

Swimming

for health and wellbeing

Executive Summary of the health and wellbeing benefits of swimming report



Commissioned by Swim
England's Swimming and
Health Commission, chaired
by Professor Ian Cumming

Produced June 2017

This report was commissioned by the Swimming and Health Commission.

The Commission was established by Swim England to identify evidence for the health benefits of swimming and to promote future research in this area. Although established by Swim England, the Commission operates entirely independently under the chairmanship of Professor Ian Cumming.

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Keywords:

swimming, swimming pool, aquatic therapy, hydrotherapy, physiology, acute effects, chronic adaptations, wellbeing, health, quality of life, mental health, aquatic exercise, community, public health, physical activity, drowning, water sport, aquatics, health, swimming pools, competitive swimming, disability, cognition, swim, cost, effectiveness, cost-effectiveness, cost effectiveness.

Foreword



Whether it's for leisure, pleasure or competition, swimming is a great way to improve your health and wellbeing. These are the key themes from a scientific report commissioned by Swim England on the health and wellbeing benefits of swimming. The evidence from this report is an important landmark and shows that:

Swimming is one of England's most popular sports

Swimming may be associated with a decrease in early death due to cardiovascular disease and any other cause

Swimming can have a number of health and wellbeing benefits for individuals, patients, communities, the public and the nation

There is emerging scientific data for the physical and mental health benefits of swimming

Research on swimming and health benefits is sparse and sporadic. Specific areas of further research need to be developed

The future now offers opportunities for Swim England to lead on a strategy that engages with and retains the public passion for swimming for health and wellbeing

Going forwards, it will be important to link the health, economic and wellbeing benefits of swimming as a key strategy to address the physical inactivity epidemic in this country. We also need further research on the specific health and wellbeing benefits of swimming

This is not the time to tread water; we need to enrich and harness the evidence and opportunity, and to encourage more to swim, and swim regularly. We need to move as a nation to take more exercise. So do swim for pleasure, leisure or as a sport.

A handwritten signature in black ink that reads "Sally C. Davies".

Professor Dame Sally C. Davies
Chief Medical Officer for England



Swim England's 'Swimming and Health Commission' is the first time that the relationship between swimming and health and wellbeing has been scientifically investigated in this depth. Swim England is the national governing body for the sport in England and they commissioned this work to provide a baseline of knowledge from which to build future evidence and share best practice.

Glossary and definitions

Swim England is the national governing body for swimming in England. The organisation and network helps people learn how to swim, enjoy the water safely, and compete in all their sports.

Swimming is the sport or activity of propelling oneself through water using the limbs. In the context of this summary it includes all forms of swimming and water-based activities.

Physical Activity (PA) is any volitional movement of skeletal muscle that results in energy expenditure is regarded as physical activity.

Exercise is a form of leisure-time physical activity that is planned, structured, and repetitive. Exercise training is purposeful and is performed with specific external goals, including the improvement or maintenance of physical fitness, physical performance or health.

Sport is a form of physical activity that includes rules and is usually competitive.

Metabolic Equivalents (MET). Physical activity is measured in METs e.g. the energy it takes to sit quietly. For the average adult, this is about one calorie per kilogram of body weight per hour. Moderate intensity activity is those that used 3 – 6 METS and vigorous activities more than 6 METS.

An independent team of United Kingdom (UK) researchers have reviewed and scrutinised the available evidence for the Commission on the benefits of swimming for: individuals, patients, communities and nations. Their scope was to scientifically review the health and wellbeing benefits across the lifespan, to highlight disparities in evidence, practice and access, and to evidence the many health advantages that swimming regularly affords to us all.

It is clear from the evidence that being able to swim, swimming regularly, and swimming as a part of daily community life can have considerable health and wellbeing benefits. For instance, research has identified that any amount of swimming participation compared to those who engaged in none was associated with a 28% and 41% reduction in all-cause and cardiovascular disease cause mortality respectively. The striking evidence of where swimming has afforded significantly improved health, quality of life and a sense of community are additional examples of best practice that need to be promoted across the nation.

And it is evident that water-based exercise can confer several specific advantages, as compared to land-based exercise. For this reason, water-based exercise prescription should be a key consideration for all health care clinicians, providers and commissioners.

It is also emphasised that having adequate opportunities to learn to swim and have positive experiences in early life, particularly among those from disadvantaged backgrounds, may be an important step to tackle drowning as one of the causes of avoidable and tragic death.

It is estimated that those who swim for recreational or competitive purposes are eight times more likely to meet physical activity guidelines. Long-term swim training can also improve cardiorespiratory fitness or endurance in healthy pre-pubertal girls and adults, women during pregnancy, children with asthma, and adults with osteoarthritis (a condition affecting joints, causing pain and stiffness).

It is however concerning to find in many areas a profound lack of robust scientific evidence in swimming as a contemporary means to: increase physical activity levels, move the inactive into swimming as a preferred physical activity, and to use a variety of community swimming venues to promote health and wellbeing at population levels.

This report is just the start of a focus on swimming being a greater part of the national and international picture to increase health and wellbeing through physical activity, leisure and water-based sports.

The full scientific report of the commission is divided into seven chapters. Each chapter contains a review of the evidence for the health benefits of swimming together with key points and summary statements. Chapter one focuses on the individual health benefits of swimming and other water-based activities. Swimming and mental health and wellbeing is covered in chapter two. The physiology of swimming and health benefits is detailed in chapter three. Chapter four explores the evidence for swimming benefits for communities within a framework of delivering community capacity. Chapter five details the public health benefits of swimming and the importance of fulfilling key societal priorities such as reducing the number of deaths by drowning. Chapter six describes the benefits of swimming as a sport and the final chapter seven looks at the economic case for swimming. This summary of the full report identifies the key highlights of each chapter of the main report.

Chapter one

The individual physical health benefits of swimming:

a literature review by Dr Fiona Moffatt

Introduction

The global pandemic of physical inactivity is well recognised with concomitant implications for global health. In the United Kingdom (UK), a significant proportion of children, adolescents and adults fail to meet the national recommendations for physical activity:



90%
of 2-4 year olds



80%
of 5-15 year olds



39%
of adults

Similar patterns are seen globally

The cost of such physical inactivity is high – globally, the economic burden of physical inactivity in terms of healthcare costs, productivity losses and disability adjusted life years amounts to £51.5 billion per annum.

An intimate relationship exists between physical (in)activity and physical health. Sedentary behaviour is associated with adverse cardiometabolic adaptations such as insulin resistance, altered lipid trafficking, muscle fibre type alteration and ectopic fat storage. Poor cardiorespiratory fitness/physical inactivity is a significant risk factor for the majority of non-communicable diseases (NCDs), including cardiovascular disease, dementia, certain cancers, osteoporosis, obesity and type 2 diabetes. It is also the strongest independent risk factor for development of post-operative morbidity and mortality.

A multi-agential approach to promoting physical activity has been highlighted as imperative to the promotion of national and international physical activity (PA) guidelines. These guidelines detail the recommended amount of physical activity required to achieve physical health benefits for young children (at least 180 minutes per day), children aged 5 and over (at least 60 minutes per day), and adults (at least 150 minutes of moderate intensity activity per week, plus two episodes of strength/balance training). Physical activity may be multi-modal, including activities such as walking, jogging/running, aerobics, racket sports, swimming, cycling. Adults who are physically active have a reduction in all-cause mortality of up to 30% compared to sedentary individuals and a reduced risk of developing chronic diseases. Furthermore, evidence suggests that physical activity and exercise interventions produce similar results to drug therapy in terms of mortality outcomes in the secondary prevention of coronary heart disease, rehabilitation post-stroke, treatment of heart failure and prevention of diabetes.

