Technical Report

Physical Activity Guidelines in the UK: Review and Recommendations

Appendices

May 2010

BHF National Centre physical activity+health

Loughborough University

Contents

Appendix 1: Meeting Schedule

Consultation Meeting Schedule – Day 1

11.30-12.30pm	Arrival and registration *(Light lunch provided)*
12:30pm	Meeting opens (Chair: Professor Fiona Bull) Welcome by Department of Health and opening address by WHO Headquarters Background outline of process and housekeeping
1:30pm – 5:00pm	Chair: Professor Fiona Bull Presentations from Expert Working Groups
 1.30 – 2.00pm 2.00 – 2.30pm	**1. Adult Population** Presentation Plenary Q&A
2.30 – 2.40pm	*Refreshment Break*
 2.40 – 3.10pm 3.10 – 3.40pm	**2. Older Adult Population** Presentation Plenary Q&A
3.40 – 3.50pm	*Refreshment Break*
 3.50 – 4.20pm 4.20 – 4.50pm 4.50 – 5.20pm	**3. Children and Young People** Presentation Plenary Q&A **4. Early Years** Presentation
5.20 – 6:00pm	**Exercise break for delegates** **Working party members convene to stock the days progress**
6:45 – 8.15pm	Dinner (all)
8:30 – 9:30pm	**After dinner presentations** Lessons learned from development of Physical Activity Guidelines for Americans. Speaker Professor David Buchner *Developments and future plans for "Change for Life". tbc*

Consultation Meeting Schedule – Day 2

7.00 – 8.15am	Early Years Breakfast Discussion Meeting (Optional Attendance, open to all delegates) Communications Meeting
8.30 - 9.00am	**Day 2 Start** Housekeeping Plenary session: Overview of tasks on Day 2
9.00 – 10.15am	**Plenary Session: Chair (tbc)** **Summary reports on progress for each population Group** **key issues to address in each Working Group**
10.15 – 10.35am	*Refreshment break (possibly in break out rooms)*
10.35 – 12:35pm	**Break out Discussion workshops (concurrent 3 groups)** Discuss remaining key issues/recommendations Prepare draft of the suggested modifications to UK Guidelines
12.35 – 2.00pm	*Lunch*
2.00 – 4.15pm	**Plenary Session** **Reports from each workshop** Adults Older adults Young People
3.15 – 3.30pm	*Refreshment Break*
3.30 – 4.15pm	**Final Plenary Discussions** Reaching final recommendations Q&A on communications agenda and implications
4.15 – 4.30pm	**Summary of progress**
4.30 – 5.00pm	**Closing remarks** Closing remarks from WHO Closing remarks from Home Country Governments on their next steps
5.00pm	**Thanks and depart**

Appendix 2: Delegate List

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Appendix 3: Draft Recommendations and Summary Statements for Children and Young People (posted for web consultation)

DRAFT RECOMMENDATIONS

#1
The UK guidelines on physical activity for *children and young people* should include a recommendation for physical activity in general – an overall guideline - and specific recommendations for promoting musculoskeletal health and flexibility

#2
The UK guidelines for *children and young people* should include a specific recommendation for vigorous activity (≥6-7 METS) on at least 3 days a week.

#3
The UK guidelines on physical activity for *children and young people* should recommend "daily physical activity".

#4
The UK guidelines on physical activity for *children and young people* should recommend physical activity for the promotion of musculoskeletal health and flexibility at least 3 days per week.

#5
The UK guidelines on physical activity for *children and young people* should recommend at least 60 minutes of moderate to vigorous physical activity (MVPA) daily.

#6
The UK guidelines on physical activity for *children and young people* should add a statement to suggest that, for very inactive young people, a progressive increase in activity to eventually achieve the 60 minute target of MVPA is appropriate, starting at 30 minutes per day.

#7
The UK guidelines on physical activity for *children and young people* should add a statement that additional MVPA beyond 60 mins and up to several hours a day confers even greater health benefit.

#8
The UK guidelines on physical activity for *children and young people* should use the term "accumulate" in the main messaging describing the recommended amount of physical activity.

#9
The UK guidelines on physical activity for *children and young people* should include some explanation to convey that the recommended physical activity is above and beyond the light physical activity undertaken in the course of normal daily living (e.g. chores, hygiene, and incidental activity).

#10

The UK Physical Activity Guidelines for *children and young people* should emphasize that the benefits of regular physical activity outweigh the inherent risks involved in participation.

#11
It is recommended that the UK Physical Activity Guidelines for *children and young people* do not include a specific guideline on physical activity for healthy weight gain or the maintenance of weight loss in children and young people; it is recommended that this be a high priority area for further research.

#12
The UK guidelines on physical activity for *children and young people* should provide a comment for those children and young people with disabilities (as done in Scottish 2003 guidelines) to ensure the guidelines are as inclusive as possible.

#13
The development of guidelines on sedentary behaviour for *children and young people* should be a priority and when complete should be integrated into the physical activity guidelines.

#14
It is recommended that there is sufficient scientific evidence to warrant changes to the existing UK guidelines on physical activity for *children and young people* to be more in-line with the new scientific evidence

Other recommendations

***#15**
It is recommended that the UK should establish a process to develop physical activity guidelines for *children and young people* with non-communicable disease (e.g. cardiovascular disease, diabetes, cancer, mental health conditions) as a matter of priority.

***#16**
It is recommended that the UK should use objective, time-stamped measurement techniques in population surveillance and the monitoring of trends over time.

***#17**
It is recommended that the UK work in cooperation and collaboration with other countries to standardize data cleaning, reduction and analysis procedures for objective physical activity monitoring devices.

***#18**
The physical activity guidelines for *children and young people* in all four UK jurisdictions should be harmonized to provide a common set of scientifically and expert informed statements with a common level of detail.

***#19**

The development of UK physical activity and sedentary behaviour guidelines for *infants, toddlers and preschool children* should be a priority and should be integrated into the "family" of existing guidelines.

***#20**

Planned reviews (and revisions if necessary) of the UK Physical Activity Guidelines for *children and young people* should be completed every 5 years in collaboration and coordination with other jurisdictions (e.g. World Health Organisation, Canada, U.S., Australia); International collaboration will result in more robust, less costly and scientifically harmonized evidence and interpretation while providing an opportunity for scientific and communication exchange and cross-fertilization.

** these recommendations do not directly relate to the specific content of the Physical Activity Guidelines but rather speak to the process and wider related issues. These will be retained in the Technical report but do not appear in the Summary Statements.*

DRAFT SUMMARY STATEMENTS

1	*Children and young people* aged 5- <19 years of age should accumulate at least 60 mins and up to several hours of MVPA on a daily basis to achieve most of the health benefits associated with physical activity. This daily activity should be achieved as part of play, games, sports, work, transportation, recreation, physical education, or planned exercise, in the context of family, school, and community activities.
2	*Children and young people* aged 5- <19 years of age should incorporate vigorous-intensity activities on at least 3 days per week.
3	*Children and young people* aged 5- <19 years of age should include activities that strengthen muscle and bone and promote flexibility with a target of at least 3 days per week
4	Aerobic-type activities should make up the majority of the daily physical activity.
5	The recommended 60 minutes or more of moderate intensity activity should be above and beyond light routine activities associated with daily living.
6	For very inactive *children and young people*, some health benefits can be achieved through 30 minutes/day of MVPA. Some physical activity is better than none.
7	*All children and young people*, regardless of physical or mental disabilities should meet the recommended 60 minutes or more of moderate intensity activity each day
8	Engaging in health promoting physical activity has very low risk for most *children and young people*, however, in contrast the risks of poor health as a result of low levels of activity (inactivity) are very high.

Appendix 4: Draft Recommendations and Summary Statements for Adults (posted for web consultation)

DRAFT RECOMMENDATIONS

#1
The UK guidelines should encourage *adults* to engage in moderate-intensity physical activity for at least 150 minutes per week; this physical activity should be spread across the week; and engaging in at least 30 minutes on 5 or more days each week is one example of how this volume can be achieved.

#2
The UK Physical Activity Guidelines for *adults* should recognize that vigorous-intensity activity also provides health benefits for adults, and that 75 minutes of vigorous-intensity activity provides comparable health benefits to 150 minutes of moderate-intensity activity.

#3
The UK guidelines for *adults* should recognise that combinations of moderate- and vigorous-intensity activities can provide health benefits and this represents another way of achieving the recommended target volume of activity.

#4
The UK guidelines for *adults* should retain a statement advising that physical activity can be accumulated across multiple bouts throughout the week, but only bouts of 10 minutes or more count toward meeting guidelines, as the health benefits of bouts of less than 10 minutes are currently unclear.

#5
The UK Physical Activity Guidelines for *adults* should include a specific recommendation to undertake muscle strengthening activities involving the major muscle groups of the body on two or more days per week. Time spent undertaking muscle strengthening activities should be *in addition* to the primary recommendation of 150 minutes. There is currently insufficient evidence to further refine type or duration.

 # 6
The UK Physical Activity Guidelines for *adults* should recognise that physical activities such as stretching can improve flexibility, which can be beneficial for health, maintaining mobility and potentially preventing injury. But no specific quantification or recommendation should be made on type, frequency, duration or total volume, as there is insufficient evidence.

#7
The UK Physical Activity Guidelines for *adults* should emphasise the health benefits of activity for those *adults* who are already overweight or obese. They should indicate that overweight and obese adults achieving the recommended weekly volume of activity (5 x 30/ 150 minutes/week) will gain multiple health benefits even in the absence of reductions in body weight.

#8
The UK Physical Activity Guidelines for *adults* should recognise that physical activity has an important role in healthy weight management and body composition. They should also indicate that attaining a healthy weight may require an additional amount of activity beyond the primary recommendation of 150 mins/week and include a decrease in caloric intake through dietary modifications.

#9
The UK Physical Activity Guidelines for *adults* should recognise that those who are least active are most at risk of poor health and increasing their physical activity (even if it does not meet the public health target of 150 minutes of moderate-intensity activity per week) will have health benefits.

#10
The UK Physical Activity Guidelines for *adults* should include a specific statement to recognise that higher volumes of activity (>150 mins) are associated with additional health benefits but at a somewhat decreasing benefit.

#11
The UK guidelines for *adults* should continue to acknowledge the role of physical activity in both the prevention of mental illness (such as depression and dementia) and the improvement of mental well being (such as mood, self-perception and sleep); the guidance should continue to indicate that these benefits are possible from the currently recommended dose of activity of 150 mins/week of moderate-intensity physical activity.

#12
The UK Physical Activity Guidelines for *adults* do not need to differ for sub populations based on gender or race/ethnicity; however it is noted that the communication strategies and "messaging" of the Physical Activity Guidelines to different sub population may differ to be most effective.

#13
The UK Physical Activity Guidelines for *adults* should include a statement to recognize that the Physical Activity Guidelines written for generally healthy adults can be applied to persons with disabilities: they should also emphasize that they need to be tailored for each individual based on their exercise capacity and any special health/risks issues.

#14
The UK Physical Activity Guidelines for *adults* should include a statement clarifying that the risks of ill health from inactivity are very high and outweigh the very low risk of injury from engaging in health promoting physical activity.

#15
It is highly recommended that a comprehensive communication strategy is undertaken for effective dissemination of physical activity guidelines for *adults* to a variety of audiences across the UK.

#16
It is recommended that consultation with relevant agencies / departments that collect, analyse and report the national physical activity data is undertaken to review the implications of the updated Physical Activity Guidelines for *adults.*

#17
No recommendations on sedentary behaviour for *adults* are provided. This issue was deferred due to ongoing work reviewing the primary evidence in this area. A separate consultation is planned for early 2010 and a final report in March 2010.

DRAFT SUMMARY STATEMENTS

1	Undertaking some physical activity is better than none, and *adults* who participate in any amount of physical activity gain some health benefits
2	All *adults* should achieve a total of at least 150 minutes of moderate- intensity physical activity per week. This activity should be spread across multiple days. For example 30 mins on five days of the week is one good way to achieve the guideline.
3	Physical activity can be accumulated through multiple shorter bouts of at least 10 minutes or more.
4	For substantial health benefits, *adults* should do at least 150 minutes a week of moderate intensity, or 75 minutes a week of vigorous intensity aerobic activity, or equivalent combinations of moderate and vigorous intensity aerobic activity.
5	All *adults* should undertake physical activities to improve muscle strength at least twice a week *in addition* to the primary recommendation of 150 minutes.
6	These Physical Activity Guidelines are applicable to *adults* who are already overweight or obese. Adults who are overweight or obese who achieve the recommended target activity (150 minutes/week or 5 x 30) can gain multiple health benefits from undertaking physical activity even in the absence of reductions in body weight. Physical activity has an important role in healthy weight management and body composition for all *adults*. Adults who are overweight or obese should aim to attain a healthy weight by undertaking additional amount of activity beyond the primary recommendation of 150 min/week and include a decrease in caloric intake through dietary modifications.
7	For additional health benefits, *adults* should increase the amount of aerobic physical activity over the target of 150 minutes a week of moderate intensity, or 75 minutes a week of vigorous intensity aerobic physical activity.
8	Undertaking the recommended levels of physical activity is beneficial for the prevention of mental illness (such as depression and dementia) and improvement in mental well being (such as mood, self perception, and sleep).
9	These Physical Activity Guidelines apply to generally healthy *adults* and can also be applied to many persons with disabilities, however implementation should be tailored for individuals based on exercise capacity and any special health/risks issues.
10	Engaging in health promoting physical activity has very low risk for most *adults*, however, in contrast the risks of poor health as a result of low levels of activity (inactivity) are very high.
11	*Adults* should maintain and improve their flexibility through physical activities such as stretching as this can be beneficial.

Appendix 5: Draft Recommendations and Summary Statements for Older Adults (posted for web consultation)

DRAFT RECOMMENDATIONS

Recommendation
The UK guidelines on physical activity for older adults should, where applicable adopt the same recommendation(s) as the adult population.

#1
The UK guidelines should encourage *older adults* to engage in moderate-intensity physical activity for at least 150 minutes per week; this physical activity should be spread across the week; and engaging in at least 30 minutes on 5 or more days each week is one example of how this volume can be achieved.

#2
The UK physical activity guidelines for *older adults* should recognize that vigorous-intensity activity also provides health benefits for older adults, and that 75 minutes of vigorous-intensity activity provides comparable health benefits to 150 minutes of moderate-intensity activity. However, the guidelines in older adults should place greater emphasis on moderate-intensity rather than vigorous intensity activities.

#3
The UK guidelines for *older adults* should recognise that combinations of moderate- and vigorous- intensity activities can provide health benefits and this represents another way of achieving the recommended target volume of activity. However, only those who are used to physical activity should engage in vigorous activity.

