of the adverse consequences of maintaining the status quo.

What we hope to realise through the recommendations of this policy statement is an informed public which understands the benefits of physical activity, which receives clear messages regarding type, frequency and duration from appropriately trained health professionals, and which is enabled to put this advice into practice through a supportive environment in everyday life and throughout their life.

# RECOMMENDATIONS

## PROFESSIONS

### Clinical Practice

- For all doctors and other health professionals:
  - **Ask** patients about their level of physical activity and **record** this information.
  - **Inform** patients that regular physical activity can reduce the risk of illnesses.
  - **Offer** advice to increase their levels of physical activity. This may be in the form of a prescription as to frequency, intensity, type and duration.
  - **Inform** those who are inactive that even small increases in physical activity are beneficial.
  - Where possible, **encourage** patients to gradually increase their levels of physical activity, to meet or exceed the national guidelines of 30 minutes daily (adult guideline).
  - Encourage patients to **set goals** in relation to physical activity and to record their own progress, for example through use of pedometers.
  - **Provide** patients with information on local facilities and groups.
  - **Encourage** women with uncomplicated pregnancies, including those who have been sedentary prior to pregnancy to become or continue to be physically active while pregnant.
- Develop national guidelines for use of exercise in prevention and treatment of disease.
- Develop an Irish guideline on exercise during pregnancy.
- Use professionally supervised structured exercise programmes (exercise referral schemes) for management and rehabilitation for certain health conditions.<sup>†</sup>
- Advise and support patients who are sedentary or inactive but otherwise healthy, using brief advice or brief intervention.

**Brief advice** is an informal conversation of 30 seconds to 3 minutes during which awareness is raised and simple advice is given to the patient. It may or may not involve written or other support or follow up.

Brief Intervention describes a longer, more structured engagement with the patient, which may include provision of more formal help such as arranging follow up.

### Exercise Referral

A healthcare professional refers a patient to a physical activity specialist or service, where the specialist or service carries out a personal assessment and determines a programme to suit their needs, with an opportunity to participate in such a programme.

<sup>†</sup> Including myocardial infarction, stroke, chronic heart failure, COPD, depression, low back pain, chronic fatigue syndrome/ myalgic encephalomyelitis, encephalopathy, osteoporosis, and recent cancer surgery. Programmes aimed at reducing falls in older people are also supported by evidence and recommended.

**Education and Research**

- Review and update curricula of medical schools, postgraduate medical training bodies and curricula of other health professions, to ensure that they incorporate knowledge on physical activity and teach the skills to engage patients constructively in increasing their physical activity levels.
- Support research and audit on the benefits of physical activity and the effectiveness of interventions to increase physical activity levels.

**Health Professionals – lead by example**

- **Be physically active yourself**, to protect your own health and wellbeing and to act as a role model for positive health behaviours.

**Exercise Prescription**

In exercise prescription, which may form part of brief advice/ brief intervention, the health professional may prescribe an increase in structured physical activity with reference to frequency, duration, intensity and type.

Signposting to local facilities and groups may also form part of the prescription, but it is not a referral to a specific programme or a service.

## OUR MESSAGE TO THE PUBLIC

Health professionals and all involved in health promotion should inform the public and patients about the health benefits of physical activity at every opportunity.

- Everybody should aim to be more active. This may be achieved through formal exercise, team or individual sports, active travel or even household chores. Pick an activity you enjoy and encourage a friend or family member to join you.
- Even if you are currently inactive, try to become a little more active. Even small increases in regular physical activity bring positive health benefits.
- For greater health benefits, strive to meet the recommended guidelines for daily physical activity. For adults, this means 30 minutes daily of moderate physical activity (see table 3), which may be broken up throughout the day. For optimum health benefits, increase your level of activity above these levels.
- Reduce the total time spent sitting every day. Try to break it up, especially when watching TV. If your daily routine involves extended sitting time (greater than 8 hours), aim to be active to a moderate to vigorous level for at least 60 minutes daily.
- If you are a parent or guardian, provide opportunities for your children to be active for at least 60 minutes every day. Pre-school children should be active for at least 3 hours, spread throughout the day.<sup>u</sup> Be a positive role model for your children and be a physically active parent.
- Both young and old, in different states of health and ability, can benefit from being physically active. In case of health concerns, discuss with your family doctor or other health professional.
- Set goals for yourself in relation to physical activity and track your progress. Technologies such as pedometers and apps can make this easy.

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<sup>u</sup> This is the guidance from the UK- Start Active, Stay Active: A report on physical activity for health from the four home countries 'Chief Medical Officers (2011)

## POLICYMAKERS

### **Environment, Transport and Planning**

**Policy-makers must prioritise the creation of a safe and attractive environment where everyone can be active, regardless of age or disability.**