This chapter presents a contemporary review of the empirical evidence in relation to swimming and aquatic exercise, and physical health. Specifically, it elucidates how swimming/aquatic exercise influences the physical health of the general population and, additionally, certain specific sub-groups or those with chronic disease.

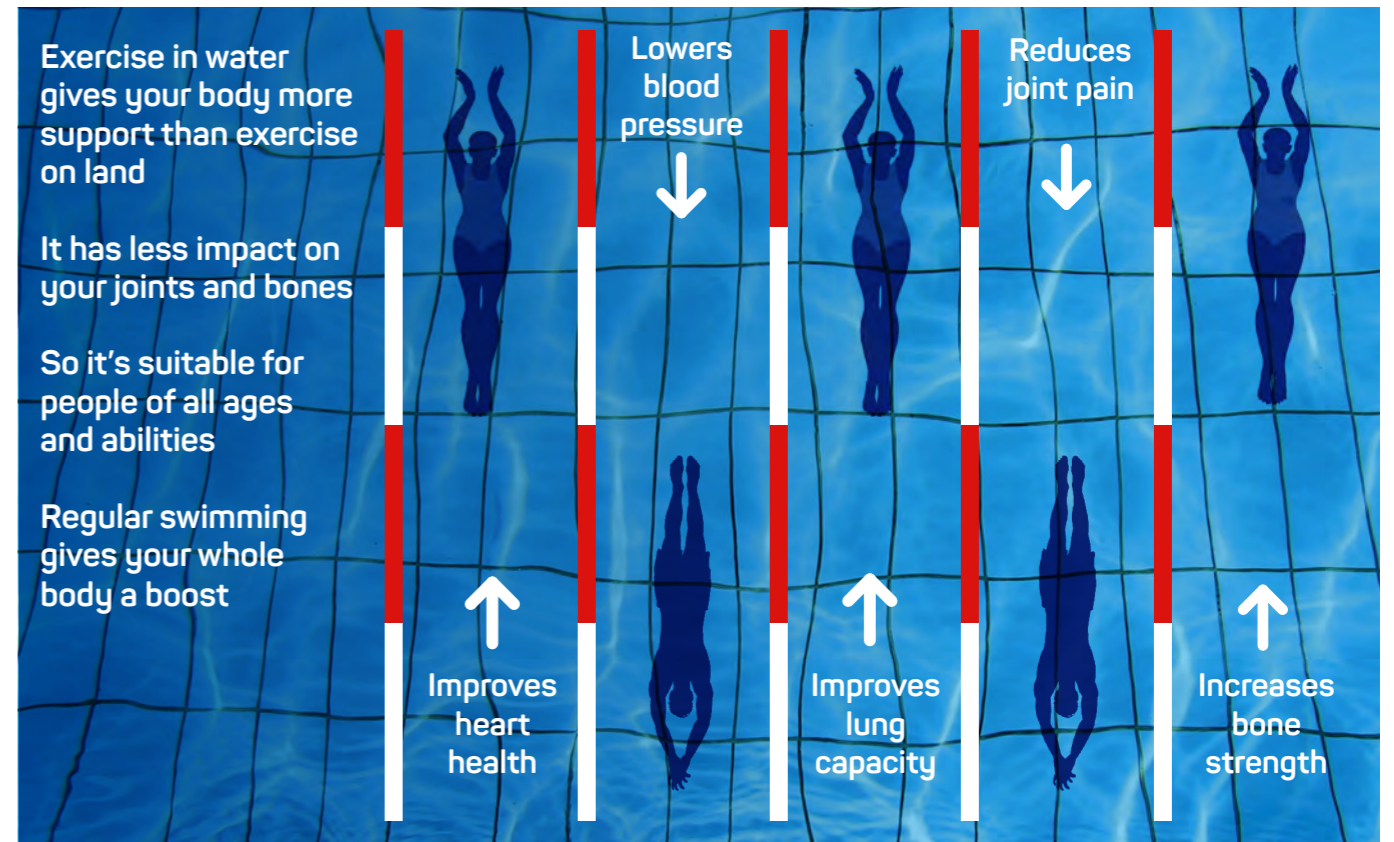
Summary

As one of the most popular modes of physical activity, swimming/aquatic exercise confers significant physical health benefits for both healthy individuals and those with disease. Furthermore, these health benefits extend across the entire life-course – from foetus through to the frail elderly.

Whilst there is a large body of literature considering aquatic exercise per se, there is relatively much less exploring the effects of swimming as a unique activity. It is imperative that this is addressed in future research, particularly given the compelling evidence presented that swimmers demonstrate lower all-cause mortality rates, and reduced incidence of falls in later life.

The unique nature of the aquatic environment as a medium for exercise and physical activity has been comprehensively described in Chapter 1. What is evident is that water-based exercise can confer a number of specific advantages, as compared to land-based exercise. As an environment that offers reduced weight-bearing stress, higher humidity levels, decreased heat load and a greater margin of therapeutic safety in terms of falls-risk, swimming/aquatic exercise is extremely well-placed to safely and effectively meet the needs of a wide range of individuals, in both the treatment and prevention of physical health issues.

Swimming is low in impact, but high in reward



Specific recommendations:

Water-based exercise prescription should be a key consideration for health care clinicians, providers and commissioners.

Many of the studies presented have methodological limitations – future studies of swimming and aquatic therapy should ensure larger sample sizes and land-based exercise as comparators, especially where exploring the effect on modifiable risk factors.

A research focus on programme intensity, frequency and design for optimal physical health benefits, as well as longer-term effectiveness, would be of significant value for clinical and public health arenas.

Chapter two



The wellbeing benefits of swimming:

a systematic review by Dr Brendon Stubbs
and Professor Ian Cumming

Introduction

There is an increasing recognition of the importance of maintaining and promoting the wellbeing of individuals within society and the entire lifespan.

With unprecedented changes in global demographics including the fact people are living longer, yet with more years of disability and an increasing number of mental health problems across the lifespan, the need for strategies to maintain and improve wellbeing are fundamental for individuals and the communities they reside.

The World Health Organisation (WHO) state that promoting wellbeing across the lifespan should include a multitude of factors including tackling poverty, food and water shortages, appropriate management of disease, infrastructure and lifestyle behaviours. Set within this context is the growing realisation that physical activity, sport, leisure and exercise can play an integral role in achieving the wellbeing agenda.

In the wider physical activity literature, there is an abundance of evidence demonstrating that physical activity and exercise positively influence wellbeing. For instance, physical activity, including outdoor fitness programmes and exercise has been shown to improve social and emotional wellbeing among youth who may be at risk of poor mental health outcomes. A landmark study published in *The Lancet* conducted among 2,223 boys and 2,838 girls aged 16 demonstrated that vigorous participation in sports was positively associated with emotional wellbeing. Moreover, physical activity has been shown to positively improve the wellbeing of specific groups such as veterans with post-traumatic stress disorder, people with depression, people in prison and young people using wheelchairs. At the other end of life's spectrum, a previous systematic review found that two sessions of exercise a week for 45 minutes can significantly improve the wellbeing of older people. Moreover, the authors indicated that there was evidence of an incremental cost-effectiveness ratios (compared with minimal intervention) of £7,300 and £12,100 per quality adjusted life year gained for community-based walking and exercise programmes, respectively.

Swimming remains one of the most popular forms of physical activity across the world and may offer a unique opportunity to promote, maintain and improve wellbeing across the lifespan, with potential to reach all individuals of society, regardless of gender, age, disability or socioeconomic status.