#4
The UK guidelines for *older adults* should retain a statement advising that physical activity can be accumulated across multiple bouts throughout the week, but only bouts of 10 minutes or more count toward meeting guidelines, as the health benefits of bouts of less than 10 minutes are currently unclear.

 # 5
The UK Physical Activity Guidelines for *older adults* should indicate that the relative intensity of physical activity should be the same for younger and older adults. The guidelines should explain the implication of this statement-- commonly, older adults will be active at a lower absolute intensity than younger adults.

#6
The UK Physical Activity Guidelines for *older adults* should include a specific recommendation to undertake muscle strengthening activities involving the major muscle groups of the body on two or more days per week. Time spent undertaking muscle strengthening activities should be *in addition* to the primary recommendation of 150 minutes. There is currently insufficient evidence to further refine type or duration.

#7
The UK Physical Activity Guidelines for *older adults* should include a specific recommendation on the benefits of physical activity involving balance training on two or more days per week for the prevention of falls in those at risk of falls. Although this should be in addition to the primary recommendation of 150 minutes, there should be acknowledgement that some aerobic activities enhance balance (e.g. dancing), and that some movements simultaneously strengthen muscles and improve balance (e.g. Tai Chi exercise).

 # 8
The UK Physical Activity Guidelines for *older adults* should recognise that physical activities such as stretching can improve flexibility, which can be beneficial for mobility when there is age-related loss of flexibility. But no specific quantification or recommendation should be made on type, frequency, duration or total volume, as there is insufficient evidence.

#9
The UK Physical Activity Guidelines for *older adults* should emphasise the health benefits of activity for those *older adults* who are already overweight or obese. They should indicate that overweight and obese older adults achieving the recommended weekly volume of activity (5 x 30/ 150 minutes/week) will gain multiple health benefits even in the absence of reductions in body weight.

#10
The UK Physical Activity Guidelines for *older adults* should recognise that physical activity has an important role in healthy weight management and body composition. They should indicate that attaining a healthy weight may require an additional amount of activity beyond the primary recommendation of 150 min/week and include a decrease in calorific intake through dietary modifications. ,

#11
Particularly for *older adults*, the UK physical activity guidelines should recognise that those who are least active are most at risk and increasing their physical activity (even if it does not meet the public health target of 150 minutes of moderate-intensity activity per week) will have health benefits.

#12
The UK Physical Activity Guidelines for *older adults* should include a specific recommendation that older adults should gradually increase physical activity levels over time. It can be appropriate for inactive older adults with low fitness to begin with bouts of less than 10 minutes However, because the evidence is incomplete on the health benefits of such bouts, older adults should gradually increase levels of physical activity so as to engage in moderate-intensity activity in bouts of 10 minutes or more.

#13
The UK Physical Activity Guidelines for *older adults* should include a specific statement to recognise that higher volumes of activity (>150 mins) are associated with additional health benefits but at a somewhat decreasing benefit.

#14
The UK guidelines for *older adults* should acknowledge the role of physical activity in both the prevention of mental illness (such as depression and dementia) and the improvement of mental well being (such as mood, self-perception and sleep); the guidance should continue to indicate that these benefits are possible from the currently recommended dose of activity of 150 mins/week of moderate-intensity physical activity.

#15
The UK Physical Activity Guidelines for *older adults* do not need to differ for sub populations based on gender or race/ethnicity; however it is noted that the communication strategies and "messaging" of the Physical Activity Guidelines to different sub population may differ to be most effective.

#16
The UK Physical Activity Guidelines for *older adults* should include a statement to recognize that the Physical Activity Guidelines written for generally healthy adults can be applied to persons with chronic diseases and age-related disabilities: they should also emphasize that they need to be tailored for each individual based on their exercise capacity and any special health/risks issues.

#17
The UK Physical Activity Guidelines for *older adults* should include a statement clarifying that the risks of inactivity are very high and outweigh the very low risk of engaging in health promoting physical activity.

#18
It is highly recommended that a comprehensive communication strategy is undertaken for effective dissemination of Physical Activity Guidelines for *older adults* to a variety of audiences across the UK.

#19
It is recommended that consultation with relevant agencies / departments that collect, analyse and report the national physical activity data is undertaken to review the implications of the updated Physical Activity Guidelines for *older adults*

#20
No recommendations on sedentary behaviour are provided. This issue was deferred due to ongoing work reviewing the primary evidence in this area. A separate consultation is planned for early 2010 and a final report in March 2010.

DRAFT SUMMARY STATEMENTS

1	Those individuals who are least active are at greater risk, thus, undertaking some physical activity is better than none, and *older adults* who participate in any amount of physical activity gain some health benefits. *Older adults* in particular are encouraged to gradually increase their physical activity levels over time until they reach at least the target level of activity.
2	All *older adults* should achieve a total of at least 150 minutes of moderate- intensity physical activity per week. This activity should be spread across multiple days. For example 30 mins on five days of the week is one good way to achieve the guideline.
3	Physical activity can be accumulated through multiple shorter bouts of at least 10 minutes or more.
4	*Older adults* can gain benefit from vigorous-intensity activity, and 75 minutes of vigorous-intensity activity can provide similar health benefits to 150 minutes of moderate-intensity activity. However, vigorous activity is inappropriate for older adults unless they have been active at the moderate intensity level for some time. Also, the risk of injury is lower with moderate-intensity activity.
5	*Older adults* can perform moderate- and vigorous- intensity activities throughout the week to achieve the health benefits as this represents another way of achieving the recommended target volume of activity.
6	All *older adults* should undertake physical activities to improve muscle strength at least twice a week *in addition* to the primary recommendation of 150 minutes, activities can include heavy gardening, dancing and need not be undertaken as gym based exercise.
7	*Older adults* at risk of falls should undertake physical activity involving balance training on two or more days per week for the prevention of falls. This should be in addition to the primary recommendation of 150 minutes, although some aerobic activities can also enhance balance (e.g. dancing), and some movements simultaneously strengthen muscles and improve balance (e.g. Tai Chi exercise).
8	These physical activity guidelines are applicable to *older adults* who are already overweight or obese. Older adults who are overweight or obese who achieve the recommended target of activity (150 minutes/week or 5 x 30) can gain multiple health benefits even in the absence of reductions in body weight.
9	Physical activity has an important role in healthy weight management and body composition. *Older adults* who are overweight or obese should aim to attain a healthy weight by undertaking additional amount of activity beyond the primary recommendation of 150 min/week and include a decrease in calorific intake.
10	Moderate intensity physical activity is relative to fitness so for some de-conditioned *older adults* a brisk walk will be at half the speed of a brisk walk for an older adult who has better fitness. However, both may be working at an equivalent percentage of their maximum abilities. Therefore the acknowledged lay definition of moderate intensity (slightly warmer than normal and slightly out of breath) should be applied, rather than a MET equivalent or a

	speed of walking.
11	For additional health benefits, *older adults* should increase the amount of physical activity over the target of 150 minutes a week of moderate intensity. Additional health benefits are gained by engaging in physical activity beyond this amount
12	*Older adults* can benefit from undertaking the recommended levels of physical activity for the prevention of mental illness (such as depression and dementia) and improvement in mental well being (such as mood, self perception, and sleep)
13	These physical activity guidelines apply to generally healthy *older adults* but can also be applied to persons with chronic diseases and age-related disabilities by tailoring to the individual needs based on physical capacity and any special health/risks issues.
14	Engaging in health promoting physical activity has very low risk for most *older adults*, however, in contrast the risks of poor health as a result of low levels of activity (inactivity) are very high.
15	*Older Adults* should maintain and improve their flexibility through physical activities such as stretching as this can be beneficial for maintenance of mobility

Appendix 6: Working Paper Prepared for Marlow Meeting - Children and Young People

Updating the UK Physical Activity Guidelines for Children and Young People: Recommendations Based on the Current Scientific Evidence

Authorship of this paper is: Children and Young People Expert Working Group

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Executive Summary of Questions and Recommendations for UK Guidelines on Physical Activity for Children and Young people

Question 2. Based on the current evidence what, if any, modifications to the current Physical Activity Guidelines should be considered? In particular, please make recommendations on any modifications to the stated characteristics of how physical activity can be undertaken and accumulated for optimal prevention of chronic disease?

Recommendation 1
The UK guidelines on physical activity for children and young people should include a recommendation for physical activity in general – an overall guideline - and specific recommendations for promoting strength/bone/flexibility (musculoskeletal fitness).

Recommendation 2
The UK guidelines for children and young people should include a specific recommendation for vigorous activity (≥6-7 METS) on at least 3 days a week.

Recommendation 3
The UK guidelines on physical activity for children and young people should recommend "daily physical activity".

Recommendation 4
The UK guidelines on physical activity for children and young people should recommend physical activity for the promotion of strength/bone/flexibility (musculoskeletal fitness) at least 3 days per week.

Recommendation 5
The UK guidelines on physical activity for children and young people should recommend at least 60 minutes of physical activity daily.

Recommendation 6
The UK guidelines on physical activity for children and young people should add a statement to suggest that, for the very inactive young people, a progressive increase in activity to eventually achieve the 60 minute target is appropriate, perhaps starting at 30 minutes per day.

Question 3. Please comment specifically on the available evidence related to the accumulation of physical activity in multiple short periods. Please comment on i) whether this is relevant for the optimal health message and ii) whether it is or is not appropriate for any specific health conditions?

Recommendation 7
The UK guidelines on physical activity for children and young people should use the term "accumulate" in the main messaging describing the recommended amount of physical activity.

Question 4. Is there sufficient evidence / knowledge of the risks associated with physical activity, particularly in early years to inform an analysis of the risks versus benefits of the physical activity guidelines?

Recommendation 8
The UK physical activity guidelines for children and young people should emphasize that the benefits of regular physical activity outweigh the inherent risks involved in participation.

Question 5. If the evidence points to a revision of the current guidelines, are the advantages of making such a change likely to outweigh the disadvantages (for example confusion amongst healthcare practitioners still relatively unfamiliar with the 2004 Guidelines)?

Recommendation 9
It is recommended that there is sufficient scientific evidence to warrant changes to the existing UK guidelines on physical activity for children and young people to be more in-line with the new scientific evidence

Question 6. Do physical activity guidelines need to be modified to specifically address weight loss or maintenance of weight loss for children and young people?

Recommendation 10
It is recommended that the UK physical activity guidelines for children and young people do not include a specific guideline on physical activity for weight loss or the maintenance of weight loss in young people; it is recommended that this be a high priority area for further research.

Recommendation 11
The UK guidelines on physical activity for children and young people should include some explanation to convey that the recommended physical activity is above and beyond the physical activity accumulated in the course of normal daily non-recreational activities (e.g. chores, hygiene, and incidental activity).

Question 7. Do Physical Activity Guidelines need to be modified for young people with disabilities and for young people with chronic disease?

Recommendation 12
The UK guidelines on physical activity for children and young people should provide a comment for those young people with disabilities (as done in Scotland guidelines) to ensure the guidelines are as inclusive as possible.

Recommendation 13
It is recommended that the UK should establish a process to develop physical activity guidelines for children and young people with non-communicable disease (e.g. cardiovascular disease, diabetes, cancer, mental health conditions) as a matter of priority.

Question 8. Data Limitations and Implications for Surveillance

Recommendation 14
It is recommended that the UK should use objective, time-stamped measurement techniques in population surveillance and the monitoring of trends over time.

Recommendation 15
It is recommended that the UK work in cooperation and collaboration with other countries to standardize data cleaning, reduction and analysis procedures for objective physical activity monitoring devices.

Additional Recommendations for Consideration

Recommendation 16
The physical activity guidelines for children and young people in all four UK jurisdictions should be harmonized to provide a common set of scientifically and expert informed statements with a common level of detail.

Recommendation 17
The development of guidelines on sedentary behaviour for children and young people should be a priority and when complete should be integrated into the physical activity guidelines.

Recommendation 18
The development of UK physical activity and sedentary behaviour guidelines for infants and preschool children should be a priority and should be integrated into the "family" of existing guidelines.

Recommendation 19
Planned reviews (and revisions if necessary) of the UK Physical Activity Guidelines for children and young people should be completed every 5 years in collaboration and coordination with other jurisdictions (e.g. WHO, Canada, U.S., Australia); International collaboration will result in more robust, less costly and scientifically harmonized evidence and interpretation while providing an opportunity for scientific and communication exchange and cross-fertilization.

Question 9. Please comment on the need for a coherent comprehensive communication strategy to disseminate the Physical Activity Guidelines to a variety of audiences (including education sector, health sector and others).

(Statement provided)

Question 10. What is the appropriate summary guideline for healthcare practitioners, as a basis for communicating brief advice on physical activity to patients aged 5-19 years and their parents?

(Statement provided)

Introduction

The objective of this paper is to provide a brief review of the current UK Physical Activity Guidelines on the preventative health benefits of physical activity for children and young people to assess their relevance and currency for use for the next 3-5 years in light of the most recent scientific evidence. Specifically, this report focuses on the evidence-base informing the reaffirmation or revision of the existing Physical Activity Guidelines in the U.K. (see Table 1). The paper is organized to answer specific questions related to this objective and with this structure is ***meant to serve as a discussion paper, not a definitive position statement***. This project benefits from similar work that has recently been undertaken in the United States, Canada and elsewhere and rather than replicate the detailed literature reviews already completed, the evidence-base for this discussion paper will draw predominantly on the existing reviews. Taking advantage of the comprehensive work recently completed elsewhere, this project is expedited, saves significant resources and increases the likelihood of international harmonization of Physical Activity Guidelines.

This paper focuses on children and young people aged 5-18 years and will not address the evidence related to infants and pre-school children (ages < 5 years). Furthermore, the focus of this paper is on **Physical Activity Guidelines** and not reducing **sedentary behaviours** *per se* so research evidence on the health consequences of sedentary behaviour (e.g. screen-time) is not included and recommendations for guidelines addressing sedentary behaviour are not provided. Finally, the evidence used to answer the questions below is based on, and applies to, apparently healthy, asymptomatic children and young people (e.g. no non-communicable disease (cardiovascular disease, diabetes, cancer) currently diagnosed). The recommendations in this Working Paper for updating the UK guidelines on physical activity are generally appropriate for children with a disability who are otherwise healthy; the subsequent promotion and communication "messaging" should promote inclusion as this is important for optimal population level health benefits. Furthermore, a recommendation is provided encouraging further work to ensure that physical activity guidelines are also prepared for children and young people with existing disease (e.g. secondary and tertiary prevention) and early years (<5 years).

The recommendations in this paper are to be interpreted as suggestions for the UK physical activity guidelines as *public health targets*, informed by a broad, heterogeneous base of evidence from a variety of study designs and disease risk factors of interest. There is insufficient research available to make evidence-informed statements regarding "minimal" or "optimal" levels of physical activity.