- Review progress on implementation of the Smarter Travel Policy (2009)
- Complete and publish the mid-term review of the National Cycle Policy Framework (2009)
- Specify more ambitious targets for the National Cycle Policy Framework (2009).<sup>v</sup>
- Develop a coordinated approach for implementation of outstanding actions from these two policies and **prioritise those that are focused on safety.**
- Legislate to place relevant actions under environment in the National Physical Activity Plan (NPAP) on a statutory basis.<sup>w</sup> Specifically regarding the following actions:
  - Ensure that the planning, development and design of towns, cities and schools promotes cycling and walking with the aim of delivering a network of cycle routes and footpaths. (NPAP action 33)
  - Ensure that the planning, development and design of towns and cities promotes the development of local and regional parks and recreational spaces that encourage physical activity. (NPAP action 34)
  - Prioritise the planning and development of walking and cycling and general recreational /physical activity infrastructure. (NPAP action 36)
- Explore opportunities to maximise physical activity and recreation amenities in the natural environment. (NPAP action 37)
- Develop a process to ensure that planning applications prioritise the need for people to be physically active as a routine part of their daily life.
- Make health and wellbeing a central component of local and regional development plans.
- Ensure local transport planning considers the need for transport links to local facilities for physical activity, especially for disadvantaged groups. Implement recommendations of the 2010 Position Paper from the National Heart Alliance, 'Building Young Hearts', to improve young people's opportunities for physical activity. These include recommendations from the Smarter Travel Policy and the National Cycle Policy Framework such as:
  - Objective 4.2 of the Cycle Policy will ensure by 2020 the environment in the immediate vicinity of schools is a safe and attractive low speed (30kph) environment with speed limits strictly enforced, and drop-off by car restricted within a given distance.
  - Smarter Travel Action 4: prioritise design and retrofitting for open, safe, well-lit routes overlooked by used buildings with destination visibility and increased junction safety.

<sup>v</sup> The National Cycle Policy Framework specifies targets of 10% commuting by bike; and making cycling a more safe and popular means of getting to school for primary and post primary

<sup>w</sup> The Active Travel (Wales) act provides a model for such legislation. The Act requires local authorities in Wales to produce active travel maps and deliver year on year improvements in active travel routes and facilities. It requires highways authorities in Wales to make enhancements to routes and facilities for pedestrians and cyclists in all new road schemes and to have regard to the needs of walkers and cyclists in a range of other highway authority functions. It also requires the Welsh Ministers and local authorities to promote active travel journeys in exercising their functions under this Act

**And other recommendations such as:**

- A review of Ready, Steady, Play!<sup>x</sup> to identify if the objectives have been achieved, and to determine the best way to move forward in relation to play facilities for children and young people.

**Fiscal measures**

- Introduce financial incentives to encourage more people to be physically active. This may include:
  - Reduction or removal of VAT on sports equipment.
  - Tax and social welfare incentives to make club and gym membership and fees more affordable.
  - Evaluation of the cycle to work scheme. If beneficial, consider incentivised schemes for other groups such as self-employed and unemployed.
  - Introduction of fiscal measures targeted at family based initiatives; for example a 'cycle to school' scheme for purchase or rental of children's bikes.
  - Provision of subsidies to encourage private facilities to offer a reduced rate to special groups- e.g. older people.

**Education and Schools**

- Ensure that school facilities encourage physical activity, active play and support active travel.
- Encourage activity throughout the school day, in addition to timetabled physical education (PE) classes, with the aim of achieving a minimum of 30 minutes dedicated physical activity every day in all

educational settings.

- Extend and resource the Active School Flag initiative<sup>y</sup>, including through roll-out to secondary schools.
- **Prioritise PE in schools**, and support schools and teachers to deliver PE with greater emphasis on varied, non-competitive physical activity, in addition to competitive and performance aspects. For some children PE is their only opportunity for physical activity.
- **Ensure that all primary school children receive the Department of Education minimum requirement of 60 minutes PE per week** and aim to increase this time to 2 hours per week.<sup>z</sup>
- **Ensure that in post-primary education, the recommended 2 hours per week of PE is implemented.**
- Urgently implement the new Leaving Certificate PE curriculum and ensure that students in the senior cycle receive the basic minimum of two hours per week physical education.

<sup>x</sup> The National Play Policy, published in 2004 by the Department of Children and Youth Affairs

<sup>y</sup> A Department of Education and Skills initiative awarded to schools that achieve a physically educated and active school community.

<sup>z</sup> To bring Ireland in line with other European countries in terms of minimum time for PE.

**Workplaces**

- Address hazards of prolonged sedentary time in the workplace safety statement.<sup>aa</sup>
- Develop workplace programmes to address barriers to physical activity which may include some of the following actions:
  - Make the stairs the visible option through signage.
  - Encourage cycling to work through the cycle to work scheme; also by providing cycle racks and shower facilities.
  - Encourage employees to take short walks during work breaks and walking/standing meetings, where practical.
  - Disseminate information to employees on the benefits of physical activity and decreasing sedentary time, and advice on how to achieve this.
- Support, encourage and incentivise those who change their behaviours and engage in greater levels of physical activity.
- The Royal College of Physicians will aim to be an exemplar of a healthy workplace through implementation of the above actions.

**Sporting Organisations**

- Sporting and leisure organisations and clubs should extend their reach in communities including through:<sup>ab</sup> Increased sharing of facilities with schools, other sports clubs, community centres etc.
  - Waiving or reducing club membership fees for those on lower incomes.
  - Offering family memberships or packages that are more affordable to families.
  - Encouraging use of facilities by a wide cross-section of ages and abilities within the community.

**NATIONAL PHYSICAL ACTIVITY PLAN**

The National Physical Activity Plan (NPAP), launched in 2016 contains many relevant and potentially powerful actions to increase levels of physical activity across the population.

The recommendations of this policy statement are intended to support and reinforce these actions. To realise the benefits of the NPAP, we recommend the following:

- Full and timely implementation and resourcing of the National Physical Activity Plan.
- Full engagement of all relevant stakeholders in implementation of the National Physical Activity Plan.
- Formal review or audit of progress to be undertaken on an annual basis.