Summary

There is growing recognition that exercise can cross many boundaries and meet the wellbeing needs of the population from the cradle to the grave.

However, there is a dearth of research specifically considering the wellbeing benefits of swimming among the general population. The literature is also incredibly difficult to locate due to poor indexing in electronic databases. To date, the literature considering the wellbeing benefits of swimming in the general population is largely circumstantial and relies on “leaps of faith” drawing from indirect inferences from the general benefits of physical activity and exercise.

There is however promising evidence that aquatic exercise can improve quality of life in people with osteoarthritis, some other musculoskeletal disorders and people after cancer. There are several important initiatives happening (for example Dementia Friendly Swimming) and it is essential that this is accompanied by robust evaluation, so that further opportunities to demonstrate the value of swimming are not missed.

Swimming is good for health and wellbeing, whatever your age

<p>3+ Months</p>		<p>18+ Years</p>		<p>65+ Years</p>
<p>It helps children develop more quickly:</p> <p>Helping them get to grips with key skills like walking, talking and counting, faster</p>		<p>It helps adults keep on top of their mental health:</p> <p>Helping reduce stress and anxiety, and improving their quality of life</p>		<p>It helps older people stay mentally agile:</p> <p>Helping slow the decline of things like memory that can often happen as we age</p>

Specific recommendations:

There is an urgent need to investigate why there is a drastic haemorrhaging in the numbers of people swimming in general and in the transition from childhood to adulthood.

Investment in research is required to investigate the wellbeing benefits of swimming across the lifespan in the general population, with a focus on mental health, emotional health and subjective wellbeing. Understanding and relaying this information may potentially help participation with the considerable public interest in the wellbeing value of specific activities. More research is particularly required to consider the wellbeing benefits of swimming on people with mental health conditions, people with learning disabilities (including Down’s syndrome), older adults with and without dementia and other ostracised groups such as black and minority ethnic groups, homeless people and those who are isolated and identified as being lonely.

Targeted pragmatic evaluations of “hot” initiatives, such as the dementia friendly swimming, are required to document potential improvements in wellbeing. This could also include addressing social inequalities and promoting participation among ostracised groups such as the homeless, migrants and vulnerable children and adults at risk of poor wellbeing and health.

Chapter three

The physiological effects of swimming:

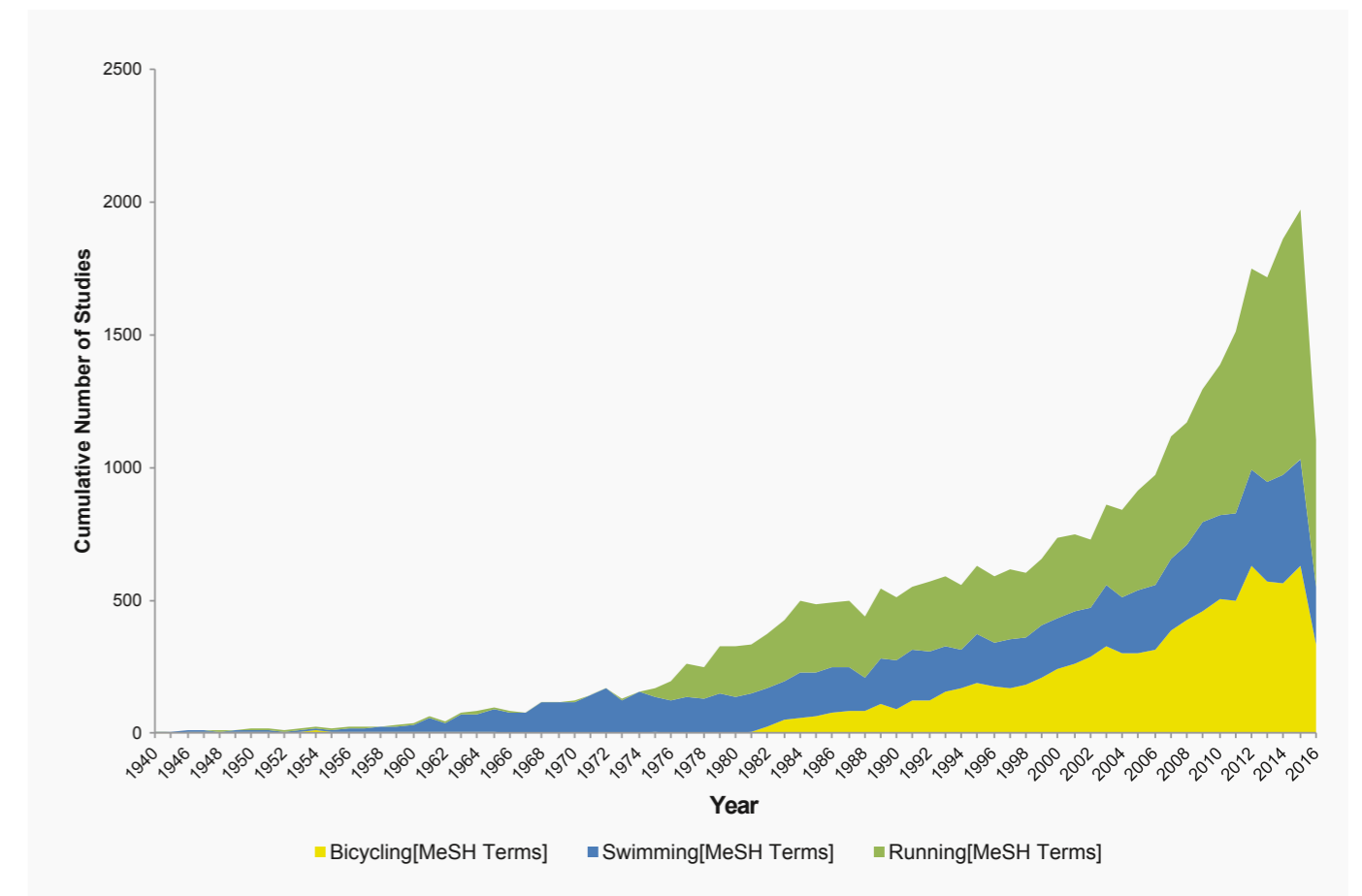
a systematic review by Dr Ian Lahart
and Professor George Metsios