Current UK Physical Activity Guidelines

Table 1 presents a summary of the headline recommendations on physical activity for young people currently in the UK. These have been extracted from the key documents currently used to guide public health work in this area.

Table 1: Current Physical Activity Guidelines: A summary comparison across the four UK home countries.

Country	Children and Young People Physical Activity Guidelines
England[1]	A total of at least 60 minutes of at least moderate intensity physical activity each day At least twice a week this should include activities to improve bone health, muscle strength, and flexibility
Scotland[2]	At least 60 minutes of moderate activity on most days of the week
Wales[3]	60 minutes of moderate intensity physical activity on at least 5 days of the week 5 x 60 minutes of physical activity per week
Northern Ireland	A total of at least 60 minutes of at least moderate intensity physical activity each day

First, it is worth mentioning that the Physical Activity Guidelines listed in Table 1 are similar but not the same.[1-3] Important distinctions between them (e.g. "each day" vs "most days of the week" vs "5 days of the week"; references to specific activities for bone health, muscle strength and flexibility or not; "60 minutes of moderate intensity physical activity" vs "*at least* 60 minutes of moderate activity") allow for potential confusion among UK jurisdictions and also means that UK guidelines cannot necessarily be assessed as a single entity.

Several countries and organizations have produced Physical Activity Guidelines for children and young people over the past 20 years[4-15] (see Table 2 adapted from Janssen 2007[16] for chronological summary) based on varying methods of background research and literature reviews. Although the more recent guidelines converge, perhaps conveniently, at 60 minutes of moderate to vigorous physical activity (MVPA) most days of the week, there remains similar nuance differences (e.g. "engage" vs "participate" vs "accumulate"; "every day" vs "most days") to those identified among the UK country guidelines.

More recent, comprehensive and/or systematic reviews have been completed by the U.S. Department of Health and Human Services Physical Activity Guidelines Advisory Committee,[17,18] the Canadian Society for Exercise Physiology and Public Health Agency of Canada,[16,19,20] the Australian Department of Health and Aging,[21] U.S. Centers for Disease Control,[22] the European Union,[23] and the British Association for Sport and Exercise Sciences.[24] Some of these reviews concluded with recommended physical activity guidelines for children and young people based on their reviews.[18,19,20,21,22,23] The details and scope of these reviews are provided in each of the references. In general, they examined the published literature (in some cases including "grey literature" e.g. surveillance reports) on studies examining the relationship between physical activity and health outcomes or risk factors including indicators of:

- cardio-respiratory fitness (e.g. aerobic fitness)
- musculo-skeletal fitness (e.g. muscular strength, muscular endurance)
- cardiovascular disease risk (e.g. high cholesterol/triglycerides, high blood pressure, carotid intima-media thickness, inflammatory markers)
- metabolic disease (e.g. metabolic syndrome, fasting insulin, fasting glucose, glycosylated haemoglobin)
- body composition, weight gain and obesity (e.g. BMI, waist circumference, visceral adiposity)
- bone health (e.g. low bone mineral density, incidence of fracture)
- mental health (e.g. depression, stress, anxiety, academic achievement and cognition, performance, self-esteem)
- risk of injury (e.g. minor and major sports injuries).

The summary recommended guidelines from these reviews are provided in Table 3. First, it is easily seen that the specific language varies as does the detail included. Some, but not all, mention the idea of accumulation,[16,19,20,23] some make specific reference to bone or muscle strengthening,[16-20,23] some provide physical activity context or location,[21,22] and some speak to both physical activity and sedentary behaviours.[21,22] In comparing these guidelines to the various existing UK guidelines some important differences emerge but relate more to the details provided in the physical activity guideline statement than in a fundamental change in evidence based on recent research.

Table 2: Physical activity guidelines for school-aged children and young people, listed in chronological order of release.

Organization Title of recommendation	Year	Age Range	Recommendation
American College of Sports Medicine[4] Opinion statement on physical fitness in children and youth	1988	children and youth	▪ Obtain 20-30 min of vigorous exercise each day
International Consensus Conference on Physical Activity Guidelines for Adolescents[5] Physical activity guideline for adolescents: consensus statement	1994	11-21 years	▪ Be physically active daily, or nearly daily, as part of play, games, sports, work, transportation, recreation, physical education, or planned exercise. ▪ Engage in ≥3 sessions/wk of moderate to vigorous activities that last ≥20 min.
U.S. National Institutes of Health[6] Consensus development panel on physical activity and cardiovascular health	1995	all ages	▪ Accumulate 30 min of moderate physical activity on most, preferably all, days of the week.
U.S. Surgeon General[7] Physical activity and health	1996	≥2 years	▪ Accumulate 30 min of moderate physical activity on most, preferably all, days of the week.
U.K. Health Education Authority[8] Young people and health-enhancing physical activity: evidence and implications	1998	children and young people	▪ Participate in physical activity that is of a least a moderate intensity for an average of 1 h/d. ▪ Participate in physical activities that enhance and maintain strength in the musculature of the trunk and upper arm girdle ≥2 d/wk. ▪ The above recommendation should be met by participating in developmentally appropriate activities.
Australia Department of Health and Ageing[9] National physical activity guidelines for	1999	5-18 years	▪ At least 60 minutes, and up to several hours, of

Australians			moderate to vigorous physical activity every day. ▪ Limit screen time ≤2 h/d.
American Cancer Society[10]			
Guidelines on nutrition and physical activity for cancer prevention	2002	children and youth	▪ Engage in ≥60 min/d of moderate-to-vigorous physical activity at least 5 d/wk.
Health Canada, Canadian Society for Exercise Physiology[11,12]			
Canada's physical activity guide for children and youth	2002	6-14 years	▪ Increase time currently engage in physical activity by at least 30 min/d (in periods of at least 5-10 min), progressing to ≥90 min/d more physical activity. ▪ The 90 min/d increase in physical activity should include both moderate (60 min) and vigorous (30 min) activities. ▪ Decrease time spent doing sedentary activities (television, video games, Internet), initially by 30 min/d, eventually by ≥90 min/d.
Weight Realities Division of the Society for Nutrition Education[13]			
Guidelines for childhood obesity prevention programs	2003	children	▪ Be active for at least 60 min/d. ▪ Limited screen time to <2 h/d and replace with more active activities.
U.S. National Association for Sports and Physical Education[14]			
Guidelines for appropriate physical activity for elementary school children	2003	5-12 years	▪ Accumulate at least 60 min, and up to several hours, of age-appropriate physical activity on all, or most days of the week. ▪ Daily accumulation should include moderate and vigorous physical activities, with the majority being intermittent in nature.
U.S. Department of Agriculture[15]			
Dietary guidelines for Americans	2005	children and youth	▪ Accumulate ≥60 minutes of physical activity on most, preferably all, days of the week.

Table 3: Recommended guidelines from recent comprehensive and/or systematic reviews.

Ref	Physical Activity Guidelines
17,18 U.S.	▪ Children and adolescents should do 60 minutes (1 hour) or more of physical activity daily. ▪ Aerobic: Most of the 60 or more minutes a day should be either moderate- or vigorous-intensity aerobic physical activity, and should include vigorous-intensity physical activity at least 3 days a week. ▪ Muscle-strengthening: As part of their 60 or more minutes of daily physical activity, children and adolescents should include muscle-strengthening physical activity on at least 3 days of the week. ▪ Bone-strengthening: As part of their 60 or more minutes of daily physical activity, children and adolescents should include bone-strengthening physical activity on at least 3 days of the week. ▪ It is important to encourage young people to participate in physical activities that are appropriate for their age, that are enjoyable, and that offer variety.
16,19 Canada	▪ Children and youth 5-17 years of age should accumulate at least 60 minutes per day and up to several hours of at least moderate intensity physical activity. Some of the health benefits can be achieved through 30 minutes per day, and this should be a 'stepping stone' for currently sedentary children. *[Level 2, Grade A]*. ▪ More vigorous intensity activities should be incorporated or added when possible, including activities that strengthen muscle and bone *[Level 3, Grade B]*. 3) Aerobic activities should make up the majority of the physical activity. Muscle and bone strengthening activities should be incorporated on at least 3 days of the week *[Level 2, Grade A]*.
20 Canada	▪ *Recommendation 1*: Children and youth aged 5–19 years of age should accumulate at least 1 hour and up to several hours of at least moderate-intensity physical activity on a daily basis to achieve most of the health benefits associated with physical activity (evidence: level 3, grade A). Some health benefits can be achieved through 30 minutes/day of moderate intensity physical activity, and this should be used as a "stepping stone" for currently sedentary children (evidence: level 2, grade A). ▪ *Recommendation 2*: Vigorous-intensity activities should be incorporated or added when possible, including activities that strengthen muscle and bone (evidence: level 3, grade B). ▪ *Recommendation 3*: Aerobic activities should make up the majority of the daily physical activity. Muscle- and bone-strengthening activities should be incorporated on at least 3 days of the week (evidence: level 2, grade A).
21 Australia	▪ All children and youth should be physically active daily, or nearly every day, as part of play, games, sports, work, transportation, recreation, physical education, or planned exercise, in the context of family, school, and community activities. ▪ All children and youth should engage in physical activity of at least moderate intensity for 60 minutes or more on a daily basis.

	▪ Children and youth should avoid extended periods of inactivity through participation in sedentary activities such television watching, video, computer games and surfing the internet. ▪ Children and youth who currently do little activity should participate in physical activity of at least moderate intensity for at least 30 minutes daily, building up to undertaking 60 minutes daily.
22 U.S.	▪ School-age youth should participate daily in 60 minutes or more of moderate to vigorous physical activity that is developmentally appropriate, enjoyable, and involves a variety of activities. ▪ The recommended 60 minutes or more of physical activity can be achieved in a cumulative manner in school during physical education, recess, intramural sports, and before and after school programs. ▪ Sedentary activities such as excessive television viewing, computer use, video games, and telephone conversations should be discouraged. ▪ For youth who have been physically inactive, an incremental approach to the 60-minute goal is recommended.
23 European Union	▪ School-aged youth should participate in 60 minutes or more of moderate to vigorous physical activity daily, in forms that are developmentally appropriate, enjoyable, and involve a variety of activities. The full dose can be accumulated in bouts of at least 10 minutes. Development of motor skills should be emphasized in early age groups. Specific types of activity according to the needs of the age group should be addressed: aerobic, strength, weight bearing, balance, flexibility, motor development.

Questions and Responses

Question 1. Does the scientific evidence continue to support the current Physical Activity Guidelines for the children and young people population group?

If in answering this question the obligation is to disprove the existing guidelines, the answer is yes, the evidence continues to support the current Physical Activity Guidelines – they are not erroneous, though as listed in Table 1 they are incomplete. Details on this are provided in response to subsequent questions.

Question 2. Based on the current evidence what, if any, modifications to the current Physical Activity Guidelines should be considered? In particular, please make recommendations on any modifications to the stated characteristics of how physical activity can be undertaken and accumulated for optimal prevention of chronic disease?

What type?

Because children and young people are growing and developing, it is prudent (and supported by the available evidence) that Physical Activity Guidelines speak to physical activity in general (usually recreational activities, sports, physical education or active play); but also activities that promote strength/bone/flexibility (musculoskeletal fitness) and vigorous-intensity activities specifically, as is evident in several of the most recent guidelines internationally. Significant health promoting benefits have been observed for each of these activities, however the evidence supporting flexibility activities is somewhat lacking, though the belief is that the risk of such a recommendation is negligible.[16-21] Developmentally appropriate activities are essential and change as a child ages - "active play" and "motor development activities" should be promoted. It is therefore recommended that the UK guidelines include both a general physical activity recommendation and ones specific to strength/bone/flexibility (musculoskeletal fitness). The specifics of how much activity is required are detailed in the following sections.

Recommendation 1
The UK guidelines on physical activity for children and young people should include a recommendation for physical activity in general – an overall guideline - and specific recommendations for promoting strength/bone/flexibility (musculoskeletal fitness).

What intensity?

Different health outcomes require different overload intensities but for most outcomes studied there appears to be a dose-response relationship such that an increase in activity intensity (and/or increases in activity duration and/or frequency) yields additional benefits. Nevertheless, for some outcomes, high levels of sustained activity (higher intensity) may be required (for example to improve cardio-respiratory fitness) whereas for other benefits, more moderate-intensity physical activity may achieve significant benefits (e.g. mental health indicators).

All reviews conclude that the public health target to receive significant health benefits is "moderate [to vigorous] physical activity". In children and young people this is typically defined at ≥3-4 METS. The intensity recommendation in all existing UK guidelines is in line with the evidence from the recent reviews. However, the new American and Canadian reviews conclude that a specific recommendation for vigorous activity (≥6-7 METS) at least 3 days a week should also be included in young people guidelines because additional and sometimes separate health benefits accrue from more vigorous-intensity activity. There is however a lack of evidence regarding the health benefits associated with varying durations of vigorous activity. Therefore, an appropriate prescription for the bout length of vigorous-intensity activity for young people cannot at the moment be based on the existing scientific literature. The evidence that does exist suggests that in general more and longer bouts are associated with greater health outcomes[16,17,19] and this is consistent with the basic exercise physiology principles of progressive overload and adaptation. Further research on this issue is encouraged.

Recommendation 2
The UK guidelines on physical activity for children and young people should include a specific recommendation for vigorous activity (≥6-7 METS) on at least 3 days a week.

What frequency?

Unfortunately the available evidence base does not clearly indicate any particular frequency of physical activity is best, in large part because such systematic studies have not been performed. The consensus of the most recent reviews and subsequent guidelines is that young people should be physically active everyday (daily)[16-22] and that vigorous-intensity activities as well as activities to promote musculoskeletal fitness should be done at least 3 times per week.[16-20] In much of the research, the volume of physical activity is typically studied, not the distribution of physical activity throughout the week. For example, although the guidelines cluster around "daily" recommendations, there is no clear evidence that missing one day (or two? three?) a week has any measureable negative effect on health – as with duration and intensity, in general more is better but evidence of a clear threshold remains elusive. In the absence of such evidence, and to promote a pattern of regular physical activity and keep messaging simple, most guidelines have opted for a "daily" recommendation.

Recommendation 3
The UK guidelines on physical activity for children and young people should recommend "daily physical activity".

Recommendation 4
The UK guidelines on physical activity for children and young people should recommend physical activity for the promotion strength/bone/flexibility (musculoskeletal fitness) at least 3 days per week.

What duration?

All of the new guidelines recommend *at least* 60 minutes of physical activity daily. The literature clearly shows significant and meaningful health benefits of this level of activity though more activity is typically associated with even greater benefits. A number of recommendations now suggest that for very inactive young people, even 30 minutes of daily activity will provide benefits and may serve as "stepping stone" to higher levels of activity.[16,19,20,21]

The recent American physical activity guidelines for adults and older adults describe their recommendations in minutes per week.[17] However, none of the existing, or earlier guidelines have taken this approach for children and young people. In an effort

to establish physical activity as an integral component of daily living it is recommended to stay with *per day* recommendations for children and young people.