<sup>aa</sup> Under the Safety, Health and Welfare at Work Act 2005 every employer is required to carry out a risk assessment for the workplace which should identify any hazards present in the workplace, assess the risks arising from such hazards and identify the steps to be taken to deal with any risks. The employer must also prepare a safety statement which is based on the risk assessment

<sup>ab</sup> The GAA Healthy Clubs initiative may be a useful model

## REFERENCES

1. HSE (2016) Planning for Health: Trends and Priorities to Inform Health Service Planning.
2. Department of Health and Department of Transport, Tourism and Sport. Get Ireland Active-National Physical Activity Plan for Ireland. Dublin 2016.
3. Irish Department of Health. Healthy Ireland - a framework for improved health and wellbeing 2013 – 2025. Dublin, 2013
4. Irish Department of Transport. Smarter Travel- A Sustainable Transport Future. A New Transport Policy for Ireland 2009-2020. Dublin, 2009
5. Irish Department of Transport. National Cycle Policy Framework. Dublin, 2009
6. Academy of Medical Royal Colleges. Exercise: The miracle cure and the role of the doctor in promoting it. London 2015.
7. Royal College of Physicians. Exercise for Life: Physical Activity in Health and Disease. RCP, 2012.
8. Public Health England. Everybody active, every day: an evidence-based approach to physical activity. PHE, 2014.
9. World Health Organization. Physical activity strategy for the WHO European Region 2016–2025. EUR/RC65/9. WHO Regional Office for Europe; 2015
10. Bull FC, Gauvin L, Bauman A, Shilton T, Kohl HW 3rd, Salmon A. The Toronto Charter for Physical Activity: a global call for action. *J Phys Act Health*. 2010 Jul;7(4):421-2.
11. World Health Organisation. Global Health Risks- Mortality and burden of disease attributable to selected major risks. Geneva, WHO, 2009.
12. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT; Lancet Physical Activity Series Working Group. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet*. 2012 Jul 21;380(9838):219-29.
13. Naci H, Ioannidis JPA. Comparative effectiveness of exercise and drug interventions on mortality outcomes: metaepidemiological study. *BMJ* 2013;347:f5577.
14. Lee IM1, Skerrett PJ. Physical activity and all-cause mortality: what is the dose-response relation? *Med Sci Sports Exerc*. 2001 Jun;33(6 Suppl):S459-71; discussion S493-4.
15. Vranian M et al. Impact of Fitness Versus Obesity on Routinely Measured Cardiometabolic Risk in Young, Healthy Adults. *Am J Cardiol*. 2013 Apr 1; 111(7): 991–995.
16. O Powell KE, Paluch AE, Blair SN. Physical activity for health: What kind? How much? How intense? On top of what? *Annu Rev Public Health* 2011;32:349-65.
17. Hamer M, de Oliveira C, Demakakos P. Non-exercise physical activity and survival: English longitudinal study of ageing. *Am J Prev Med* 2014;47:452-60.
18. Warburton DE, Bredin SS. Reflections on Physical Activity and Health: What Should We Recommend? *Can J Cardiol*. 2016 Apr;32(4):495-504.
19. Physical Activity Guidelines Advisory Committee. Physical Activity Guidelines Advisory Committee Report, 2008. Washington, DC: U.S. Department of Health and Human Services, 2008
20. Kyu Hmwe H, Bachman Victoria F, Alexander Lily T, Mumford John Everett, Afshin Ashkan, Estep Kara et al. Physical activity and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events: systematic review and dose-response meta-analysis for the Global Burden of Disease Study 2013. *BMJ* 2016; 354 :i3857
21. Warburton DE, Charlesworth S, Ivey A, Nettlefold L, Bredin SS. A systematic review of the evidence for Canada's Physical Activity Guidelines for Adults. *Int J Behav Nutr Phys Act*. 2010 May 11;7:39
22. Thornton JS, Frémont P, Khan K, Poirier P, Fowles J, Wells GD, Frankovich RJ. Physical activity prescription: a critical opportunity to address a modifiable risk factor for the prevention and management of chronic disease: a position statement by the Canadian Academy of Sport and Exercise Medicine. *Br J Sports Med*. 2016 Sep;50(18):1109-14.
23. Pedersen BK, Saltin B. Exercise as medicine—evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scand J Med Sci Sports* 2015;25(Suppl 3):1–72
24. Stevens Z, Barlow C, Kendrick D, et al. Effectiveness of general practice-based physical activity promotion for older adults: systematic review. *Prim Health Care Res Dev* 2014;15:190–201.