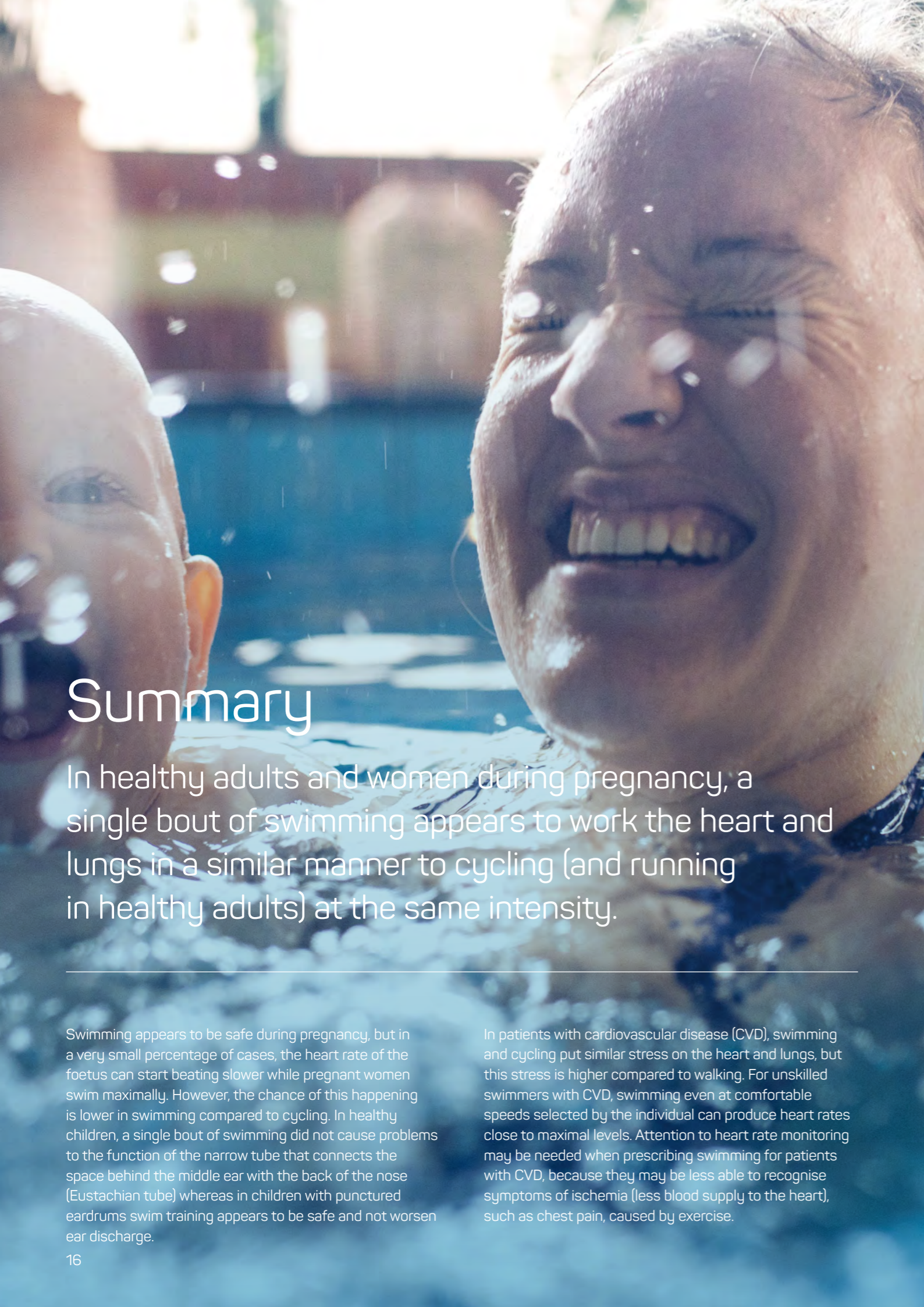
Introduction

Over the years, there have been fewer studies on swimming compared to running and cycling (see Figure 1). Knowledge of the physiological effects of single swimming bouts and long-term swim training is important to a) explain how these changes take place in the body, b) produce and deliver safe and effective exercise prescription, and c) identify individuals that may benefit most from swimming or require modifications or supervision, and those for which it may be not be recommended.

Figure 1.

The number of published studies per year on cycling, swimming, and running from 1940 to 2016





Summary

In healthy adults and women during pregnancy, a single bout of swimming appears to work the heart and lungs in a similar manner to cycling (and running in healthy adults) at the same intensity.

Swimming appears to be safe during pregnancy, but in a very small percentage of cases, the heart rate of the foetus can start beating slower while pregnant women swim maximally. However, the chance of this happening is lower in swimming compared to cycling. In healthy children, a single bout of swimming did not cause problems to the function of the narrow tube that connects the space behind the middle ear with the back of the nose (Eustachian tube) whereas in children with punctured eardrums swim training appears to be safe and not worsen ear discharge.

In patients with cardiovascular disease (CVD), swimming and cycling put similar stress on the heart and lungs, but this stress is higher compared to walking. For unskilled swimmers with CVD, swimming even at comfortable speeds selected by the individual can produce heart rates close to maximal levels. Attention to heart rate monitoring may be needed when prescribing swimming for patients with CVD, because they may be less able to recognise symptoms of ischemia (less blood supply to the heart), such as chest pain, caused by exercise.

In healthy children and adolescents, single swimming bouts may reduce the body's ability to respond to oxidative stress (which can cause cell damage), however, repeated swim training may actually improve the body's defences against oxidative stress. Long-term swim training can also improve cardiorespiratory fitness or endurance in healthy pre-pubertal girls and adults, women during pregnancy, children with asthma, and adults with osteoarthritis (a condition affecting joints, causing pain and stiffness). Although swim training may improve lung function in healthy adults and adults with asthma, for children with asthma or cystic fibrosis the evidence is less clear. Specifically, swim training can improve asthma severity and symptoms in children with asthma but only a small number of studies have found improvements in lung function tests in children and adolescents with asthma. In contrast, swimming can improve disease signs and symptoms in children with cystic fibrosis.

Long-term swim training may also improve systolic blood pressure in adults with abnormally high blood pressure (hypertension), but blood pressure may not change in healthy adults, women during pregnancy, and individuals with osteoarthritis that have normal blood pressure. Swim training may increase muscle strength in healthy adults and older adults with osteoarthritis, but may only modestly reduce body weight and body fat and increase muscle mass in healthy children, adolescents, and adults, pregnant women, and individuals with hypertension or osteoarthritis.

Swim training studies have also reported improvements in measures of heart and blood vessel function, and how sensitive the body is to the effects of insulin in adults with hypertension, and blood vessel function in older adults with osteoarthritis. However, swim training may not improve how strong the bones are in participants with hypertension, blood vessel structure in individuals with osteoarthritis, or aspects of how the respiratory system produces speech in individuals with Down's syndrome.

The majority of findings are from low quality, small, limited range population studies, which did not randomise participants into swimming and non-swimming groups. Therefore, it is difficult to make general recommendations based on the evidence. Most eligible studies were at a high or unclear risk of several errors that could influence the degree to which the effects can be attributable to swimming. There is a need for better designed short-term and long-term swimming studies. Future studies should compare swimming to other popular types of exercise (e.g., running and cycling) in children, adolescents, adults, pregnant women, and individuals with non-communicable disease, such as cystic fibrosis, type 1 or 2 diabetes and related conditions, CVD, cancer, and arthritis.



Chapter four

The wellbeing benefits of swimming to communities:

a literature review by Dr Fiona Moffatt

Introduction

It is acknowledged that a critical strategy in the fight to improve population health and wellbeing is to focus on communities. This is of particular relevance when considering the social determinants of health and community health disparities.

Indeed, the complex and multi-faceted nature of community wellbeing has been implicated in the relative under-performance of individual-oriented strategies in reducing health inequalities. The contention here is that many traditional health promotion approaches have been overly reductionist in nature, focusing upon the development of replicable programmes, aimed at individual outcomes across (notionally) homogenous populations, thereby obfuscating the representativeness of the community setting. As an alternative, approaches that operate at the community level capitalising upon, or further developing, the pre-existing social and human capital of a community, as well as its immanent organisational resources, may be used as leverage to identify and solve collective problems, and ameliorate wellbeing.

Central to this proposition is the notion of community capacity. In general terms, community capacity is defined as all activities, resources and infrastructures that support individual community members to take effective action and lead community development. As such, it is both an antecedent requirement for supporting community health and wellbeing, and the end-product of community-level interventions.