Recommendation 5
The UK guidelines on physical activity for children and young people should recommend at least 60 minutes of physical activity daily.

Recommendation 6
The UK guidelines on physical activity for children and young people should add a statement to suggest that, for the very inactive young people, a progressive increase in activity to eventually achieve the 60 minute target is appropriate, perhaps starting at 30 minutes per day.

Question 3. Please comment specifically on the available evidence related to the accumulation of physical activity in multiple short periods. Please comment on i) whether this is relevant for the optimal health message and ii) whether it is or is not appropriate for any specific health conditions?

Controlled physical activity interventions with differing bout durations do not exist in studies on children and young people. Children in particular are sporadically active and achieve their physical activity throughout the day, in varying bout durations and activities of varying intensities.[32] In the absence of clear evidence informing a particular bout length the Canadian[16,19,20] reviews included the term "accumulate" to acknowledge that this is indeed how children perform physical activity, but do not ascribe a recommended bout length. The recent American[17,18] guidelines do not use the term "accumulate". The evidence relating specific bout lengths to specific conditions is not available. However, inclusion of the term "accumulate" in the physical activity guidelines is appropriate because the literature across the various scientific reviews included a variety of exposures, including those where physical activity was accumulated in bouts of various durations. Moreover, this position also conveys that the physical activity does not need to be accomplished in one single bout, which may be overwhelming and discouraging to some. It is noted that further research in this area is required.

Recommendation 7
The UK guidelines on physical activity for children and young people should use the term "accumulate" in the main messaging describing the recommended amount of physical activity.

Question 4. Is there sufficient evidence / knowledge of the risks associated with physical activity, particularly in early years to inform an analysis of the risks versus benefits of the Physical Activity Guidelines?

The health benefits of physical activity have been systematically documented in the many reports referred to here,[1-24,26-28,31] however the reporting of risks has been much less systematic. For example, it is not customary for physical activity interventions to systematically report adverse events and it often occurs only when there are adverse events or injuries (e.g. people do not report that no injuries occurred during the intervention in their manuscripts) so the available evidence may be biased. The Canadian systematic review concluded that "most of the published information is limited to groups of participants that have all been injured or groups of participants comprised entirely of athletes (e.g., football players, ballet dancers)."[19] The Australian background papers noted that: "Like most activities in life, participation in exercise or physical activity is not without risk. In the physical activity and sport domains, some of the most commonly studied risks include musculoskeletal injury, negative psychological conditions (stress, burnout, and staleness), and risks to reproductive health. Notably, these negative outcomes mostly occur in children and adolescents participating in intensive competitive sport."[21]

The recent scientific report for the US guidelines states: "The benefits of regular physical activity outweigh the inherent risk of adverse events. Still, adverse events are common even if usually not severe and are an impediment to widespread participation in regular physical activity. Awareness of the types and causes of activity-associated adverse events can be helpful. Selection of low risk activities and prudent behavior while doing any activity can minimize the frequency and severity of adverse events and maximize the benefits of regular physical activity."[17] Safety should always be promoted (e.g. progressive overload, activities matched with abilities, protective equipment, safe environments). The American Report concludes with the statement that "the benefits of physical activity outweigh the risks".[17] Although the research

specifically examining the risks associated with the U.K. or any other particular physical activity guidelines is lacking, it is reasonable to conclude that the benefits of responsible physical activity participation, as articulated in the proposed suggestions for U.K. physical activity guidelines for young people outweigh the inherent risks involved.

Recommendation 8
UK physical activity guidelines for children and young people should emphasize that the benefits of regular physical activity outweigh the inherent risks involved in participation.

Question 5. If the evidence points to a revision of the current guidelines, are the advantages of making such a change likely to outweigh the disadvantages (for example confusion amongst healthcare practitioners still relatively unfamiliar with the 2004 Guidelines)?

The recommendations made in the working paper contain sufficient modifications to the current UK guidelines on physical activity for young people that changes should be made. How these modifications are positioned (revised, refreshed, extended, updated) is an item for some consideration. In most cases, the modifications suggested are additional clarifications or extensions to what presently exists. The UK Physical Activity Guidelines as they exist now are not *wrong* in light of the latest scientific reviews, but they are incomplete, lack clarity and in some cases lack precision. Positioning any "revisions" in this light minimizes the disruption or confusion with existing guidelines, and should a healthcare practitioner chose to ignore revised or updated guidelines, there is very little risk of harm, but possibly a risk of misinterpretation or misapplication of the guidelines on the part of the healthcare practitioner or patient; in other words, there may be a suboptimal impact of the guidelines.

Recommendation 9
It is recommended that there is sufficient scientific evidence to warrant changes to the existing UK guidelines on physical activity for children and young people to be more in-line with the new scientific evidence

Question 6. Do Physical Activity Guidelines need to be modified to specifically address weight loss or maintenance of weight loss for children and young people?

Several recent scientific reviews note that despite the evidence informing a public health target of 60 minutes of MVPA each day, many children achieve this target yet childhood obesity continues to rise. Possible explanations for this, include:

- measurement studies (e.g. self-report) over-estimate what children are actually doing[25]
- this occurs purely because of an excess of energy intake over expenditure, even if expenditure is high
- or although significant health benefits accrue from this level of activity it remains too low for a certain segment of children given contemporary lifestyles.

The scientific report for the US Guidelines specifically investigated the evidence regarding physical activity for decreasing adiposity in overweight or obese children.[17] Although many observational and experimental studies demonstrated desirable changes with increased physical activity, the results were equivocal and no specific physical activity recommendations for weight loss (or the maintenance of weight loss) in children and young people is available at this time. In adults, there is substantial evidence that a higher volume of physical activity is required for weight loss and the maintenance of weight loss.[15,17,18] Given the high prevalence of childhood obesity, this is an important area for further study.

It is also possible that people interpret the physical activity guideline to be the total cumulative amount of physical activity required per day, yet the research informing the guidelines is based on *additional physical activity* beyond that associated with normal daily living. If people misinterpret the guideline, it may actually encourage people to be *less active* if they had high levels of daily incidental movement previously.

Recommendation 10
It is recommended that the UK physical activity guidelines for children and young people do not include a specific guideline on physical activity for weight loss or the

maintenance of weight loss in young people; it is recommended that this be a high priority area for further research.

Recommendation 11
The UK guidelines on physical activity for children and young people should include some explanation to convey that the recommended physical activity is above and beyond the physical activity accumulated in the course of normal daily non-recreational activities (e.g. chores, hygiene, and incidental activity).

Question 7. Do Physical Activity Guidelines need to be modified for young people with disabilities and for children and young people with chronic disease?

Many children and young people have physical, emotional, mental and/or intellectual disabilities or challenges. The background material reviewed for this report did not specifically review the available evidence in this area. The array of different disabilities makes making generalizations difficult. Nevertheless, it is believed most children and young people with disabilities would benefit from the physical activity guidelines recommended in this report. Specific physical activities may require adaptation to specific limitations, and safety needs must be met. Messaging promoting inclusion is important for optimal population health benefit.

Although beyond the scope of this report, a recommendation is provided encouraging further work to ensure that evidence-informed physical activity guidelines are also prepared for children and young people with existing disease (e.g. secondary and tertiary prevention). Physical activity is indicated in the treatment of many non-communicable diseases and chronic conditions. The potential benefit of specific public health and clinical guidelines for physical activity for children and young people with chronic conditions has the potential to be very substantial given the acceleration in paediatric conditions exacerbated by sedentary living.

Recommendation 12
The UK guidelines on physical activity for children and young people should provide a comment for those young people with disabilities (as done in Scotland guidelines) to ensure the guidelines are as inclusive as possible.

Recommendation 13

It is recommended that the UK should establish a process to develop physical activity guidelines for children and young people with non-communicable disease (e.g. cardiovascular disease, diabetes, cancer, mental health conditions) as a matter of priority.

Question 8. Data Limitations and Implications for Surveillance

Two significant limitations of the existing scientific evidence-base are worth noting. First, the reliance on self- or parental-reporting methodologies for the assessment of physical activity is problematic and likely misrepresents the true relationships between physical activity and health in many papers used to inform the development of physical activity guidelines.[25] Second, intervention studies have not looked carefully at a wide range of physical activity "doses" so the evidence clusters around previous guidelines, perpetuating similar evidence.

The important and careful measures from the European Youth Heart Study is noteworthy and provides compelling, albeit cross-sectional, evidence of a strong dose-response relationship, from very low, to very high levels, between directly measured physical activity level (or fitness level) and a variety of measured cardio-metabolic disease risk factors in children and adolescents.[26-28] Further intervention research with robust measurement methodologies are required to better inform future physical activity guidelines.[29-31]

Furthermore, standardization of data cleaning, reduction and analysis procedures is desperately required to allow for comparison between published studies. In this regard it is recommended that the U.K. consider the findings from the recent workshop on objective monitoring standardization hosted by the National Institutes of Health and the American College of Sports Medicine (http://conference.novaresearch.com/OMPA/index.cfm) and cooperate and collaborate with others to further advance this important work. Objective assessment permits careful assessment of behaviour compensation and allows for more detailed physical activity profiling including assessing more difficult to recall "activity", including short bouts (e.g. 1-5 minutes), light activities, non-exercise activity thermogenesis (NEAT), incidental movement and sleep.[29-31]

Recommendation 14
It is recommended that the UK should use objective, time-stamped measurement techniques in population surveillance and the monitoring of trends over time.

Recommendation 15
It is recommended that the UK work in cooperation and collaboration with other countries to standardize data cleaning, reduction and analysis procedures for objective physical activity monitoring devices.

Question 9. Please comment on the need for a coherent comprehensive communication strategy to disseminate the physical activity guidelines to a variety of audiences (including education sector, health sector and others).

Though beyond the scope of work for this working paper, research in the social marketing field would suggest that a comprehensive social marketing and communications plan in conjunction with a release (or re-release) of physical activity guidelines is required to have the desired impact. Such an exercise is particularly challenging for guidelines aimed at young people because of the multiple settings and multiple people who control their environments and behaviours. In Canada, a series of physical activity guides designed for children[12] and youth[11] are supported by guides for families, teachers.[33-38] Some assessments have been performed on Canada's Physical Activity Guides and suggest a comprehensive dissemination and communication plan is important for the guides to have the desired impact.[39,40]

Question 10. What is the appropriate summary guideline for healthcare practitioners, as a basis for communicating brief advice on physical activity to patients aged 5-18 years and their parents?

The following key messages should be adopted as the essence of the U.K. physical activity guidelines for children and young people.

- All children and young people should be physically active daily, as part of play, games, sports, work, transportation, recreation, physical education, or planned exercise, in the context of family, school, and community activities.
- Children and young people aged 5–18 years of age should accumulate at least 1 hour and up to several hours of at least moderate-intensity physical activity on a daily basis to achieve most of the health benefits associated with physical

activity. This activity should be above and beyond routine, non-recreational activities associated with daily living.

- Some health benefits can be achieved through 30 minutes/day of moderate intensity physical activity for currently sedentary children and young people.
- Vigorous-intensity activities should be incorporated or added when possible, including activities that strengthen muscle and bone, with a target of 3 days per week.
- Aerobic-type activities should make up the majority of the daily physical activity.
- It is important to encourage young people to participate in physical activities that are developmentally appropriate, enjoyable, safe and offer variety.
- Physical activity guidance should be presented in a fashion that is inclusive of children from both sexes, a variety of ethnic backgrounds, and an array of disabilities and limitations.

Additional Recommendations for Consideration

Recommendation 16
The physical activity guidelines for children and young people in all four UK jurisdictions should be harmonized to provide a common set of scientifically and expert informed statements with a common level of detail.

Recommendation 17
The development of guidelines on sedentary behaviour for children and young people should be a priority and when complete should be integrated into the physical activity guidelines.

Recommendation 18
The development of UK physical activity and sedentary behaviour guidelines for infants and preschool children should be a priority and should be integrated into the "family" of existing guidelines.

Recommendation 19
Planned reviews (and revisions if necessary) of the UK Physical Activity Guidelines for children and young people should be completed every 5 years in collaboration and coordination with other jurisdictions (e.g. WHO, Canada, U.S., Australia); International collaboration will result in more robust, less costly and scientifically harmonized evidence and interpretation while providing an opportunity for scientific and communication exchange and cross-fertilization.

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Appendix 7: Working Paper Prepared for Marlow Meeting – Adult and Older Adults

Updating the UK Physical Activity Guidelines for Adults and Older Adults: Recommendations Based on the Current Scientific Evidence

Authorship of this paper is: Adult and Older Adult Expert Working Groups

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Executive Summary of Questions and Recommendations for UK Guidelines on Physical Activity for Adults and Older Adults: Working Paper 1

Question 1 Does the scientific evidence continue to support the current Physical Activity Guidelines for adults and older adults?

Recommendation #1
The current scientific evidence does continue to support the health benefits of the volume of activity stated in the current UK guidelines on physical activity, namely, 5 x 30 mins of moderate intensity activity per week. However it is recommended that the current Physical Activity Guidelines in each of the home countries should be reviewed and potential refining, clarification and or extensions should be considered to allow a better reflection of the scientific knowledge accumulated since 2004 on the health benefits of physical activity.

Question 2 Based on the current evidence on volume, intensity, duration and frequency of activity and their impact on health and disease, what modifications to existing UK guidelines are warranted?

Activity volume
Recommendation #2
The UK guidelines should maintain the focus on stating the amount of activity in terms of "5 sessions x 30 minutes of moderate-intensity physical activity per week" and note that this equates to a volume of 150 minutes of moderate intensity per week.

Recommendation #3
The UK guidelines should note that there are multiple ways of accumulating the total of 150 minutes, and "5 x 30" is one way.

Recommendation #4
The UK guidelines should recognise that the volume of physical activity associated with the prevention of different chronic diseases may vary but the evidence is currently insufficiently precise to warrant separate guidelines for each specific disease because in part the evidence may be equivocal and also it is likely to cause confusion.

Recommendation #5
The UK Physical Activity Guidelines should recognise the health benefits of moving from 'no activity' to 'low levels' of activity, particularly for those who have been very inactive and older people with physical and disease limitations.

Recommendation #6
The UK Physical Activity Guidelines should recognise that higher volumes of activity (> 150 minutes) are associated with increased health benefits.

Recommendation #7
The UK guidelines on physical activity for older adults should adopt the same key recommendation(s) on total amount of activity needed for health benefits as used for the adult population.

Activity intensity

Recommendation #8
The UK guidelines should include a specific statement recognising the health benefits of vigorous intensity activity.