25. Tremblay MS, Warbuton DE, Janssen I, et al. New Canadian physical activity guidelines. *Appl Physiol Nutr Metab* 2011;36:36–46.
26. Babyak M, Blumenthal JA, Herman S, et al. Exercise treatment for major depression: maintenance of therapeutic benefit at 10 months. *Psychosom Med* 2000;62:633–8.
27. Proper KI, Singh AS, van Mechelen W, et al. Sedentary behaviors and health outcomes among adults: a systematic review of prospective studies. *Am J Prev Med* 2011; 40:174–82.
28. Healy GN, Matthews CE, Dunstan DW, et al. Sedentary time and cardio-metabolic biomarkers in US adults: NHANES 2003–06. *Eur Heart J* 2011; 32:590–7.
29. Schmid D, Leitzmann MF. Television viewing and time spent sedentary in relation to cancer risk: a meta-analysis. *J Natl Cancer Inst* 2014; 106:pii: dju098.
30. Seguin R, Buchner DM, Liu J, et al. Sedentary behaviour and mortality in older women: the Women's Health Initiative. *Am J Prev Med* 2014; 46:122–35.
31. Biswas A, Oh PI, Faulkner GE, Bajaj RR, Silver MA, Mitchell MS, et al. Sedentary Time and Its Association With Risk for Disease Incidence, Mortality, and Hospitalization in Adults: A Systematic Review and Meta-analysis. *Ann Intern Med*. 2015; 162:123-132.
32. de Rezende LF, Rodrigues Lopes M, Rey-López JP, Matsudo VK, Luiz Odo C. Sedentary behavior and health outcomes: an overview of systematic reviews. *PLoSOne*. 2014 Aug 21; 9(8):e105620.
33. Wilmot EG, Edwardson CL, Achana FA, et al. Sedentary time in adults and the association with diabetes, cardiovascular disease and death: systematic review and meta-analysis. *Diabetologia* 2012;55:2895–905
34. Ekelund U, Steene-Johannessen J, Brown WJ, Fagerland MW, Owen N, Powell KE, Bauman A, Lee IM; Lancet Physical Activity Series 2 Executive Committee; Lancet Sedentary Behaviour Working Group. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *Lancet*. 2016 Jul 27. pii: S0140-6736(16)30370-1. doi: 10.1016/S0140-6736(16)30370-1. [Epub ahead of print]
35. Grontved A, Hu FB. Television viewing and risk of type 2 diabetes, cardiovascular disease, and all-cause mortality: a meta-analysis. *JAMA* 2011; 305:2448–55.
36. Matthews CE, George SM, Moore SC, et al. Amount of time spent in sedentary behaviors and cause-specific mortality in US adults. *Am J Clin Nutr* 2012;95:437–45
37. Costigan SA, Barnett L, Plotnikoff RC, Lubans DR. The health indicators associated with screen-based sedentary behavior among adolescent girls: a systematic review. *J Adolesc Health*. 2013 Apr;52(4):382-92.
38. Lane A, Harrison M, Murphy N. Screen time increases risk of overweight and obesity in active and inactive 9-year old Irish children: a cross sectional analysis. *J Phys Act Health*. 2014 Jul;11(5):985-91.
39. Chinapaw MJ, Proper KI, Brug J, van Mechelen W, Singh AS. Relationship between young peoples' sedentary behaviour and biomedical health indicators: a systematic review of prospective studies. *Obes Rev*. 2011 Jul;12(7):e621-32.
40. Kujala UM. Evidence of the effects of exercise therapy in the treatment of chronic disease. *Br J Sports Med* 2009 43:550-555.
41. Donoghue O, O'Connell M, Kenny R.A. Walking to Wellbeing: Physical Activity, Social Participation and Psychological Health in Irish adults aged 50 years and older. Dublin: The Irish Longitudinal Study on Ageing (TILDA), 2016
42. Gillespie LD, Robertson MC, Gillespie WJ, Sherrington C, Gates S, Clemson LM, Lamb SE. Interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev*. 2012 Sep 12;(9)
43. Sherrington et al Effective exercise for prevention of falls. *JAGS* 2008;56:2234
44. Fortes C, Mastroeni S, Sperati A, Pacifici R, Zuccaro P, Francesco F, Agabiti N, Piras G, Amleto D, Ebrahim S. Walking four times weekly for at least 15 min is associated with longevity in a cohort of very elderly people. *Maturitas*. 2013 Mar;74(3):246-51.
45. Balsamo S, Willardson JM, Frederico Sde S, Prestes J, Balsamo DC, Dahan da CN, Dos Santos-Neto L, Nobrega OT. Effectiveness of exercise on cognitive impairment and Alzheimer's disease. *Int J Gen Med*. 2013 May 24;6:387-91