The role of sport as a vehicle for the promotion of physical, mental and social health within communities is increasingly advocated. Development through sport utilises sporting participation as a means of facilitating individual and societal progress. Indeed, sport, as a critical constituent of community and social development programmes, has been demonstrated to strengthen education, improve public health, address community safety, promote inter-cultural exchange and augment social cohesion/inclusion. The intent of this chapter therefore is to consider the efficacy of swimming, as a community based sport, in contributing to community capacity.

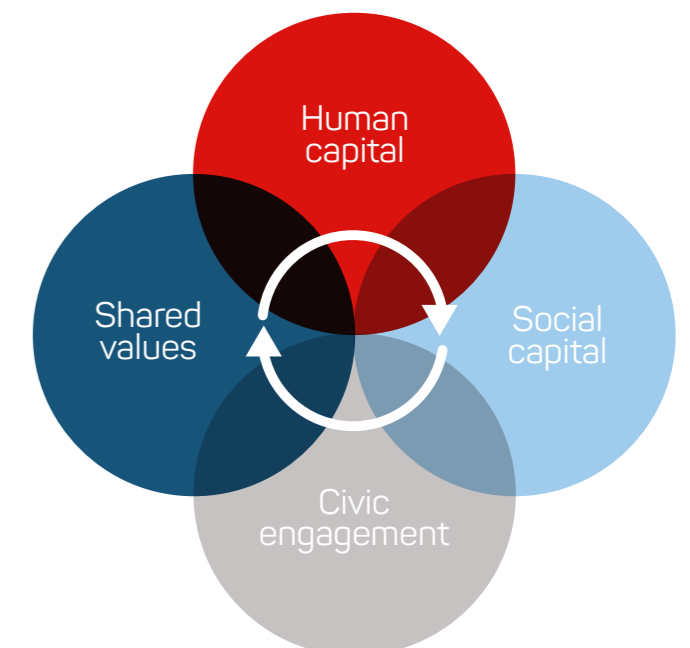
Community Capacity

The concept of community capacity has been of interest across a diverse range of disciplines, it is not the sole remit of health and wellbeing. Nonetheless, community capacity is intimately linked to The World Health Organisation's (WHO) expanded definition of health that acknowledges the criticality of controlling health determinants, and incorporates social and personal resources in addition to physical capacities.

As an evolving construct, there has been significant research endeavour aiming to develop or define the key characteristics or criteria of community capacity. This chapter describes a number of dimensions of community capacity that represent the greatest degree of consensus across researchers.

These dimensions have been used to inform the theoretical framework for this chapter (Figure 1), and will be reflected on in turn, specifically considering how swimming may influence each one. Two case studies are included as examples of best practice.

Figure 1.
Key dimensions of community capacity



Case study 1



A multi-agential community sport development case study of swimming and drowning

The following case study describes one proposal for 'Memphis Swims Now', a community-based programme designed in response to the fatal drowning of two black youths in municipal pools

The focus of the programme was not on elite or competitive swimming, rather swimming as a basic life skill, and as an opportunity to interact with other young people in a safe and sociable environment. The programme was to be delivered in a centrally-located pool to minimise travel constraints. A local children's hospital volunteered additional transportation. The Parks and Recreation department employed black swimming instructors to ensure that coaches shared the same ethnic background as the majority of the participants. A local faith-based organisation offered to support the marketing of the programme. Whilst word-of-mouth promotion was felt to be a particularly effective way of disseminating information, it was also believed that parents and guardians would be more open to the programme given their pre-established trust in the faith organisation. The programme designers recognised the critical role that parents/guardians would play in the youths' willingness to try swimming as a new activity.

Social support and interaction were the key features of the programme intended to ensure retention of the participants. The coaches would offer personalised instruction to each swimmer based upon an initial assessment. Attendance and application would be awarded in an informal ceremony involving food and music at the mid-way and endpoint of the programme.

Family and friends would be invited to celebrate the successes, with the intention that this would constitute further social reinforcement. Journalists would also be invited to profile 'Memphis Swims Now' in the hope of transforming the cultural associations black residents had previously formed with regards to open water and swimming. A monthly newsletter would also be created detailing the programme's history, the benefits of swimming, etc.

A final element of the programme was to ensure that there was a dedicated time for unstructured play. This component was deemed essential in avoiding boredom with swimming drills, but also an opportunity to practise swimming skills in a fun and sociable way, fostering stronger friendships with other participants.

Case study 2



Jean's Story

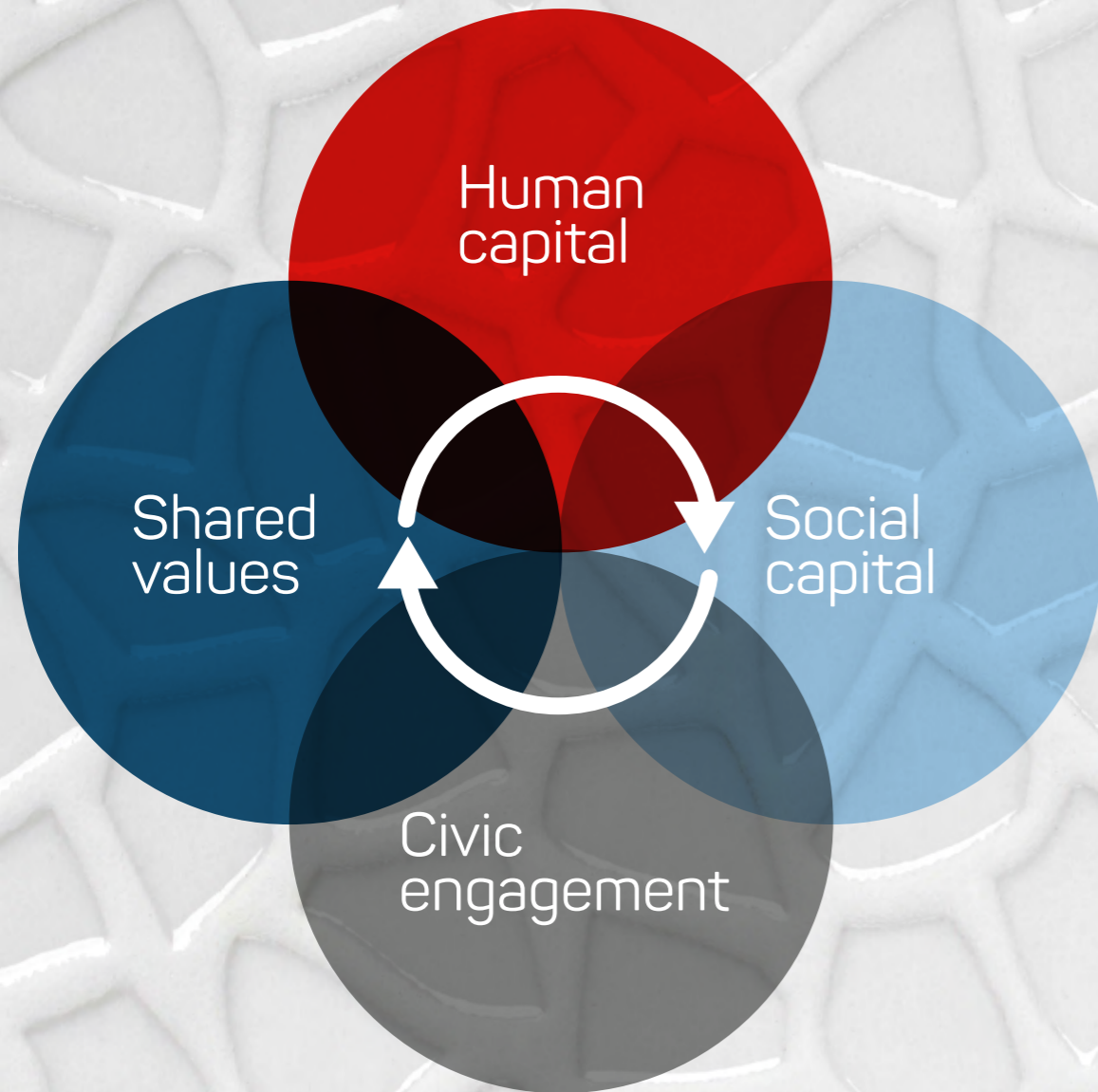
Jean, 80, is a full-time carer for her elderly husband who is confined to a wheelchair.