Recommendation #9
The UK guidelines should recognise that combinations of moderate- and vigorous-intensity activities can provide health benefits and this represents another way of achieving the recommended target volume of activity.

Recommendation #10
The UK Physical Activity Guidelines for older adults should place greater emphasis on moderate-intensity rather than vigorous intensity activities and should be based on lower absolute but similar relative intensity.

Session duration and accumulation of shorter bouts

Recommendation #11
The UK guidelines should retain a statement recognising that activity can be accumulated through shorter bouts of at least 10 mins or more of moderate intensity exercise.

Recommendation #12
The UK guidelines should acknowledge shorter bouts of activities that may not last the minimum required bout of 10 minutes (for example activities including walking up and down stairs) will add to total activity and may help sedentary people get started. This is consistent with recommendation #5 that all movement is good.

Recommendation #13
The UK guidelines should retain the recommendation that physical activity is undertaken regularly across the week (such as 5 or more times per week) because of the evidence of acute effects on biomedical markers and because it can encourage regular activities undertaken as part of daily lifestyle such as active travel through walking and cycling.

Question 3. Is there any evidence that being very sedentary puts person at highest risk? If possible, please clarify the definition of 'sedentary' and provide any indication of the amount (quantity) and specify the health outcomes that are covered by this evidence?

Recommendation #14
The UK guidelines should be revised to include a statement on avoiding long periods of the day spent in low intensity activity such as sitting. The guidelines should not attempt any quantification in terms of frequency or duration of sedentary activities as there is insufficient evidence to guide this task at this time.

Question 4. Is the evidence sufficient to support a separate guideline for muscle-strengthening activity, a separate guideline for flexibility activities, and/or a separate guideline for balance activities? If so, what should be considered and should these guidelines differ for adults and older adults?

Recommendation # 15
The UK Physical Activity Guidelines for adults and for older adults should include a specific recommendation to undertake muscle strengthening activities involving the major muscle groups of the body on two or more days per week.

Recommendation # 16
The UK guidelines for older adults should include a specific recommendation on the benefits of physical activity involving balance training on two or more days per week for the prevention of falls *in those adults at risk of falls.*

Recommendation # 17
The UK guidelines for adults and for older adults should recognise the benefits of physical activity in improving flexibility but no specific quantification or recommendation on type, frequency, duration or total volume should be attempted as there is insufficient evidence.

Question 5. Based on the current scientific evidence, how should the Physical Activity Guidelines address physical activity and weight management?

Recommendation # 18
The UK Physical Activity Guidelines should emphasize the health and fitness benefits of physical activity independent of any impact on body weight. They should indicate that overweight and obese adults achieving the recommended weekly volume of activity [5 x 30 / 150 mins/week] will gain health benefit even in the absence of reductions in body weight.

Recommendation #19
The UK Physical Activity Guidelines should indicate that weight loss may require an additional amount of activity beyond the primary recommendation of 150 mins per week and include a decrease in caloric intake.

Question 6. Based on the current scientific evidence, how should the Physical Activity Guidelines address physical activity preventive mental health benefits?

Recommendation #20
The UK guidelines should continue to acknowledge the role of physical activity in both the prevention of poor mental health; reductions of symptoms of poor mental health (such as depression and dementia) and improvement in mental well being (such as mood, self-perception and sleep); the guidance should continue to indicate that these benefits are possible from the minimum currently recommended dose of activity of 5 x 30 mins (or 150 mins/week equivalent) of moderate-intensity physical activity.

Question 7. Does the scientific evidence on the health benefits of physical activity suggest that Physical Activity Guidelines should vary for women and men or for different population groups based on race, ethnicity?

Recommendation #21
The UK Physical Activity Guidelines for adult and for older adults do not need to differ for sub populations based on gender or race/ethnicity; however it is noted that the communication strategies and "messaging" of the Physical Activity Guidelines to different sub population may differ to be most effective.

Question 8. How applicable are the any proposed changes to the current UK Physical Activity Guidelines for adults with disability?

Recommendation # 22
The UK guidelines should include a statement to recognise that the Physical Activity Guidelines written for generally healthy adults can be applied to persons with disabilities; they should also emphasize that they need to be adjusted for each individual based on their exercise capacity and any special health/risk issues.

Question 9. Is there sufficient evidence to require separate Physical Activity Guidelines for older adults?

Recommendation # 23
It is recommended that the UK consider presenting separate Physical Activity Guidelines appropriate for older adults (age 65 and above) as this is warranted by the scientific evidence indicating sufficient differences to warrant clear differentiation and later a separate communication strategy; it is noted that some sections of the guidelines aimed at older adults would be the same as those for adults.

Question 10. Is there sufficient evidence / knowledge of the risks associated with physical activity to inform a statement on the risks versus benefits of the Physical Activity Guidelines?

Recommendation #24
The UK guidelines should include a statement clarifying that the benefits of physical activity outweigh the risk and guidance on how to minimize the risk of health-promoting physical activity.

Question 11. Please comment on the need for a coherent comprehensive communication strategy to disseminate Physical Activity Guidelines to a variety of audiences (including education sector, health sector and others).

Recommendation #25
It is highly recommended that a comprehensive communication strategy is undertaken for effective dissemination of Physical Activity Guidelines to a variety of audiences across the UK.

Question 12. What, if any, are the implications of adopting any of the proposed changes to the current UK Physical Activity Guidelines on the data collected and how it is used and presented as part of ongoing population health monitoring and surveillance systems?

Recommendation #26

Adopting any or all of the recommended modifications to update the UK Physical Activity Guidelines will have implications for the monitoring and reporting of trend data in England, Scotland, Wales and Northern Ireland. Consultation with relevant agencies / departments that collect, analyse and report the national health data is important and documentation associated with any revised physical activity guideline should outline the implications for physical activity surveillance.

Question 13. Would adoption of the proposed modifications to current UK Physical Activity Guidelines influence the difficulty of meeting Physical Activity Guidelines compared to the current Physical Activity Guidelines for insufficiently active adults?

(statement provided)

Question 14. What is the appropriate summary guideline for healthcare practitioners, as a basis for communicating brief advice on physical activity to patients

(statement provided)

Introduction and Background

This working paper provides the background content and framework for the reappraisal of the current UK Physical Activity Guidelines for the preventive health benefits of physical activity for adults, including older adults. In England, the last comprehensive review of this scientific field was undertaken within the context of the Chief Medical Officer's (CMO) report published in 2004. This document reflected the scientific evidence up to early 2003.

The field of exercise science has grown exponentially in the past 6 years and new guidelines have emerged in USA (Physical Activity Guidelines Advisory Committee, 2008), and are under development in Canada and globally under the auspices of the World Health Organization. These wider agendas and the new scientific evidence available provide grounds for a new look at current UK guidelines. Moreover, there are particular areas of specific interest where there has been a growth in new evidence, for example on the health benefits of physical activity for improving muscular strength and endurance, with particular emphasis on effects for older adult populations. Also, the impact of physical activity on energy balance, given increasing prevalence of obesity, and mental health outcomes in the light of increasing levels of mental illness such as depression and dementia.

This Working Paper presents a set of specific recommendations in regards to potential modifications to the current Physical Activity Guidelines. For the purposes of this review, adulthood is defined as older than 16 years and those 65 years and older are categorised as older adults.

The audience for this Working Paper includes the scientific community as well as professionals in exercise and health, public health and medicine who have responsibility for policies and programs that impact the health of the general public and specific patient populations.

This paper is not a set of new Physical Activity Guidelines – it sets out recommendations, based on the latest science, for consideration by interested parties and relevant government agencies for updating the current guidelines. A set of key

questions provide the structure for this Working Paper, and for each question one or more recommendations are provided.

Current context of Physical Activity Guidelines for adults and older adult in the UK

The devolved health administrations in the UK have each produced their own guideline documents during the past five years. Although the key recommendations in each show minor variations in wording, they are generally consistent in their message (see Table 1) and can be summarized as *adults should attain 30 minutes of moderate-intensity physical activity each week, on 5 or more days a week*. The Scottish guidelines refer to "on most days of the week" suggesting activity on least four days. It is well recognised that these concise statements are in many ways over simplistic and so recommendations are also accompanied by important additional subsidiary statements, some of which refer to other forms of physical activity, specific aspects of health, or special considerations for sub-populations.

The current "headline" recommendations on physical activity for adults are also presented as appropriate for older adults (although not overtly specified in the Welsh document).

Additional qualifying statements are also made to highlight special considerations for older adults. For example, the Scottish guidelines included the statement: "…the absolute intensity of activities for older people can be lower than it is for younger adults." In England, the CMO report (page 25) includes a section on recommendations for older adults that features bulleted statements such as "Older people should take particular care to keep moving and retain their mobility through daily activity", and "Activities that promote improved strength, coordination and balance are particularly beneficial….".

Table 1: Summary of the current "headline" Physical Activity Guidelines for Adults and Older Adults in England, Scotland, Wales and Northern Ireland.

Country	Adults	Older Adults
England[1]	Adults should achieve a total of at least 30 minutes of at least moderate intensity physical activity a day, on 5 or more days a week	The recommendations for adults are also appropriate for older adults
Scotland[2]	Adults should accumulate (build up) at least 30 minutes of moderate physical activity on most days of the week	At least 30 minutes of moderate activity on most days of the week Three times per week of strength and balance exercises is also recommended
Wales[3]	30 minutes of moderate intensity on at least five days a week	Not specified
Northern Ireland	A total of at least 30 minutes of at least moderate intensity physical activity a day, on 5 or more days of the week	A total of at least 30 minutes of at least moderate intensity physical activity a day, on 5 or more days of the week

Question 1. Does the scientific evidence continue to support the current Physical Activity Guidelines for adults and older adults?

The current headline recommendations in each of the home country guidelines on physical activity (reported in Table 1) fundamentally refer to aerobic activity. They each capture and convey the quantification of duration, intensity and frequency of activity in a concise statement. These statements are phrased in a relatively easy manner to allow communication of the message to and by health professionals and for the general public.

The scientific evidence supporting the important health benefits of regular physical activity continues to grow. Moreover the evidence continues to support the main elements of the current physical activity guidelines in the UK. However, whilst these guidelines remain correct in terms of the scientific underpinning, the new evidence since 2003, the emergence of new guidelines in the USA and Canada, and the absence of specific guidelines in the UK for older adults, suggests that a closer look at the parameters of physical activity, and specifically total volume, activity intensity, activity duration and frequency of physical activity is required. The following sections address each in turn.

Recommendation #1
The current scientific evidence does continue to support the health benefits of the volume of activity stated in the current UK guidelines on physical activity, namely, 5 x 30 mins of moderate intensity activity per week. However it is recommended that the current Physical Activity Guidelines in each of the home countries should be reviewed and potential refining, clarification and or extensions should be considered to allow a better reflection of the scientific knowledge accumulated since 2004 on the health benefits of physical activity.

Question 2 Based on the current evidence on volume, intensity, duration and frequency of physical activity and their impact on health and disease, what modifications to existing UK guidelines warranted?

2a) Activity volume

There is no explicit statement on total volume of activity in the current UK guidelines although 150 minutes of moderate intensity physical activity per week is implied in the '5 x 30 minutes' message. In the most recent US Physical Activity Guidelines (Physical Activity Guidelines Advisory Committee, 2008), the headline recommendation is 'at least 150 minutes/week of moderate intensity activity' with '5 x 30 minutes' given as the first of several examples of a good way to achieve this goal. The US Guidelines (2008) is based on possibly the most extensive review of the science conducted to date on the effect of physical activity on all the key physical and mental health end points. The main findings of which scientific studies continue to support the key role that total volume of aerobic activity of ≥ moderate intensity (that is ≥3 METs) plays in achieving health benefits. Achieving an adequate volume of at least moderate or vigorous intensity activity (MVPA) appears to be more important for a composite of health benefits than does the specific mode of activity (e.g.,

walking, swimming, cycling), its intensity (assessed or expressed in absolute or relative terms) or the session frequency (number of days/week).

There does however appear to be some variability in the amount or volume of moderate intensity activity required for different health benefits. A number of good quality prospective observational studies show that rates of all-cause mortality, CVD mortality development of type 2 diabetes and depression are significantly lower in adults reporting 120-150 minutes per week of moderate intensity activity while significantly lower rates of colon cancer, breast cancer and obesity occur at 180-300 minutes per week of moderate intensity activity.

In relatively healthy adults, there is insufficient evidence to conclude that age affects the volume (total amount) of physical activity necessary for health benefits. Hence, relatively healthy adults and older adults should follow the same key guideline (or guidelines) for aerobic activity. This is consistent with the US Guidelines (2008), whereby the key aerobic guidelines apply to both adults and older adults.

For both adults and older adults, there is strong evidence of a dose-response relationship between volume of activity and the health benefits of activity. This holds true for both ends of the activity continuum. More activity (greater volume) has greater health benefits. However, compared to inactivity, even low volumes of activity provide some health benefits. This relationship highlights the importance of avoiding inactivity and is relevant to all adults, but particularly for older adults. Older adults frequently have low fitness or functional capacity, chronic health conditions, and often have serious limitations to undertaking activity. In such adults, there is strong evidence that regular physical activity has preventive benefits and reduces risk of new chronic conditions. Those who are not able to engage in the equivalent of 150 minutes of moderate-intensity activity per week, should not be discouraged and should be guided to be as active as their fitness and chronic conditions allow.

Recommendation #2

The UK guidelines should maintain the focus on stating the amount of activity in terms of "5 sessions x 30 minutes of moderate-intensity physical activity per week" and note that this equates to a volume of 150 minutes of moderate intensity per week.

Recommendation #3
The UK guidelines should note that there are multiple ways of accumulating the total of 150 minutes, and "5 x 30" is one way.

Recommendation #4
The UK guidelines should recognise that the volume of physical activity associated with the prevention of different chronic diseases may vary but the evidence is currently insufficiently precise to warrant separate guidelines for each specific disease because in part the evidence may be equivocal and also it is likely to cause confusion.

Recommendation #5
The UK Physical Activity Guidelines should recognise the health benefits of moving from 'no activity' to 'low levels' of activity, particularly for those who have been very inactive and older people with physical and disease limitations.

Recommendation #6
The UK Physical Activity Guidelines should recognise that higher volumes of activity (> 150 minutes) are associated with increased health benefits.

Recommendation #7
The UK guidelines on physical activity for older adults should adopt the same key recommendation(s) on total amount of activity needed for health benefits as used for the adult population.