46. Raji CA, Merrill DA, Eyre H, Mallam S, Torosyan N, Erickson KI, Lopez OL, Becker JT, Carmichael OT, Gach HM, Thompson PM, Longstreth WT, Kuller LH. Longitudinal Relationships between Caloric Expenditure and Gray Matter in the Cardiovascular Health Study. *J Alzheimers Dis.* 2016 Mar 11. [Epub ahead of print]
47. Hillman CH, Pontifex MB, Castelli DM, Khan NA, Raine LB, Scudder MR, Drollette ES, Moore RD, Wu CT, Kamijo K. Effects of the FITKids randomized controlled trial on executive control and brain function. *Pediatrics.* 2014 Oct;134(4):e1063-71.
48. US Department of Health and Human Services. 2008 Physical activity guidelines for Americans. Washington, 2008.
49. Greene, S, Williams, J, Layte, R, Doyle, E, Harris, E, McCrory, C, et al. Growing Up in Ireland. Overweight and Obesity among 9 year olds. Office of the Minister for Children and Youth Affairs; 2011.
50. National Longitudinal Study of Children. Growing Up in Ireland. The Health of 3 Year Olds. Department of Children and Youth Affairs [Internet]. 2011. Available from: [http://www.growingup.ie/fileadmin/user\\_upload/documents/Conference/2011/Growing\\_Up\\_in\\_Ireland\\_-\\_The\\_Health\\_of\\_3-Year-Olds.pdf](http://www.growingup.ie/fileadmin/user_upload/documents/Conference/2011/Growing_Up_in_Ireland_-_The_Health_of_3-Year-Olds.pdf)
51. Clapp JF. The effects of maternal exercise on early pregnancy outcome. *Am J Obstet Gynecol* 1989;161:1453
52. Klebanoff MA, Shiono PH, Carey JC. The effect of physical activity during pregnancy on preterm delivery and birth weight. *Am J Obstet Gynecol* 1990;163:1450-6.
53. Kulpa PJ, White BM, Visscher R. Aerobic exercise in pregnancy. *Am J Obstet Gynecol* 1987;156:1395-403.
54. Hall DC, Kaufmann DA. Effects of aerobic and strength conditioning on pregnancy outcomes. *Am J Obstet Gynecol* 1987;157:1199-203.
55. Hatch MC, Shu X, McLean DE, Levin B, Begg M, Reuss L, et al. Maternal exercise during pregnancy, physical fitness, and fetal growth. *Am J Epidemiol* 1993;137:1105-14.
56. Kardel KR, Kase T. Training in pregnant women: effects on fetal development and birth. *Am J Obstet Gynecol* 1998;178:280-6.
57. Clapp JF, Lopez B, Harcar-Sevcik R. Neonatal behavioral profile of the offspring of women who continued to exercise regularly throughout pregnancy. *Am J Obstet Gynecol* 1999;180:91-4.
58. Sternfeld B, Queensberry CP, Eskenazi B, Newman LA. Exercise during pregnancy and pregnancy outcome. *Med Sci Sports Ex* 1995;27:634-40.
59. Daly N, Mitchell C, Farren M, Kennelly MM, Hussey J, Turner MJ. Maternal obesity and physical activity and exercise levels as pregnancy advances: an observational study. *Ir J Med Sci.* 2016;185(2):357-70.
60. Evenson KR, Wen F. Prevalence and correlates of objectively measured physical activity and sedentary behavior among US pregnant women. *Prev Med.* 2011; 53:39-43.
61. Ruchat SM, Davenport MH, Giroux I, Hillier M, Batada A, Sopper MM et al. Walking program of low or vigorous intensity during pregnancy confers an aerobic benefit. *In J Sports Med.* 2012; 33:661-666
62. Muktabhant B, Lawrie TA, Lumbiganan P, Laopaiboon M. Diet or exercise, or both, for preventing excessive weight gain in pregnancy. *Cochrane Database Syst Rev.* 2015; 6: CD007145. [Epub ahead of print].
63. Haakstad LA, Bo K. Exercise in pregnant women and birth weight: a randomized controlled trial. *BMC Preg Childbirth.* 2011;11:66-70.
64. Cordero Y, Mottola MF, Vargas J, Blanco M, Barakat R. Exercise is associated with a reduction in gestational diabetes mellitus. *Med Sci Sports Exercise.* 2015; 47:1328-1333.
65. Barakat R, Pelaez M, Lopez C, Lucia A, Ruiz JR. Exercise during pregnancy and gestational diabetes-related adverse effects: a randomised controlled trial. *British Journal of Sports Medicine.* 2013;47:201209178.
66. Barakat R, Pelaez M, Cordero Y, Perales M, Lopez C, Coteron J, Mottola MF. Exercise during pregnancy protects against hypertension and macrosomia: randomized clinical trial. *Am J Obstet Gynecol.* 2016;214:649.e1-e8.
67. Perales M, Refoyo I, Coteron J, Bacchi M, Barakat R. Exercise during pregnancy attenuates prenatal depression: a randomized controlled trial. *Eval Health Prof.* 2015; 38:59-72.
68. Owe KM, Nystad W, Stigum H, Vangen S, Bø K. Exercise during pregnancy and risk of Cesarean delivery in nulliparous women: A large population-based cohort study. *Am J Obstet Gynecol.* 2016 Aug 20. pii: S0002-9378(16)30579-8.

69. Wiebe HW, Boule N, Chari R, Davenport MH. The effect of supervised prenatal exercise on fetal growth. A meta-analysis. *Obstet Gynecol.* 2015; 125:1185-1194.
70. Ruchat SM, Mottola MF. Preventing long-term risk of obesity for two generations: prenatal physical activity is part of the puzzle. *J Preg.* 2012; 1-12:470247.
71. Hannon F, Fitzsimon N, Kelleher C. Physical Activity, Health and Quality of Life among People with Disabilities: An Analysis of the SLÁN Data. National Disability Authority. 2006.
72. Wahlbeck et al, Westman J, Nordentoft M, Gissler M, Laursen TM: Outcomes of nordic mental health systems: life expectancy of patients with mental disorders. *Br J Psychiatry* 2011;199(6):453–458.
73. Chang CK, Hayes RD, Perera G, Broadbent MT, Fernandes AC, Lee WE, Hotopf M, Stewart R. Life expectancy at birth for people with serious mental illness and other major disorders from a secondary mental health care case register in London. *PLoS One.* 2011;6(5):e19590..
74. Firth J, Cotter J, Elliott R, French P, Yung AR. A systematic review and meta-analysis of exercise interventions in schizophrenia patients. *Psychol Med.* 2015 May;45(7):1343-61.
75. Mammen G, Faulkner G. Physical activity and the prevention of depression: a systematic review of prospective studies. *Am J Prev Med.* 2013 Nov;45(5):649-57.
76. Rethorst CD, Wipfli BM, Landers DM. The antidepressive effects of exercise: a meta-analysis of randomized trials. *Sports Med.* 2009;39(6):491-511 trials. *Sports Med.* 2009;39(6):491–51
77. Cooney GM, Dwan K, Greig CA, Lawlor DA, Rimer J, Waugh FR, McMurdo M, Mead GE. Exercise for depression. *Cochrane Database Syst Rev.* 2013 Sep 12;(9):CD004366.
78. Dauwan M, Begemann MJ, Heringa SM, Sommer IE. Exercise Improves Clinical Symptoms, Quality of Life, Global Functioning, and Depression in Schizophrenia: A Systematic Review and Meta-analysis. *Schizophr Bull.* 2016 May; 42(3):588-99.
79. Vysniauske R, Verburgh L, Oosterlaan J, Molendijk ML. The Effects of Physical Exercise on Functional Outcomes in the Treatment of ADHD: A Meta-Analysis. *J Atten Disord.* 2016 Feb 9. pii: 1087054715627489. [Epub ahead of print]
80. Drieskens S, Van Oyen H, Demarest S, Van der Heyden J, Gisle L, Tafforeau J. Gisle L, Tafforeau J. Multiple risk behaviour: increasing socio-economic gap over time? *Eur J Public Health.* 2010 Dec;20(6):634-9.
81. Watts, Nick et al. Health and climate change: policy responses to protect public health. *Lancet.* 2015 Nov 7;386(10006):1861-914.
82. Royal College of Physicians. Every breath we take: the lifelong impact of air pollution. Report of a working party. London: RCP, 2016.
83. IPH. Active Travel, Healthy Lives. The Institute of Public Health in Ireland (2011)
84. Department of Health and Department of Transport, Tourism and Sport. Get Ireland Active-National Physical Activity Plan for Ireland. Dublin 2016.
85. Russel H, Maitre B, Watson, D. Trends and Patterns in Occupational Health and Safety in Ireland. Research Series Number 40. Economic and Social Research Institute. 2015, Dublin
86. Hafner, Marco, Christian van Stolk, Catherine L. Saunders, Joachim Krapels and Ben Baruch. Health, wellbeing and productivity in the workplace: A Britain's Healthiest Company summary report. Santa Monica, CA: RAND Corporation, 2015. [http://www.rand.org/pubs/research\\_reports/RR1084.html](http://www.rand.org/pubs/research_reports/RR1084.html).
87. SQW. Valuing the benefits of cycling: a report to Cycling England. Cambridge: SQW, 2007.
88. HM Government. Moving More, Living More: The Physical Activity Olympic and Paralympic Legacy for the Nation. London, 2014.
89. UK Department for Transport. Statistical Release – National Travel Survey 2011. Department of Transport, 2012.
90. UK Faculty of Public Health. Local action to mitigate the health impacts of cars- A briefing statement. Faculty of Public Health. London, 2016.
91. Woods, C.B., Tannehill D., Quinlan, A., Moyna, N. and Walsh, J. The Children's Sport Participation and Physical Activity Study (CSPPA). Research Report No 1. School of Health and Human Performance, Dublin City University and The Irish Sports Council, Dublin, Ireland, 2010.