Jean attends the weekly ladies' swim session at her local community pool – she enjoys meeting the other swimmers who come from very diverse backgrounds, and chats whilst they are in the pool and on poolside. Most weeks, she will stay and have coffee with a number of the other swimmers after the session. She values these informal 'friendships' and claims that it is this stimulating social contact which allows her to cope with the care-giver burden that she increasingly experiences.

Jean recently had to undergo surgery – as a consequence she missed six weeks of swimming. On the second week, the swimmers and pool staff noted Jean's absence and became concerned. Using membership records they traced a telephone number for one of Jean's family and made contact to check on Jean's wellbeing.

This case highlights how Jean accesses the social capital of the swimming community as a resource to improve her wellbeing and deal with the challenges of her daily life. The swim group has permitted her to cultivate new friendships and associations across class and ethnic barriers. Furthermore, the social network in which Jean is involved (by virtue of her swim participation) generates a valuable community 'connectedness', thereby extending the framework of support for an elderly community-dwelling lady.

Summary



Human capital:

community capacity is enhanced by the development of human capital in terms of aquatic skills, a culture of water safety and, potentially, a range of transferable life-skills that are associated with swimming participation. These skills are highly valued by community stakeholders. Such human capital however, is highly influenced by several demographic factors, not least of all ethnicity and race. Programmes aiming to engender this form of human capital should be attentive to the socio-cultural and socio-political characteristics of the community.

Social capital:

whilst swimming might be conceptualised as an individual sport, pool-based activities such as swimming clubs and exercise classes have been demonstrated to develop meaningful social networks (for participants and others) that have the potential to generate social capital and thereby bolster community capacity. The research base specific to social capital and swimming/aquatic exercise is however limited. Future empirical work should consider how swimming organisations can best promote social interaction in their facilities and programmes, for example greater use of group activities, unstructured components in training sessions, parallel social activities or the role for social media.

Civic engagement:

this is a critical dimension of community capacity because it defines the extent to which community members will engage with issues of public concern, and therefore is indicative of the potential leverage for health and community wellbeing improvement. Swimming facilities, as valued community assets, have incited significant civic participation, especially when they have come under the threat of neo-liberal policy. A paradigm shift whereby community collectives become not just the campaigners but subsequently the 'owners' of community pools is apparent. Future empirical work should be attentive to the ability of such social enterprises to influence community capacity.

Shared values:

research suggests that swimming has the potential to promote opportunities for social inclusion and cultural enrichment within community settings, however economic and socio-cultural factors are likely to influence the relative effectiveness and efficiency of swim participation programmes. Organisations should be cognisant of this complex array of influences in the design of such programmes. Co-production of social inclusion programmes may be a promising method for improving swim participation. physical health benefits, as well as longer-term effectiveness, would be of significant value for clinical and public health arenas.



Chapter five

The public health benefits of swimming:

a systematic review by Dr Brendon Stubbs

Introduction

Given the plethora of evidence for physical activity and sport on health and wellbeing, numerous international and national initiatives have been developed stressing the importance of promoting physical activity.

Many of these guidelines make recommendations regarding the amount and intensity of physical activity that different populations should seek to achieve. For instance, in their initiative "Everybody Active Everyday", Public Health England recommends that adults participate in 150 minutes of moderate-vigorous physical activity respectively per week. Swimming may be uniquely placed and have a pivotal role to help everybody to be active every day from the cradle to the grave. Specifically, swimming is an activity that people can participate in regardless of age, ethnicity, gender and culture and may offer a unique strategy for people to engage in a meaningful activity. In addition, a recent large study among 80,306 British adults, the authors found that any amount of swimming participation compared to those who engaged in none, was associated with a 28% and 41% reduction in all-cause and cardiovascular disease cause mortality respectively. Thus, there is promising evidence that swimming may help reduce premature deaths due to inactivity. Another core public health concern is the prevention and management of obesity. Given that physical activity is central to addressing the obesity epidemic and swimming is a robust form of energy expenditure, the potential for swimming to address this public health priority is considerable.

Swimming may also be uniquely placed to provide public health benefits given the fact it remains a popular form of physical activity. A recent meta-analysis of worldwide global sport and leisure activities demonstrated that swimming was consistently rated in the top five leisure participated physical activities in children and adolescents across Africa, Eastern Mediterranean, Western Pacific, Americas and Europe. However, in adulthood, the same meta-analysis found that swimming was only in the top five commonly participated physical activities in the Eastern Mediterranean and Western Pacific. Swimming remains very popular in England, with national data in England from the Active People Survey by Sport England 2016 demonstrating that between October 2015 and September 2016, 2,516,700 people aged 16 years or older reported swimming (including all swimming and diving), water polo, deep water swimming, open water swimming, deep water diving) at least once a week. However, the same report found that numbers engaging in swimming are just over 750,000 fewer than ten years earlier, which is clearly a concern. Taken together, it appears that swimming is universally popular in adolescence and childhood, but that participation numbers are declining, with the transition from childhood to adulthood a critical window. The precise reasons for this relationship are unclear and warrant investigation as a matter of priority to inform interventions to prevent this potential missed opportunity.

Swimming may also play a key role in addressing another important public health concern, drowning, which remains the leading cause of death in the United States in children and adolescents and disproportionately affects those who are non-Caucasian. In 2013 there were 381 deaths in the United Kingdom attributed to drowning and having adequate opportunities to learn to swim, may provide an important strategy to tackle potential avoidable deaths due to drowning.

Despite the popularity of swimming, there is a notable paucity of evidence investigating the public health benefits.