2b) Activity intensity

Each of the current UK guidelines emphasise moderate intensity activity with little overt reference to the role or benefit of vigorous intensity physical activity. England and Northern Ireland state "at least moderate intensity activity" suggesting that vigorous intensity activity is also included. However, this phrasing is ambiguous as it could be misinterpreted that a similar amount (volume) of vigorous-intensity activity gives the same effects as moderate-intensity activity. The Scottish and Welsh guidelines recommend "moderate intensity" and make no reference to vigorous intensity, at least not in their main recommendation. The potential of confusion could be avoided by a clear statement(s) on the health benefits of vigorous intensity activity.

The current guidelines in the UK contrast to other international examples whereby the role of vigorous intensity activity has been retained in one way or another. In the US, the Surgeon Generals Report of 1995-96 stated "prior vigorous physical activity recommendations still applied" referring primarily to the ACSM recommendations of 60-90 minutes of vigorous intensity activity/week (3 x 20 or 3 x 30 minutes/week) providing health benefits. The more recent 2007 recommendations by ACSM/AHA

included vigorous intensity activity by stating ≥20 minutes 3 x week) as well as the moderate intensity activity. This is also the case in the US Guidelines (2008) where '≥75 minutes per week of vigorous intensity activity' is presented. This calculation of minutes is based on the MET value of vigorous activity being estimated and averaged to be about double that of moderate intensity activity and therefore about half the time is required to achieve a similar volume and health benefits.

For overall public health benefit of chronic disease prevention and health promotion, the data from a large number of studies evaluating a wide variety of benefits in diverse populations continue to generally support ≥150 minutes/week of moderate intensity physical activity (or 500-1000 MET-minutes/week of moderate and/or vigorous intensity activity) (Physical Activity Guidelines Advisory Committee, 2008).

There is substantial evidence that vigorous-intensity physical activity (≥6 METs) brings significant increased benefits for some fitness and health outcomes. Data from both prospective observational studies and experimental studies demonstrate a strong and quite consistent dose response for activity intensity and cardio-respiratory fitness. When prospective observational studies include three or more intensity classifications in their analysis (e.g., light, moderate, vigorous), a number of these studies report a significant p for trend across the intensity categories. However, the results in some of these studies are confounded because possible differences in the volume of activity between groups have not been adequately controlled.

It should be noted that vigorous intensity activity is rarely achieved by at least 80% of the UK population (and even fewer older adults). Furthermore, vigorous intensity activity introduces further motivational challenges to people who are not used to this intensity level of exercise or who prefer less vigorous forms of activity, such as dance, walking. Undertaking vigorous intensity activity may also heighten risk of injury, an issue more fully addressed in responses to Question #10. Conversely, a sector of the population may prefer vigorous-intensity activity as a means of achieving all or some of their weekly requirements because the energy expenditure of vigorous activity is greater than that of moderate-intensity activity, thus fewer minutes are required to obtain health benefits equivalent to those of 150 minutes of moderate-intensity activity. Besides increased benefits of vigorous activity, it provides a more efficient

alternative to moderate intensity activity for those who might prefer it. The US Guidelines (2008) addressed this by showing how vigorous-intensity and moderate-intensity activity can be packaged together to achieve weekly recommendations. This has also been done in other national guidelines such as Finland and Switzerland. As a rule of thumb, twice the number of minutes is required of moderate intensity activity versus vigorous intensity for the same health benefits (see Box 1 for more on MET equivalents).

Intensity and Older adults

There is strong scientific evidence that both moderate-intensity and vigorous-intensity activity provide similar health benefits in older adults. There is insufficient evidence to conclude that age per se affects the relative health benefits of equal volumes of moderate-intensity activity versus vigorous-intensity activity. However, there is a rationale for using relative intensity (as opposed to absolute intensity) in guidelines for older adults, as they are not usually able to achieve equivalent absolute levels compared to younger adults. This rationale affirms the statement in the current Scottish guidelines, that the absolute intensity of aerobic activity should often be less for older adults.

Recommendation #8

The UK guidelines should include a specific statement recognising the health benefits of vigorous intensity activity.

Recommendation #9

The UK guidelines should recognise that combinations of moderate- and vigorous-intensity activities can provide health benefits and this represents another way of achieving the recommended target volume of activity.

Recommendation #10

The UK Physical Activity Guidelines for older adults should place greater emphasis on moderate-intensity rather than vigorous intensity activities and should be based on lower absolute but similar relative intensity.

Understanding Intensity of Activity and MET Values

The US Guidelines (2008) defined the absolute intensity of aerobic activity as: moderate-intensity is 3.0 to 5.9 METs and vigorous-intensity is greater than or equal to 6.0 METs. Major health benefits from moderate and vigorous intensity physical activity were consistently and significantly achieved in men and women who reported from 500 – 1000 MET-minutes per week.

A target of 500 MET-min/week could be achieved by:
walking at about 4.8 km/h (3.0 mph) for approximately150 minutes per week (12 km or 7.5 miles),
walking at 6.4 km/h (4.0 mph) for 100 minutes (10.6 km or 6.6 miles)
or jogging at 9.7 km/h (6 mph) for about 50 minutes per week (8 km or 5.0 miles).

To achieve 1,000 MET-min/wk this volume of activity would need to be doubled.

The US Guidelines (2008) specified that 75 minutes of vigorous-intensity activity/week was a volume roughly equivalent to 150 minutes of moderate-intensity activity/week (rule of thumb 2 minutes of moderate to 1 minute of vigorous.

This rule allowed specifying how people could do a combination of moderate-intensity and vigorous-intensity activity, and still meet guidelines.

MET-minutes or similar calculations are not recommended for use in primary recommendations to the public but can be used in documents for health professionals to help guide members of the public.

2c) Session duration and accumulation of shorter bouts

Both the current English and Scottish guidelines emphasise accumulation or the building up of 30 minutes of moderate intensity per day through multiple shorter bouts, thus implying that sustained 30 minute sessions are not necessary for health

benefits. The scientific evidence from prospective observational studies have not provided much new information on the value of various session durations on health outcomes mostly because session duration information has rarely been collected in a manner that allows such analytical comparisons. Also, when these data are available, after accounting for total activity volume, session duration usually is not a major independent determinant of health outcomes.

Internationally, attention has been given to the benefits of shorter bouts of physical activity, perhaps because of the practical appeal it would have to the general public. Almost all national guidelines since the mid 1990s have recommendations that include a reference to the accumulation of ≥ 30 minutes/day of moderate intensity activity by performing bouts of at least 10 minutes throughout the day. Although these statements are based on a more limited scientific evidence base, data from about 16 experimental studies have compared the response of selected fitness parameters, fatness measures and biomarkers to multiple 10-15 minute activity sessions (total of 30-40 minutes/day) to one 30-40 minute session/day (Murphy, Blair and Murtagh, 2009). These studies generally conclude that shorter bouts can increase aerobic fitness and reduce fatness and to a lesser extent improve blood pressure and lipids to the same extent as the same volume of exercise performed in longer continuous bouts. Also, an informal analysis of data from prospective observational studies indicated that many people who report ≥150 minutes per week of moderate intensity physical activity and have low chronic disease mortality risk, are likely to obtain much of their activity in relatively short bouts performed throughout the day (Physical Activity Guidelines Advisory Committee, 2008). It is also noted that shorter bouts are likely to be easier to achieve for many adults and thus may help in achieving the recommended levels of physical activity. This may be particularly important for older adults who do little formal exercise but who may achieve recommendations through daily walking. It is noted that additional research is still needed to better understand the concept of accumulation (e.g., how short can the bouts be, timing of bouts throughout the day) and the specific health benefits provided. In summary, there is evidence to support a recommendation that 30 minute bouts of moderate intensity activity is beneficial and that this can be accumulated in shorter bouts of >10 mins.

Recommendation #11
The UK guidelines should retain a statement recognising that activity can be accumulated through shorter bouts of at least 10 mins or more of moderate intensity exercise.

Recommendation #12
The UK guidelines should acknowledge shorter bouts of activities that may not last the minimum required bout of 10 minutes (for example activities including walking up and down stairs) will add to total activity and may help sedentary people get started. This is consistent with recommendation #5 that all movement is good.

2d) Session frequency

In the current UK guidelines, there is some variance in the reporting of the recommended number of days for physical activity. In the English guidelines it is stated as 'at least five days' and in the Scottish guidelines it is stated as 'on most days' thus implying (technically) at least four days but likely in practice this is intended to mean at least 5 days to be consistent with elsewhere. Nonetheless, 'on most days' leaves the interpretation as ambiguous.

The US Guidelines (2008) concluded that the scientific evidence was unclear, for both adults and older adult populations, how the frequency of physical activity affects either the health benefits or health risks of activity. For example, the US scientific report concluded that it was unclear if the health benefits of moderate-intensity activity for 50 minutes on three days each week differed from that of 30 minutes on five days each week. These US Guidelines did affirm, however, that engaging in at least 30 minutes of moderate-intensity activity on 5 or more days per week is a highly appropriate way to obtain at least 150 minutes a week of activity. Further, the US Guidelines state that aerobic activity should be "spread throughout the week" for both adults and older adults. To help clarify the meaning of this phrase, the US Guidelines stated that it is preferable to be active on 'three or more days per week' based on the fact that randomized controlled trials that demonstrate beneficial effects of physical activity typically prescribe at least 3 days per week of activity.

The underpinning scientific evidence includes many experimental studies since 1995 which have shown beneficial effects of 120 to 150 minutes/wk of moderate or vigorous intensity activity usually performed during 3 to 5 sessions per week, so we know that this frequency of activity is effective. There are still very few studies that

systematically evaluate health benefits in response to different frequencies of activity sessions per week with the volume (session duration x intensity x frequency) of activity held reasonably constant. This fundamentally limits the ability to answer key questions about the role of sessions. However, the very limited data does indicate that when activity volume is controlled for, the effect of session frequency is not significant.

Although there is a need for more scientific studies, one reason for Physical Activity Guidelines to include a recommendation that the physical activity is performed frequently across the week is because of the growing evidence that at least some of the health benefits are likely to result from acute, relatively brief responses to the aerobic exercise session. Examples of this type of response include the acute improvement in insulin-mediated glucose utilization in persons with abnormal glucose metabolism, the acute reduction in systemic arterial blood pressure in persons with elevated blood pressure and the decrease in plasma triglyceride concentration in men with hypertriglyceridemia when bouts of aerobic exercise are performed daily. Also, data have been published indicating that various measures of mental or psychological health, such as depression, are improved for a limited time in response to one or several bouts of exercise. These changes appear to last for hours, and not usually days, thus the apparent advantage of undertaking daily exercise sessions.

Session frequency and Older Adults

Older adults should be encouraged to meet guidelines by performing multiple shorter bouts of activity throughout the day. One reason is that many naturally occurring activities such as walking occur frequently as they are tied in routines involving shopping and active travel. For older people daily activity is related to trips away from the home and may be tied to independent living. It is worthwhile noting that there are numerous studies supporting the health benefits of frequent walking. In prospective observational studies larger health benefits of walking are seen when frequent walkers are compared to non-walkers, particularly for women. These results are consistent with the idea that walking may be a particularly valuable intervention for very inactive adults and older adults.

The current UK guidelines for older adults address this issue to some extent, e.g., with the statement: "Regular walking remains extremely important for the maintenance of independence and activities of daily living." Also, while there are very limited data from direct controlled comparisons, the rate of certain types of adverse events (e.g., joint irritation, muscle soreness) in older people may be lower when performing a similar amount and intensity of activity during more sessions across a week.

Recommendation #13
The UK guidelines for adult and for older adults should retain the recommendation that physical activity is undertaken regularly across the week (such as 5 or more times per week) because of the evidence of acute effects on biomedical markers and because it can encourage regular activities undertaken as part of daily lifestyle such as active travel through walking and cycling.

Question 3. Is there any evidence that being very sedentary puts person at highest risk? If possible, please clarify the definition of 'sedentary' and provide any indication of the amount (quantity) and specify the health outcomes that are covered by this evidence?

There are no explicit statements on avoiding 'sedentary time' for adults or older adult populations in the current UK physical activity guidelines. However, the issue of how sedentary behaviours affect health has attracted increasing research interest in the past five to ten years and deserves attention.

The concept of sedentary behaviour remains ill defined. Stationary sitting (as opposed to wheel chair sitting) would be regarded by most as the common sedentary behaviour but we probably spend more time lying (sleeping). Some definitions are emerging and many refer to the tendency to spend most of the time sitting and engaging in only light upright activity such as standing or moving slowly. However, no standard definition currently exists.

In almost all large prospective cohort studies, 'sedentary' behaviour is implied by low total volumes of activity or very low levels of moderate or vigorous intensity or leisure time activity. These studies compare the 'least active' (sometimes termed 'sedentary') group with one or more levels of higher activity. They clearly show that the individuals with the lowest levels of activity are at greatest risk for premature

morbidity and mortality from a wide variety of chronic diseases including CHD, stroke, hypertension, type 2 diabetes, colon cancer, breast cancer, osteoporosis and depression as well as all-cause mortality (Physical Activity Guidelines Advisory Committee, 2008). However, these studies confound sedentary behaviours such as sitting with light activity. Total self-reported sitting time was assessed in several recent prospective observational studies indicating a dose response relationship with all-cause mortality, independent of moderate and vigorous intensity (MVPA) leisure time activity.

More recent studies using accelerometry to measure activity have used cut off points based on movement counts to isolate time spent sedentary. These studies, which have relatively small samples, have indicated relationships between total sedentary time and abnormal glucose metabolism, metabolic risk, and measures of obesity. Most importantly, this risk appears to be independent of time spent in MVPA. Larger studies using accelerometry are underway in the UK. However, they do not necessarily distinguish sedentary behaviours such as sitting from standing or slow upright movement. Other studies, with measures of specific sedentary behaviours (such as TV or screen watching time) have shown similar relationships with metabolic and obesity markers. These studies do not provide a complete picture of the impact of all sitting time or other sedentary behaviours such as lying down. In contrast to total amount of sedentary behaviours, research has also recently been directed at the effects of prolonged uninterrupted periods of sitting and the hemostatic impact of moving from sitting to standing on metabolic parameters and health. These data are consistent with long term studies showing decreases in glucose tolerance with supine bed rest that are reversible when patients sit upright or stand.

The bulk of the current evidence base therefore does not fully isolate true sedentary behaviour from low levels of activity, or light intensity activity. There appears to be scientific justification to recommend that adults should limit the total amount of time that they undertake very low levels of activity during the day. One way of achieving this for most people would be to reduce sitting time. However, there is currently insufficient evidence on the specific health effects of total or prolonged periods of sitting or lying to make recommendations. These conclusions should be revisited in the light of the DH review on the health effects of sedentary behaviours in early 2010.

Recommendation #14
The UK guidelines should be revised to include a statement on avoiding long periods of the day spent in low intensity activity such as sitting. The guidelines should not attempt any quantification in terms of frequency or duration of sedentary activities as there is insufficient evidence to guide this task at this time.