92. Inchley, J., Currie, D., Young, T., Samdal, O., Torsheim, T., Augustson, L., Mathison, F., Aleman-Diaz, A., Molcho, M., Weber, M. & Barnekow, V. (eds). Growing up unequal: gender and socioeconomic differences in young people's health and well-being. Health Behaviour in School-aged Children (HBSC) study: international report from the 2013/2014 survey. Copenhagen, WHO Regional Office for Europe, 2016.
93. Central Statistics Office. Census 2011 Profile 10 Door to Door – Commuting in Ireland. Government of Ireland 2012. [internet] Available from : [http://www.cso.ie/en/media/csoie/census/documents/census2011profile10/Profile\\_10\\_Full\\_Document.pdf](http://www.cso.ie/en/media/csoie/census/documents/census2011profile10/Profile_10_Full_Document.pdf)
94. Tremblay MS, Leblanc AG, Janssen I, Kho ME, Hicks A, Murumets K et al. Canadian sedentary behaviour guidelines for children and youth. *Appl Physiol Nutr Metab*. 2011;36(1):59–64.
95. Canadian Society for Exercise Physiology. Canadian Sedentary Behaviour Guidelines. 2012 [internet]. Available from : [http://www.csep.ca/CMFiles/Guidelines/CanadianSedentaryGuidelinesStatements\\_E\\_2012.pdf](http://www.csep.ca/CMFiles/Guidelines/CanadianSedentaryGuidelinesStatements_E_2012.pdf)
96. Irish Department of Education and Skills. Promotion of Healthy Lifestyles in Post-primary schools, Circular 0051/2015. Sep 2015.
97. Irish Department of Education and Skills. Promotion of Healthy Lifestyles in primary schools, Circular 0013/2016. Feb 2016
98. European Commission/EACEA/Eurydice, 2013. Physical Education and Sport at School in Europe. Eurydice Report. Luxembourg: Publications Office of the European Union.
99. Irish Department of Health. The National Guidelines on Physical Activity for Ireland. Dublin 2009.
100. Morgan K, McGee H, Watson D, Perry I, Barry M, Shelley E, Harrington J, Molcho M, Layte R, Tully N, van Lente E, Ward M, Lutomski J, Conroy R, Brugha R. SLÁN 2007: Survey of Lifestyle, Attitudes & Nutrition in Ireland. Main Report. Dublin: Department of Health and Children, 2008.
101. Healthy Ireland . Ipsos/MRBI Healthy Ireland Survey 2015. [internet] Available online at: <http://health.gov.ie/wp-content/uploads/2015/10/Healthy-Ireland-Survey-2015-Summary-of-Findings.pdf>
102. IPSOS MRBI. Irish Sports Monitor Annual 2015/16 Mid Year Report. Irish Sports Council, 2016.
103. Nyboe L, Lund H. Low levels of physical activity in patients with severe mental illness. *Nord J Psychiatry*. 2013 Feb;67(1):43-6
104. Conroy, Mary C and Morgan, Karen and Curry, Philip and McGee, Hannah and Harrington, Janas and Ward, Mark and Shelley, Emer. The clustering of health behaviours in Ireland and their relationship with mental health, self-rated health and quality of life. *BMC Public Health* , 2011,11 , p. 692.
105. Barrett A, Burke H, Cronin H, Hickey A, Kamiya Y, Kenny RA, Layte R, Maty S, McGee H, Morgan K, Mosca I, Normand C, O'Regan C, O' Sullivan V, Savva G, Sofroniou N, Timonen V, Whelan B. Fifty plus in Ireland 2011: First results from The Irish Longitudinal Study on Ageing (TILDA). Dublin: Trinity College Dublin, 2011.
106. National Heart Alliance and the Irish Heart Foundation. Physical Activity Young People and the Physical Environment. National Heart Alliance 2006.
107. Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, Stone EJ, Rajab MW, Corso P. The effectiveness of interventions to increase physical activity. A systematic review. *Am J Prev Med*. 2002 May;22(4 Suppl):73-107. Review. PubMed PMID: 11985936.
108. Bauman AE, Reis RS, Sallis JF, Wells JC, Loos RJ, Martin BW; Lancet PhysicalActivity Series Working Group. Correlates of physical activity: why are some people physically active and others not? *Lancet*. 2012 Jul 21;380(9838):258-71.
109. National Institute for Health and Care Excellence. Physical activity and the environment. Public health guideline (PH8) NICE, 2008.
110. Sallis JF, Cerin E, Conway TL, Adams MA, Frank LD, Pratt M, Salvo D, Schipperijn J, Smith G, Cain KL, Davey R, Kerr J, Lai PC, Mitáš J, Reis R, Sarmiento OL, Schofield G, Troelsen J, Van Dyck D, De Bourdeaudhuij I, Owen N. Physical activity in relation to urban environments in 14 cities worldwide: a cross-sectional study. *Lancet*. 2016 May 28;387(10034):2207-17.
111. Martin A, Suhrcke M, Ogilvie D. Financial incentives to promote active travel: an evidence review and economic framework. *Am J Prev Med*. 2012 Dec;43(6):e45-57.