Summary

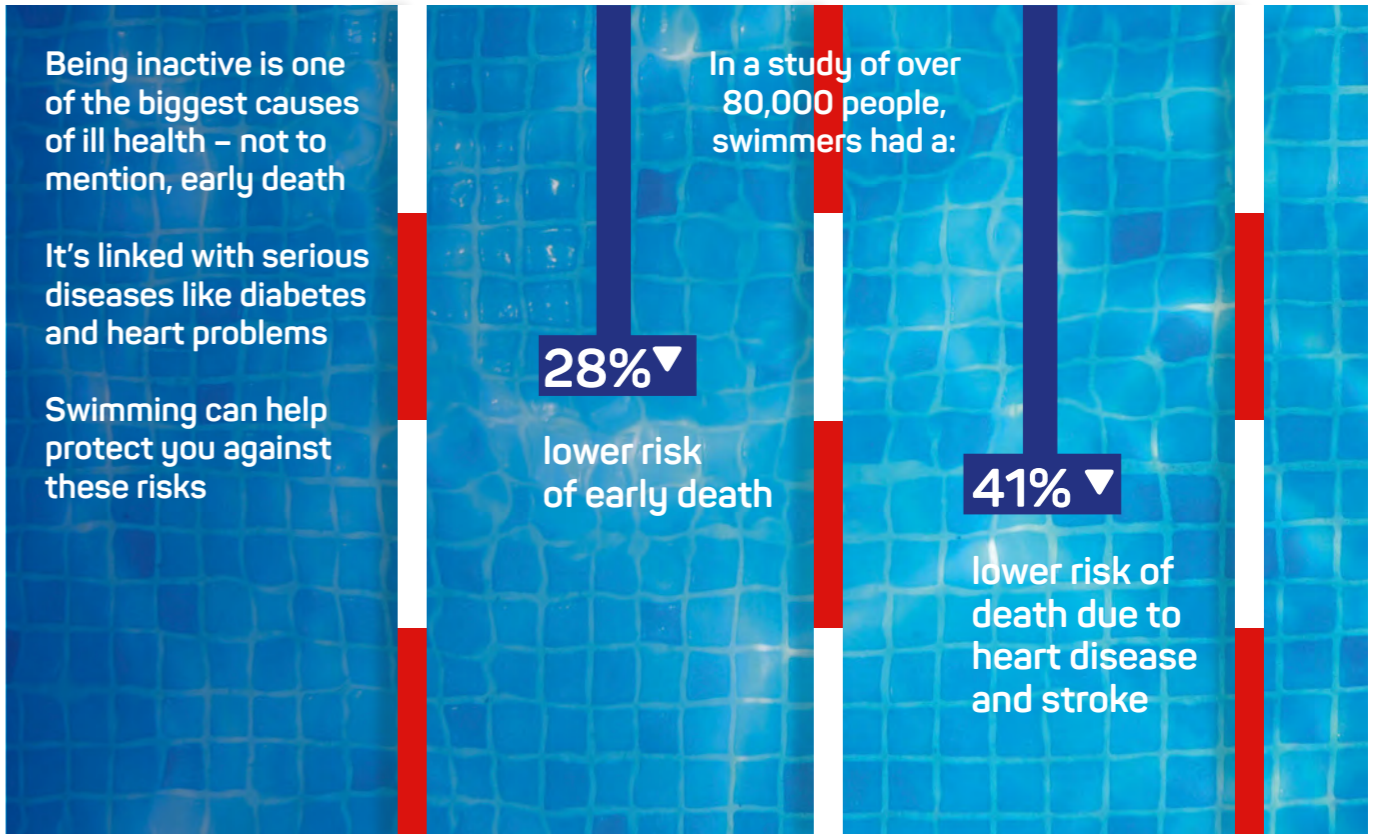
Overall, the evidence base for the public health benefits of swimming is very limited and the evidence that is available is of remarkably poor quality, precluding any firm conclusions being made.

Specifically, in key public health priorities such as addressing the obesity epidemic, increasing physical activity or preventing drowning, there is limited evidence of the benefits of swimming.

However, there is insufficient evidence to suggest that swimming in childhood is associated with worse respiratory health (for example asthma) or poor bone health (in later life). There is some tentative evidence that providing free swimming pool access may increase swimming participation, particularly among those from disadvantaged backgrounds.

There is also some tentative evidence that swimming may potentially reduce the risk of earlier death compared to people who are more sedentary or men who engage in walking or running.

Swimming is one simple way to boost your life expectancy



Specific recommendations:

Investment is required for research to consider how swimming initiatives, such as free swimming, can help increase physical activity participation and help address social determinants of health. Such initiatives should specifically consider and target key groups, such as increasing physical activity among young females and swimming participation among those from lower socioeconomic status or black and ethnic minority groups.

Future research is urgently required to consider how swimming can play a role in public health priorities, such as addressing the obesity epidemic in youth and across the lifespan.

Future research is required to more broadly capture the public health benefits of swimming – including key areas such as increasing physical activity, wellbeing, mental health and reducing the risk of drowning.

Future research in older age may wish to consider how swimming and aquatic exercise may help improve balance and reduce falls risk.



Chapter six

Swimming as a sport, the health and wellbeing benefits:

a systematic review by Dr Gary O'Donovan,
Dr Adam Loveday and Dr Dale Eslinger

Introduction

Sport England recognises swimming as a sport, including the disciplines of diving, long distance swimming, open water swimming, synchronised swimming, and water polo.

Sport England does not distinguish between swimming as a sport and swimming as a disability sport. Evidence of the benefits of swimming and its disciplines was included in this review if competition was clearly involved. Competition is an integral component of sport and evidence was not included if competition was not clearly involved.

Swimming is exercise when it does not involve competition. This chapter is about the health and wellbeing benefits of swimming as a sport. It also includes a commentary on emerging technology for swimmers.

Summary

Almost 70,000 people take part in swimming competitions in England.

Swimming is clearly a popular sport but there is little scientific evidence of the health and wellbeing benefits of swimming.

There is no experimental evidence of the health and wellbeing benefits of swimming as a sport.

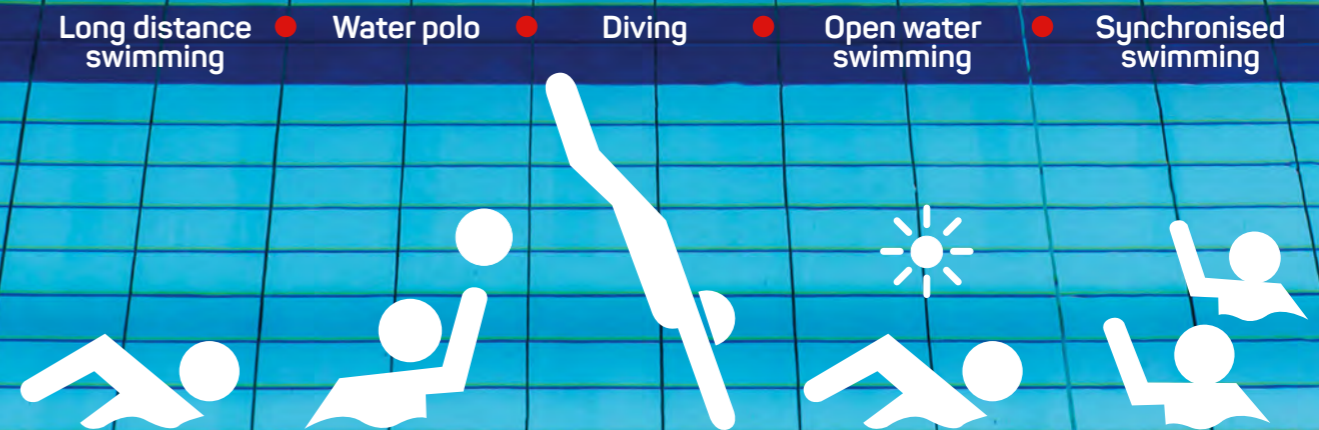
There is observational evidence that chronic disease risk factors are better in masters swimmers than the general population (evidence type: C; evidence strength: 2)
There is observational evidence that physical fitness, or the ability to perform physical activity, is high in masters swimmers (evidence type: C; evidence strength: 2)

We would recommend that the national swimming bodies together with the academic community consult with swimmers, swimming clubs, schools, local government, national government and other stakeholders to identify important research questions relating to swimming as a sport and the health and wellbeing benefits.

The UK government has said that it will change the way sport is funded, so that, "It is no longer merely about how many people take part, but rather how sport can have a meaningful and measurable impact on improving people's lives". Therefore, it is imperative that the health and wellbeing benefits of swimming as a sport are investigated without delay.

A wealth of ways to swim, a wealth of ways to benefit

Water is the perfect environment to get active and feel the benefits for body and mind, whether it's:





Chapter seven

Swimming for health and wellbeing:

the economic case by Dr Nana Anokye, Dr Glenn Stewart, and Dr Subhash Pokhrel

Introduction

Swimming is a healthy, non-weight bearing physical activity that can be undertaken by almost anyone.