Question 4. Is the evidence sufficient to support a separate guideline for muscle-strengthening activity, a separate guideline for flexibility activities, and/or a separate guideline for balance activities? If so, what Physical Activity Guideline(s) should be considered and should these guidelines differ for adults and older adults?

4a) Strength

Current adult guidelines for England, Scotland, Wales and Northern Ireland do not contain specific guidelines for muscle strengthening activities. Guidelines for older adults in England and Northern Ireland contain statements suggesting 'activities that promote improved strength …. are particularly beneficial….for people of all ages' and Scotland 'for all adults from about the age of 55, including those who are frail, three sessions a week of strength exercises is recommended'.

There is growing scientific evidence on the health benefits of muscle strengthening activities in adults and especially older adults, including the benefits of enhancing muscle strength and muscle power and the consequent improvements or maintenance of functional ability and reduction in falls. Additional benefits include the stimulation of bone formation and reduction in bone loss (Bonaiuti et al. 2002, Shea et al. 2004). The benefits are more comprehensive for older adults as it influences the prevention of falls, functional ability and independent living (Sherrington et al, 2008; Gillespie et al 2009).

The US Guidelines (2008) for both adults and older adults include specific recommendations on these components of fitness, stating 'performing muscle strengthening activities using the major muscles of the body at least twice each week'. Furthermore, the recent ACSM Position Stand for Older Adults (ACSM, 2009) recommends progressive weight training program or weight bearing calisthenics (8–10 exercises involving the major muscle groups of 8–12 repetitions each), stair

climbing, and other strengthening activities that use the major muscle groups at least 2 days/week and between moderate- (5–6) and vigorous- (7–8) intensity on a scale of 0 to 10.

There is, therefore, sufficient scientific evidence, particularly for older adults, to support physical activity guidelines including recommendations on muscle strengthening activity for both adults and older adults, although there is no compelling evidence that these should differ for adults compared with older adults. It is recommended that the UK guidelines are modified to reflect this new science. The types of activities that adults and older adults can perform for progressive muscle strengthening activities should involve the major muscle groups of the body and be undertaken on two or more days per week. For adults, strengthening activities might include weight training machines or free weights. For frailer older adults, these activities might include weight bearing activities such as sit to stands, or use of resistance bands or ankle weights.

Recommendation #15
The UK Physical Activity Guidelines for adults and for older adults should include a specific recommendation to undertake muscle strengthening activities involving the major muscle groups of the body on two or more days per week.

4b) Balance

Current adult guidelines for England, Scotland, Wales and Northern Ireland do not contain specific guidelines for balance activities. As with the muscle strengthening activities, older adults guidelines in England and Northern Ireland contain statements suggesting 'activities that promote improved…. balance are particularly beneficial….for people of all ages' and Scotland 'for all adults from about the age of 55, including those who are frail, three sessions a week of balance exercises is recommended'.

There is accumulating evidence that balance impairment increases the risk of falling in community-dwelling older adults. This includes evidence from a meta-analysis of 44 trials with over 9000 participants, and the result suggest that older adults should challenge their balance and mobility through a wide variety of activities under

different environmental challenges in order to reduce their risk of falls (Sherrington et al 2008, Gillespie Cochrane Review 2009).

The US Guidelines (2008) for adults do not contain specific guidelines for improving balance, however in contrast there is a specific guideline for older adults, it states 'to reduce risk of injury from falls, community-dwelling older adults with substantial risk of falls should perform exercises that maintain or improve balance'. However, the Sherrington Review showed that balance exercises are important even in those not at high risk of falls.

Overall, there is sufficient evidence, from the BASES report, the Canadian and the US Guidelines (2008), to support that guidelines on physical activity for older adults should include a separate guideline on the benefits of physical activity to improve balance, mobility and falls prevention. Activities that challenge (develop) balance include Tai Chi, bowls, dancing, balance ball work. For frailer older adults, activities that challenge balance might include exercise sessions that have changes of direction, changes of level, turns, and single leg stands.

Recommendation # 16
The UK guidelines for <u>older adults</u> should include a specific recommendation on the benefits of physical activity involving balance training on two or more days per week for the prevention of falls *in those adults at risk of falls.*

4c Flexibility

Currently, there are no specific guidelines for either adults or adults in England, Scotland, Wales and Northern Ireland that address activities aimed at increasing and maintaining flexibility. The most recent US Guidelines (2008) for adults also do not contain any guidelines on flexibility, however their guidelines on physical activity for older adults does specifically state 'to maintain the flexibility necessary for regular physical activity and daily life, older adults should perform activities that maintain or increase flexibility on at least two days each week for at least 10 min each day'. The guidelines of many agencies and countries have supported the inclusion of flexibility activities on at least 2 days per week (Canadian guidelines and US older adult guidelines) advocate flexibility exercises on at least 4 days per week). This policy is supported by increasing evidence of a relationship between musculoskeletal fitness

and health outcomes but the scientific evidence in this area is still limited. Some studies have compared endurance and strength exercises with flexibility exercises over 10 to 12 month months in older adults. They showed some beneficial effect of flexibility training in improving strength, physical function as well as quality of life (i.e. bodily pain). Although the specific health benefits of flexibility activities are unclear it is generally considered that flexibility activity maintains the range of motion necessary for daily activities and physical activity.

People need adequate flexibility to perform physical activity therefore older adults should perform activities that maintain or increase flexibility. It is recommended that the UK guidelines are modified along the lines of: 'Adults, especially older adults, should perform activities that maintain or improve flexibility on two or more days per week'. These activities could include static stretches or working through the full range of movement during exercise or physical activity.

Recommendation # 17
The UK guidelines for adults and for older adults should recognise the benefits of physical activity in improving flexibility but no specific quantification or recommendation on type, frequency, duration or total volume should be attempted as there is insufficient evidence.

Question 5. Based on the current scientific evidence, how should the Physical Activity Guidelines address physical activity and weight management?

The current UK guidelines describe the volume and intensity of physical activity likely to elicit health benefit. Given the range of health outcomes known to be affected by physical activity it is not surprising that the evidence on any optimal amount of physical activity may vary according to which health outcome is being examined.

Physical activity is a key component of daily energy expenditure and therefore plays an important role in weight management. However, weight status is a result of the balance between energy intake and energy expenditure at an individual level making

it difficult to determine the amount of activity required for weight management at a population level.

There is evidence from many studies, that physical activity results in weight loss, particularly from fat and helps maintain lean tissue, thus improving body composition. However, there is evidence to suggest that for some individuals, physical activity in excess of 5 x ≥30 minutes of moderate intensity may be required for weight management. This guideline (5 x >30min) may be helpful for maintaining weight for many and is likely to be a suitable initial target for overweight and obese individuals.

The scientific evidence suggests that weight loss will best be achieved by a combination of reduced energy intake (caloric restriction) and increased energy expenditure (physical activity) (Franz et al, 2007). In any guideline regarding physical activity and body weight it is extremely important to discuss the role of both caloric intake and caloric expenditure in managing body weight.

Even in the absence of weight loss, there is evidence to suggest that physical activity brings health benefits and a reduction in risk of a range of diseases including heart disease, diabetes, and some cancers (Ekelund et al, 2007). There is sufficient scientific evidence to suggest that physical activity has an important role to play in the prevention of further health complications among the overweight and obese.

There is evidence that to achieve weight loss requires more physical activity than the 150 min guidelines may be necessary but how much more is still not clear (for the reasons cited above) (Jeffery et al, 2003). Moreover cross sectional studies suggest that overweight and obese people are less active than normal weight individuals (Hemmingsson and Ekelund, 2007) - and therefore even the current guidelines (5 x 30 mins) will contribute to a shift in energy balance as well as the other heath benefits.

One approach to take in the communication of the UK physical activity guidelines to address the prevention of chronic disease and establish/maintenance of a healthy body weight, is to recommend that all adults first aim to achieve the public health target of

moderate intensity activity per week. Once this level of activity is reached and sustained, if body weight is in a desirable range, the focus should be on maintaining the current program. However, if body weight is above a desirable target, then the focus should be to develop a weight loss plan that includes some combination of decreased caloric intake and/or a further increase in caloric expenditure.

Recommendation # 18
The UK Physical Activity Guidelines should emphasize the health and fitness benefits of physical activity independent of any impact on body weight. They should indicate that overweight and obese adults achieving the recommended weekly volume of activity [5 x 30 / 150 mins/week] will gain health benefit even in the absence of reductions in body weight.

Recommendation #19
The UK Physical Activity Guidelines should indicate that weight loss may require an additional amount of activity beyond the primary recommendation of 150 mins per week and include a decrease in caloric intake.

Question 6. Based on the current scientific evidence, how should the Physical Activity Guidelines address physical activity preventive mental health benefits?

Since 2004 and the CMO report which included a chapter on physical activity and mental health the body of scientific evidence continues to grow in this field and broadly falls into the categories: the prevention of mental disease and dysfunction; and the benefits for enhancement of psychological well-being in the absence of mental illness.

The recent scientific report in the US concluded that there is strong scientific evidence in the form of prospective cohort studies that regular physical activity reduces risk of depressive illness in adults and older adults (Physical Activity Guidelines Advisory Committee, 2008).

This was also the same conclusion reached as part of the recent review work conducted by BASES (Fox & Mutrie, in press) . There is also now strong evidence from over 40 similar studies, with adults from late middle age into older age, that physical activity is associated with substantial risk of cognitive decline, cognitive impairment, dementia and Alzheimer's disease (Fox & Mutrie, in press). The data show reasonable evidence of a dose-response effect for depressive illness, but insufficient evidence of dose-response effect for cognitive decline, dementia and Alzheimer's disease as most of these studies compared inactive with active populations.

The evidence base for prevention and treatment of anxiety disorders is weaker than that for depression. Although the review conducted by Fox and Mutrie for BASES concluded that there was insufficient evidence to draw conclusions about anxiety disorders, the scientific report in the US, whilst acknowledging the small number of studies, concluded that the weight of the evidence supported both a prevention and symptom reducing role for physical activity and anxiety disorders. The US Guidelines Report (2008) also concluded that there was moderate evidence that physical activity improves sleep quality. There is also substantial evidence that physical activity improves self-perceptions and to a lesser extent esteem, reduces state and trait anxiety, improves mood and decreases feelings of fatigue.

The amount of physical activity required for mental health benefits is unclear as different effects may appear for different elements of psychological effect. For example, walking for even 10 minute bouts has been shown to improve mood. However, the US Guidelines Report (2008) consistently states that the minimum or optimal amount or type of physical activity or exercise for achieving prevention or reducing symptoms of poor mental health are not known but that a fitness effect may not be required to achieve a psychological benefit.

In summary, the evidence in support of physical activity for the prevention of mental illness (depression, cognitive decline and dementia) and improvement in mental well being (mood, self-perceptions, and sleep) continues to strengthen. However, as with physical health outcomes, the amount of activity required for different aspects of mental health may vary. Although there is a lack of evidence to guide the precise amounts of activity required for some of the mental health benefits, there is sufficient evidence to show that current guidelines of 5 x 30 are effective. In view of this state of evidence, there are no grounds for modification of current UK guidelines.

Recommendation #19

The UK guidelines should continue to acknowledge the role of physical activity in both the prevention of poor mental health; reductions of symptoms of poor mental health (such as depression and dementia) and improvement in mental well being (such as mood, self-perception and sleep); the guidance should continue to indicate that these benefits are possible from the minimum currently recommended dose of activity of 5 x 30 mins (or 150 mins/week equivalent) of moderate-intensity physical activity.

Question 7. Does the scientific evidence on the health benefits of physical activity suggest that Physical Activity Guidelines should vary for women and men or for different population groups based on race, ethnicity?

a) Sex

Over the past decade or so a large number of aerobic physical activity and health studies have been conducted with women or men only as subjects or with both men and women as subjects. The results of these studies consistently demonstrate that overall there are no consistent differences in the responses between men and women.

The least active or fit of both sexes frequently have the highest risk, with lower and lower risk observed as greater amounts of physical activity are reported. In some studies it appears that women benefit more than men from similar amounts of aerobic activity and this is likely accounted for by the lower baseline activity of women in these populations. Men and women also appear to respond in a similar manner to resistance exercise in terms of increases in muscle strength and bone health. This comparison is less well developed than for aerobic exercise because of fewer comparison studies. This similar response to increase activity occurs despite men on average having higher aerobic capacity and greater muscle strength than women. Because of these differences, the results of exercise training studies are more similar between men and women when relative intensity (e.g., % max HR reserve, % 1 rep. max) rather than absolute intensity is used

b) Race/ethnicity

Very few prospective observational or experimental studies have directly compared the health effects of similar activity profiles on adults of different races or ethnicities. In the few studies making such comparisons no systematic differences have been reported between race/ethnicity. A vast majority of subjects in large prospective observational studies that have provided much of the data supporting the role of higher amounts of activity in chronic disease prevention and health promotion have been non-Hispanic white. However, in the relatively few studies that have included large populations of adults from other races or ethnicities the relation of aerobic activity to health outcomes appears to be similar to that reported for non-Hispanic white men and women. More research is needed to better understand if any important difference exists for outcomes such as weight loss and metabolic disorders that are exceptionally prevalent in some race/ethnic populations.

Based on the results of published studies there is no scientific basis for providing different physical activity guidelines for men or women or for adults of different race/ethnicities. However, implementation plans for effective programs and policies to increase habitual activity will very likely need to take sex, race/ethnicity and culture into consideration.

Recommendation #21
The UK Physical Activity Guidelines for adult and for older adults do not need to differ for sub populations based on gender or race/ethnicity; however it is noted that the communication strategies and "messaging" of the Physical Activity Guidelines to different sub population may differ to be most effective.

Question 8. How applicable are the any proposed changes to the current UK physical activity guidelines for adults with disability?

A good understanding of the health and performance benefits derived from physical activity by persons with disabilities is still limited due to a lack of research. The goal of recent reviews of the scientific literature regarding the health benefits of physical activity for persons with disabilities has not been to consider activity as a therapy for the disability but to evaluate the evidence that physical activity provides the general health and fitness benefits frequently reported in populations without these disabilities (e.g., improvements in physical fitness, biomarkers for chronic disease, physical independence, health-related quality of life).