112. National Institute for Health and Care Excellence. Physical Activity: walking and cycling. Public health guideline (PH 41). NICE, 2012.
113. Centre for Ageing Research and Development in Ireland (CARDI). Keeping active for better ageing: encouraging physical activity in older adults. Dublin, 2015
114. Sparling Phillip B, Howard Bethany J, Dunstan David W, Owen Neville. Recommendations for physical activity in older adults *BMJ* 2015; 350 :h100
115. Korhonen et al. Declining age-adjusted incidence of fall-induced injuries among elderly Finns. *Age and Ageing* 2012;41:75-79
116. Dobbins M, Husson H, DeCorby K, LaRocca RL. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6 to 18. *Cochrane Database of Systematic Reviews* 2013, Issue 2. Art. No.: CD007651.
117. National Institute for Health and Care Excellence. Physical activity for children and young people. Public health guideline (PH 17). NICE, 2009.
118. NICE Public Health Collaborating Centre. The views of children on the barriers and facilitators to participation in physical activity: A Review Of Qualitative Studies. NICE, 2007.
119. Cheryl A. Zecevic, Line Tremblay, Tanya Lovsin, and Lariviere Michel, Parental Influence on Young Children's Physical Activity, *International Journal of Pediatrics*, vol. 2010, Article ID 468526, 9 pages, 2010.
120. Schoeppe S, Liersch S, Röbl M, Krauth C, Walter U. Mothers and Fathers Both Matter: The Positive Influence of Parental Physical Activity Modelling on Children's Leisure-Time Physical Activity. *Pediatr Exerc Sci*. 2016 Feb 17.
121. Central Statistics Office. CSO Statistical release. Number of persons in employment in Q1 2015. CSO 2015.[internet] Available from : <http://www.cso.ie/en/releasesandpublications/er/qnhs-es/qnhsemploymentseriesq12015/>
122. National Institute for Health and Care Excellence. Physical activity in the workplace (PH13). NICE, 2008.
123. Buckley JP, Hedge A, Yates T, et al. Consensus statement The sedentary office: a growing case for change towards better health and productivity. Expert statement commissioned by Public Health England and the Active Working Community Interest Company. *Br J Sports Med* bjsports-2015-094618 Published Online First: 1 June 2015
124. Soler RE, Leeks KD, Buchanan LR, Brownson RC, Heath GW, Hopkins DH; Task Force on Community Preventive Services. Point-of-decision prompts to increase stair use. A systematic review update. *Am J Prev Med*. 2010 Feb;38(2 Suppl):S292-300.
125. Hupin D, Roche F, Edouard P. Physical Activity and Successful Aging: Even a Little Is Good. *JAMA Intern Med*. 2015 Nov;175(11):1862-3
126. Arem H, Matthews CE, Lee I. Physical Activity Is Key for Successful Aging—Reply: Even a Little Is Good. *JAMA Intern Med*. 2015;175(11):1863. doi:10.1001/jamainternmed.2015.4750
127. Balde, A., Figueras, J., & Hawking, D. Physician advice to the elderly about physical activity. *Journal of Ageing and Physical Activity*, 2003. 11:90-7
128. Nunan D. Doctors should be able to prescribe exercise like a drug. *BMJ*. 2016 May 5;353:i2468.
129. UK Faculty of Sport and Exercise Medicine. Exercise prescription in health and disease: A series of cases for medical students. <http://www.fsem.ac.uk/media/43891/exercise-prescription-in-health-and-disease-booklet.pdf>
130. Weiler R, Chew S, Coombs N, Hamer M, Stamatakis E. Physical activity education in the undergraduate curricula of all UK medical schools: are tomorrow's doctors equipped to follow clinical guidelines? *Br J Sports Med*. 2012 Nov;46(14):1024-6.
131. Berra K, Rippe J, Manson JE. Making Physical Activity Counseling a Priority in Clinical Practice: The Time for Action Is Now. *JAMA*. 2015;314(24):2617-2618. doi:10.1001/jama.2015.16244.
132. Vuori IM, Lavie CJ, Blair SN. Physical activity promotion in the health care system. *Mayo Clin Proc* 2013;88:1446-61.
133. Evans, D S, Martin L, Neeson B, O'Brien M, Cahill D. Brief interventions and motivational interviewing: literature review and guidance for practice. Health Service Executive, 2011.