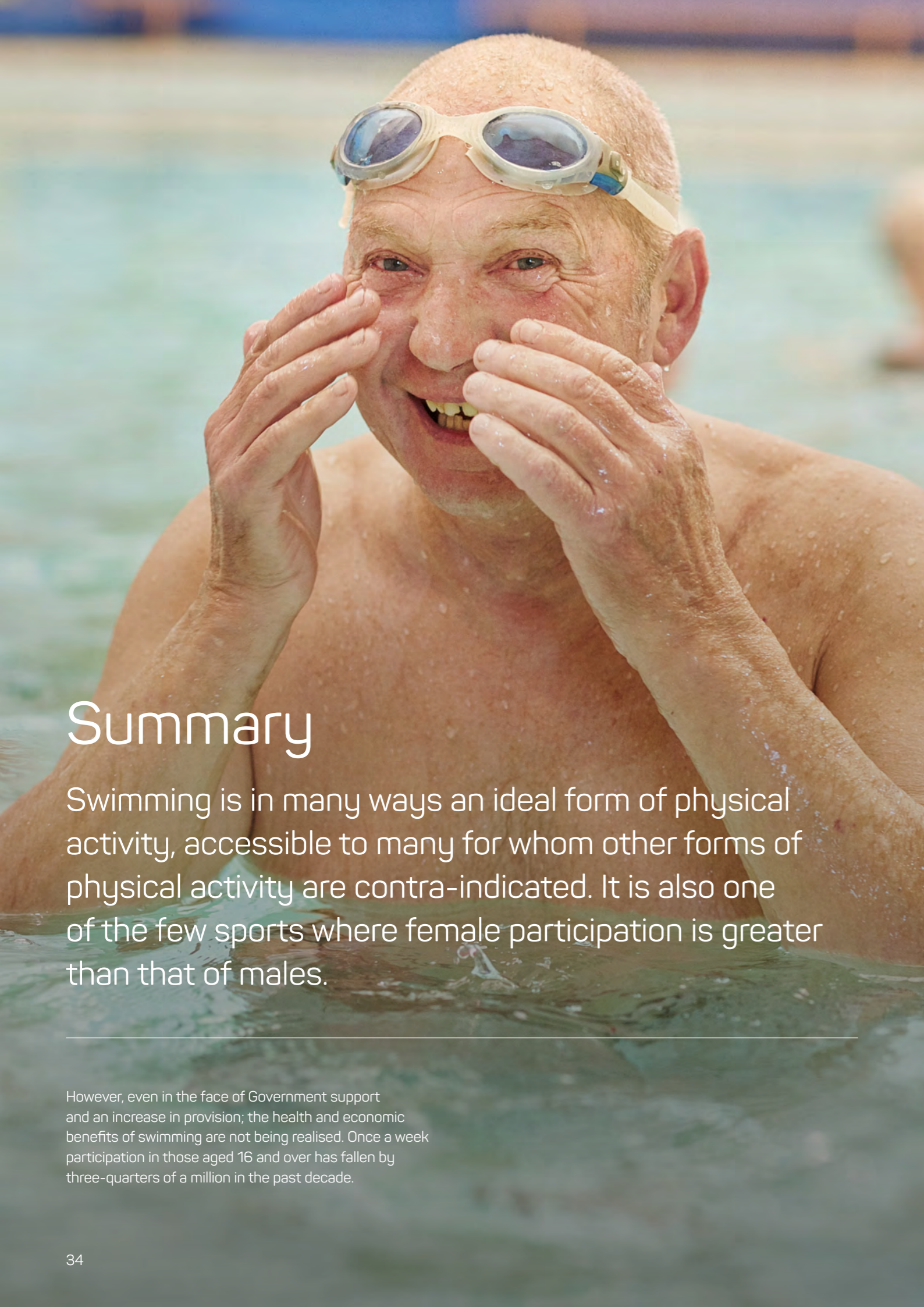


2.5

Indeed, despite a dramatic decline in popularity since 2005, in England, in the year to September 2016 some 2.5 million people aged 16 and over (5.67%) reported swimming once a week for at least 30 minutes.

This chapter presents an economic case for swimming and aims to (a) demonstrate the potential of swimming in contributing to meeting physical activity recommendations, and (b) outline the evidence of interventions designed to increase swimming participation and their value for money.

million



Summary

Swimming is in many ways an ideal form of physical activity, accessible to many for whom other forms of physical activity are contra-indicated. It is also one of the few sports where female participation is greater than that of males.

However, even in the face of Government support and an increase in provision; the health and economic benefits of swimming are not being realised. Once a week participation in those aged 16 and over has fallen by three-quarters of a million in the past decade.

Swimming is an activity that almost anyone can take part in



of the NHS budget goes on chronic diseases like diabetes and heart disease



Reasons for this are unclear; there is evidence that entrance pricing may maintain and / or increase participation in some populations but it is evident that the swimming 'offer' is failing to resonate with an increasing proportion of the population. If the Swim England vision of 'more people learning to swim, more people swimming regularly and more medals on the world stage' is to be realised then further work is needed to understand how to ensure that swimming continues to be the nation's most popular sport. Indeed, there is a notable lack of research into swimming uptake, maintenance and drop out across all populations including those that might benefit most. This includes those aged 17 – 59 i.e. those who might be expected to comprise most the swimming population. There is little evidence of learning from international best practice or indeed other sports such as athletics which has increased participation by 50% since 2005.

We estimate that those who swim for recreational or competitive purposes are eight times more likely to meet physical activity guidelines.

Given the large capital costs of building the 5,000 pools in England and very limited cost-effectiveness evidence on swimming interventions, more economic analyses on the costs and benefits of swimming are required. Future cost-effectiveness studies therefore will help decision makers to justify such investment and, more importantly, encourage further resource allocation in this ideal form of PA. Learning from existing economic analyses, it is important that future cost-effectiveness analyses should consider incorporating: (a) long-term health effects and healthcare costs; (b) wider outcomes, e.g. productivity benefits and benefits seen in other sports when used as a diversion from crime; and (c) adverse effects. These analyses should consider a trajectory that would allow explicit consideration of changes in activity levels over time. Future pragmatic/clinical trials and other types of studies evaluating swimming interventions should include economic analyses. The focus of such studies should be to establish what works (type of interventions), in which populations, in addition to demonstrating the short, medium and long-term value for money of various swimming interventions.

Sources of further information and support

Swim England

www.swimming.org/swimengland

Swim England Strategy 2017-2021

www.swimming.org/swimengland/swim-england-strategy

UK physical activity guidelines for all ages

www.gov.uk/government/publications/uk-physical-activity-guidelines

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Chapter 1

The individual physical health benefits of swimming: a literature review.
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Chapter 2

The wellbeing benefits of swimming: a systematic review.
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Kings College London and Professor Ian Cumming, Chair of Swim England Commission.

Chapter 3

The physiological effects of swimming: a systematic review.
Dr Ian Lahart and Professor George Metsios, The University of Wolverhampton.

Chapter 4

The wellbeing benefits of swimming to communities: a literature review.
Dr Fiona Moffatt, The University of Nottingham.

Chapter 5

The public health benefits of swimming: a systematic review.
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Chapter 6

Swimming as a sport, the health and wellbeing benefits: a systematic review.
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Chapter 7

Swimming for health and wellbeing: the economic case.
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The authors acknowledge the support from Swim England in the creation of this report.

This report has been commissioned by the Swimming and Health Commission on behalf of Swim England.