134. Kerse, N., Elley, C., & Robinson, E. (2005). Is physical activity counseling effective for older people? A cluster randomized, controlled trial in primary care. *Journal of the American Geriatric Society*, 53:1951-6.
135. Welmer, A., Morck, A., & Dahlin-Ivanoff, S. (2012). Physical activity in people age 80 years and older as a means of counteracting disability, balanced in relation to frailty. *Journal of aging and physical activity*, Jul;20(3):317-31.
136. National Institute for Health and Care Excellence. Physical Activity: brief advice for adults in primary care. NICE public health guidance 44, NICE 2013
137. Orrow G, Kinmonth AL, Sanderson S, et al. Effectiveness of physical activity promotion based in primary care: systematic review and meta-analysis of randomised controlled trials. *BMJ* 2012;344:e1389
138. GC Vijay, Wilson EC, Suhrcke M, et al. Are brief interventions to increase physical activity cost-effective? A systematic review. *Br J Sports Med* 2016;50:408-17.
139. Elley et al. Effectiveness of counselling patients on physical activity in general practice. *BMJ* 2003;326:793
140. Elley et al. Cost-effectiveness of PA counselling in general practice. *N Z Med J* 2004;117:1216
141. Garrett et al. Are PA interventions in primary care and the community cost-effective? *BJGP* 2011;e125-e133
142. Noordman, J., Verhaak, P., & Van Dulmen, S. Discussing patient's lifestyle choices in the consulting room: analysis of GP-patient consultations between 1975 and 2008. *BMC Fam Pract*, 2010 11:87.
143. Williams, S., & French, D. What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour--and are they the same? *Health Education Research*, 2011. Apr;26(2):308-22.
144. Heron N, Tully MA, McKinley MC, Cupples ME. Steps to a better Belfast: physical activity assessment and promotion in primary care. *Br J Sports Med*. 2014 Nov;48(21):1558-63.
145. National Institute for Health and Care Excellence. Physical Activity: exercise referral schemes (PH54). NICE 2014.
146. Bouchard C, Blair SN, Katzmarzyk PT. Less Sitting, More Physical Activity, or Higher Fitness? *Mayo Clin Proc*. 2015 Nov;90(11):1533-40.

## GLOSSARY

**Active Play:** Any type of physical activity that gets children moving and that raises their heart rate.

**Active School Flag:** A Department of Education and Skills initiative awarded to schools that achieve a physically educated and active school community.

**Active Travel:** Journeys that use physical activity such as walking or cycling instead of motorised means.

**Brief Advice:** An informal conversation of 30 seconds to 3 minutes during which awareness is raised and simple advice is given to the patient. It may or may not involve written or other support or follow up.

**Brief Intervention:** A longer, more structured engagement with the patient, which may include provision of more formal help such as arranging follow-up.

**Cycle to Work Scheme:** A tax incentive which allows employers to pay for bicycles for employees. The employee pays back through a salary sacrifice arrangement of up to 12 months. The employee does not pay tax on their repayments.

**Exercise:** Exercise is a form of physical activity that is specifically planned, structured, and repetitive such as weight training, tai chi, or an aerobics class.

**Exercise Prescription:** A health professional may prescribe an increase in physical activity with reference to frequency, intensity and type. Signposting to local facilities and groups may also form part of the prescription.

**Functional Limitation:** A restriction in performing fundamental physical and mental actions used in daily life such as mobility (physical) or memory (mental).

**Green prescription:** A type of exercise prescription, where the activity takes place in nature.

**Green Schools Initiative:** An environmental education programme, environmental management system and award scheme that promotes and acknowledges long-term, whole school action for the environment.

**Physical Activity:** Bodily movement produced by skeletal muscles that requires energy expenditure. Physical activities are any activities that get your body moving including gardening, walking the dog, raking leaves, and taking the stairs.

**Metabolic Equivalents (METs):** A physiological measure of energy expenditure. One metabolic equivalent (MET) is defined as the amount of oxygen consumed while sitting at rest. Moderate intensity activities have an energy expenditure of approximately 3-6 METs, and vigorous physical activity is approximately greater than 6 METs.

**Motivational Interviewing:** A person-centred, directive, behaviour change approach which resolves ambivalence and resistance. The underlying spirit of MI is that change comes from within the individual, not from some outside force.

**Safety Statement:** A written statement produced by an employer stating how the employer will ensure safety and health of employees in the workplace.

**Screen Time:** Activities done in front of a screen such as watching TV, working on a computer or playing video games.

**Secondary Prevention:** Action to reduce the impact of a disease or injury that is already present.

**Sedentary time:** Any waking activity with an energy expenditure of less than or equal to 1.5 METs. In general this means any sitting or reclining posture.

**Self-efficacy:** Belief in one's own ability to successfully accomplish a task.

**Signposting:** Information on a service is given to patient, but the responsibility for contacting the service lies with the patient.

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**Structured Exercise Programmes:** Structured exercise programmes vary in format, the mechanism of referral and content. They include components such as phase 3 and phase 4 rehabilitation activities and structured, tailored and supervised activities delivered by a specialist physical activity and exercise instructor.

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**Talk Test:** A way to measure relative intensity of physical activity. Doing moderate to vigorous activity you can still carry on a light conversation, but with vigorous activity you cannot say more than a few words without pausing to take a breath.

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**Vital Sign:** A clinical measurement that provides critical information about a patient's health- e.g. temperature, pulse, blood pressure, respiratory rate.

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