Moderate to strong evidence exists for improvements in walking speed and walking distance in patients with stroke, multiple sclerosis and intellectual disabilities. Quite strong evidence indicates that resistance exercise training improves muscular strength in persons with such conditions as stroke, multiple sclerosis, cerebral palsy, spinal cord injury and intellectual disability. Limited data from experimental studies indicate that increases in aerobic exercise improve cardiorespiratory fitness in individuals with lower limb loss, multiple sclerosis, stroke, spinal cord injury and mental illness. While there is suggestive evidence of benefit for such outcomes as flexibility, atherogenic lipids, bone mineral density and quality of life, the data are still very preliminary. For a majority of the studies reviewed involving persons with disabilities, the exercise regimen frequently followed was that currently recommended for the adults or older adults– aerobic exercise of 30-60 minutes, 3 to 5 days per week at moderate intensity and resistance training with 1 or 2 sets of 8-12 reps using appropriate muscle groups 2-3 times per week (intensity adjusted for the individual's capacity). Data comparing various doses of exercise in a single study in persons with disabilities are not available. Most participants had a pre-participation medical

evaluation and medical adverse event rates were low and did not differ between exercise program participants and non-exercise controls.

Based on the Physical Activity Guidelines Advisory Committee and Canadian (Ginis and Hicks, 2007) reviews, the physical activity guidelines for generally healthy adults can be applied to persons with disabilities emphasizing that they need to be adjusted for each individual based on that person's exercise capacity and any special health/risk issues.

Recommendation # 22
The UK guidelines should include a statement to recognise that the Physical Activity Guidelines written for generally healthy adults can be applied to persons with disabilities; they should also emphasize that they need to be adjusted for each individual based on their exercise capacity and any special health/risk issues.

Question 9. Is there sufficient evidence to require separate guidelines for older adults?

To date UK guidelines have suggested that adult guidelines are appropriate for older adults. The older adult population is becoming a larger sector of the overall population and they suffer from greater levels of disease, disability, are vulnerable to falls and injury and have lower activity and physical function and higher levels of mental illness than any other age sector of the population. In addition, life circumstances are different with fewer in regular employment.

Recommendation # 23
It is recommended that the UK consider presenting separate Physical Activity Guidelines appropriate for older adults (age 65 and above) as this is warranted by the scientific evidence indicating sufficient differences to warrant clear differentiation and later a separate communication strategy; it is noted that some sections of the guidelines aimed at older adults would be the same as those for adults.

Question 10. Is there sufficient evidence / knowledge of the risks associated with physical activity to inform a statement on the risks versus benefits of the Physical Activity Guidelines?

The US Physical Activity Guidelines Advisory Committee Report (2008), included a comprehensive review on selected adverse events associated with physical activity and concluded that overall, the benefits of physical activity clearly outweighed the risks. However, adverse events, like musculoskeletal injury, even if not severe are quite common and can be an impediment to the adoption of increased physical activity by some adults and older adults. For some specific conditions, existing studies de facto provide the net benefit. For example, estimates of the extent that physical activity reduce (all cause) premature mortality necessarily reflect both the risks (e.g. risk of sudden death) and benefits of activity. Estimates of the effect of physical activity on functional ability in older adults reflect both the mechanisms by which physical activity improves ability (e.g. better fitness), and the mechanisms by which physical activity reduces ability (e.g. musculoskeletal injuries).

There are many determinants of the risk for adverse events during physical activity. The Physical Activity Guidelines Advisory Committee (PAGAC) subcommittee considering adverse events came to the following conclusions. A major determinant is the type of physical activity, with activities like walking, dancing, gardening or yard work, swimming and golf having very low injury risk, while contact and collision sports have relatively high injury rates. Adverse event risk, especially musculoskeletal injury, increases as the volume of activity increases. Injury rates at the volume and intensity of activity frequently recommended (150 minutes/week of moderate intensity activity) have not been frequently documented but appear to be low. The risk of injury is directly related to the magnitude of increase in the amount or intensity of activity performed (rate of increase). Small increases in amount and/or intensity followed by a few days of no increase appears to facilitate favourable adaptation with a low risk of injury. It is recommended that session duration and frequency be increased before increasing intensity.

The risk of musculoskeletal injury during physical activity in people who are regularly active is proportional to the volume of activity they perform. That is, the more time spent being physically active and/or the higher the intensity the activity the more likely an activity-related injury will occur However, some studies have indicated that while risk during regular activity is higher in more active people, their overall risk of injury is somewhat less than for inactive persons because they are less likely to

be injured in other setting such as around the home. This appears to especially be the case for older adults who are at increased risk of injuries.

The benefits of moderate-intensity physical activity clearly outweigh the risks. There is sufficient evidence for guidelines on how to reduce adverse events due to activity, particularly guidelines advising adults that any increases in volume or intensity of activity should be done gradually over time.

Recommendation #24
The UK guidelines should include a statement clarifying that the benefits of physical activity outweigh the risk and guidance on how to minimize the risk of health-promoting physical activity.

Question 11. Please comment on the need for a coherent comprehensive communication strategy to disseminate the Physical Activity Guidelines to a variety of audiences (including education sector, health sector and others).

Each of the UK countries should have a comprehensive communication strategy for their physical activity guidelines document. Moreover, this should be alongside a long-range national plan. This plan should contain policies, programs and initiatives developed by representatives from a number of stakeholders in each country. It does not make sense to develop new guidelines, if the guidelines are not effectively disseminated and implemented.

The importance of a comprehensive communication strategy became clear in efforts to communicate physical activity guidelines in the 1990's. Consider the CDC/ACSM guideline released in 1993: *"All adults should accumulate at least 30 minutes of moderate-intensity activity on most, preferably all, days of the week."* The guideline was purposely terse, so as to facilitate dissemination. However, it soon became clear the public struggled to understand it. In particular, the meaning of "moderate-intensity" was unclear, and the term "physical activity" struck some people as so broad that it caused confusion about what activities counted toward meeting the guideline. Also, adults tended to regard 30 minutes as the target, instead of the minimum, and very few people understood that this guideline was in addition to an existing guideline dealing with vigorous intensity activity. Recognizing the need to

facilitate comprehensive communication strategies for messages dealing with physical activity, the CDC sponsored an international conference on the topic of communication in 2001.

When the U.S. Department of Health and Humans Services (DHHS) committed to developing the *2008 Physical Activity Guidelines for Americans*, DHHS regarded the communications strategy as extremely important part of the process. Communication experts within DHHS were recruited to a communications working group. This group was formed relatively early in the process, so some members attended the public meetings of the PAGAC, which occurred before the PAGAC report was even drafted. Both physical activity scientists and communication experts were recruited to the DHHS committee which drafted the *2008 Physical Activity Guidelines for Americans.* The goal was to craft and organize guidelines in a manner than facilitated dissemination.

DHHS has a major commitment to reducing health disparities, as illustrated by the *Healthy People 2010* initiative and documents. Hence, materials for the public were appropriate for diverse audiences. Focus groups were used to refine strategies and messages for disseminating the guidelines to the public. The communication plan involved:

(1) Preparing print and web materials for the public which summarized key aspects of the guidelines;

(2) A tool kit for organizations whose mission included promoting physical activity;

(3) A partnership network; and

(4) Press releases and events.

The communication plan emphasized long-term dissemination of the guidelines and included an evaluation plan.

Recommendation #25

It is highly recommended that a comprehensive communication strategy is undertaken for effective dissemination of Physical Activity Guidelines to a variety of audiences across the UK.

Question 12. What, if any, are the implications of adopting any of the proposed changes to the current UK Physical Activity Guidelines on the data collected and how it is used and presented as part of ongoing population health monitoring and surveillance systems?

A core function of public health surveillance systems is to assess and track trends over time in population health indicators. The most important health indicator related to physical activity is the percent of people who engage in recommended amounts of activity. If the key Physical Activity Guidelines in the UK are changed, then the method used to assess this indicator is likely to require changing in some way. Decisions about how to revise physical activity guidelines, and those that are regarded as key or "headline" should take into account the impact on the ability of surveillance systems to track the percent of people who meet the revised guideline(s).

For example, the 1993/95 CDC/ACSM guideline specified that moderate-intensity physical activity should be done on "most, preferably all, days of the week." This wording created some difficulty for the CDC BRFSS surveillance systems. Technically, "most days" of the week is 4 or more days. Yet the supporting text of the CDC/ACSM guidelines suggested "5 or more days" was the better interpretation. And given daily activity is "preferable," should surveillance systems separately report the percent of people who obtain daily activity? CDC eventually decided that people needed to be active on five or more days a week to be classified as meeting the moderate-intensity activity recommendation, and that it was not essential to track the percent of people active on all days each week.

Other issues related to the Physical Activity Guideline and computation of the leading health indicator selected for physical activity include whether to only count minutes reported that are greater than 10 mins, whether to include, and if so how, vigorous-intensity activities, and what domains of activity (work, transport, domestic) are accepted within the computations. There is no internationally accepted standard in this field and this has led to great difficulty in between country comparisons. Each country faces this same issue when national guidelines are reviewed, and the UK will have to consider the impact of introducing any modification on current methods of collecting and reporting national indicators.

Historically, with headline recommendations focussed solely on the benefits of aerobic activity and with this presented as a recommendation of "5 x 30", the health indicator of interest for physical activity is the percent of people who engage in recommended amounts of moderate- to vigorous-intensity aerobic activity five or more days a week. If additional (new) guidelines are introduced to address other types of activity (e.g., muscle strengthening activity, flexibility activity, balance training, sitting time), a decision must be made as to the definition of the leading health indicator for physical activity. For example, to classify a person as "meeting physical activity guidelines," is it sufficient only to meet an aerobic guideline or must a person also meet the muscle strengthening guideline (e.g. do muscle strengthening activities on at least two days each week)?

Moreover, if the UK chooses to modify the "headline" recommendation to focus on the total volume (e.g. obtain the equivalent of at least 150 minutes of moderate-intensity aerobic activity each week) then the focus on "5 days per week" is dropped and the analysis and reporting of population data would have to modified accordingly.

Introduction of any or all of the proposed changes to the current UK guidelines is likely to have some implications and require some changes to current methods used to report prevalence and trend data on physical activity. It is known that any change in assessment or analysis methods will discontinue/break longitudinal trend data from a surveillance system. This is unavoidable although mechanism for building in a transition and methods for data harmonization are possible and should be considered.

Another related development in population surveillance methodologies in recent years has been the introduction of objective measurement methods. In the US, the National Health and Nutrition Examination Survey (NHANES) recently used accelerometers to provide objective assessments of activity. These data revealed a large discrepancy between prevalence estimates based on self report survey and the objective data (in the same people). This has also been found elsewhere. The UK may also be moving in this direction and may face similar issues.

In summary, adopting any or all of the suggestions in this document to update the UK physical activity guidelines may require modifications to the current ways in which

physical activity is monitored in England, Scotland, Wales and Northern Ireland. Documentation associated with any revised physical activity guideline should where possible outline the implications for physical activity surveillance. Critically, consultation with those agencies and departments that collect, analyse and report the national health data is important.

Recommendation #26
Adopting any or all of the recommended modifications to update the UK physical activity guidelines will have implications for the monitoring and reporting of trend data in England, Scotland, Wales and Northern Ireland. Consultation with relevant agencies / departments that collect, analyse and report the national health data is important and documentation associated with any revised Physical Activity Guideline should outline the implications for physical activity surveillance.

Question 13. Would adoption of the proposed modifications to current UK PA guidelines influence the difficulty of meeting Physical Activity Guidelines compared to the current Physical Activity Guidelines for insufficiently active adults?

Adoption of the recommendations made in this working paper would have both some positive and some potentially negative implications for the ease / challenges faced by adults and older adults in meeting the Physical Activity Guidelines. A few of the implications are noted below:

- Recommending that activity can be accumulated in bouts of 10 mins provides a positive message for adults and older adults to reach the guidelines.

- Recommending an alternative number of ways to reach the guidelines that are not limited to just 5 or more days, increases the number of options for how a person schedules physical activity in their week. Lack of time is the #1 barrier to physical activity. Removing constraints on how time for physical activity is scheduled during the week should reduce the challenge of meeting Physical Activity Guidelines.

- Recommending that physical activity becomes part of ones daily routine will provide more options for adult to reach the guidelines.

- Clarifying the health benefits of vigorous intensity activity and that combinations of moderate and vigorous intensity activity can be health enhancing provides more flexibility of adult to reach the guidelines.

- Adopting aerobic guidelines which can be met by moderate-intensity activity, vigorous-intensity activity, or both, increases the number of options for how a person meets aerobic guidelines. This should reduce the challenge of meeting the guidelines.

- The inclusion of recommendations on physical activity to improve and maintain muscle-strength, balance, and/or flexibility would represent an addition to existing guidelines which focus primarily on aerobic activity. Hence, adults would have to set aside additional time and resources to meet these guidelines. It would likely take a minimum of 20 minutes twice a week to meet a muscle-strengthening recommendation, and a minimum of 10 minutes three times a week to meet a balance training recommendation.

In summary, it is noted that adoption of the proposed modifications to the current UK Physical Activity Guidelines will likely reduce the challenges of obtaining sufficient amounts of aerobic activity however, adding guidelines on muscle-strengthening for all adults, and a guideline for balance exercise in adults at increased fall risk, will increase the time and resources necessary to meet physical activity guidelines.

Question 14. What is the appropriate summary guideline for healthcare practitioners, as a basis for communicating brief advice on physical activity to patients?

Nationally endorsed Physical Activity Guidelines should form the basis for the summary guidance provided to healthcare practitioners. It is reasonable to have separate guidelines for adults and older adults.

It is not possible to reduce all the national guidelines into one succinct summary guideline, which forms the basis for brief advice by practitioners to all adult patients,

including those with chronic conditions. Nonetheless, with modest amounts of education and training about physical activity guidelines and counselling, it is possible for health care providers to communicate brief advice to patients. There is an extensive evidence base on the effectiveness of interventions in this area.

Overall, it is well accepted that health care providers can play an important role in promoting physical activity in adults, and particularly in older adults with chronic health conditions. Although this review has been limited to looking at the scientific evidence on primary prevention, and therefore excluded looking at the role and recommended dose of activity for those living with long term chronic diseases, this should be the focus of future review work and additional physical activity recommendations in the UK.

It is very important to recognise that practitioners need to be provided with adequate training and support to enable them to integrate and deliver evidence-based approaches for the promotion of physical activity in various clinical settings.

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Appendix 8: Final Recommendations for Children and Young People

Recommendation 1	The UK guidelines on physical activity for children and young people should include a recommendation for physical activity in general, an overall guideline.
Recommendation 2	The UK guidelines on physical activity for children and young people should recommend "daily physical activity".
Recommendation 3	The UK guidelines on physical activity for children and young people should recommend at least 60 minutes of moderate to vigorous physical activity (MVPA) daily.
Recommendation 4	The UK guidelines for children and young people should include a specific recommendation for vigorous activity (≥6-7 METS) on at least 3 days a week. *Recommendation for supporting commentary* *The commentary which accompanies the guidelines should indicate that vigorous intensity activity will form part of the daily 60 minute recommendation for children and young people.*
Recommendation 5	The UK guidelines on physical activity for children and young people should recommend physical activity for the promotion of musculoskeletal health and flexibility at least 3 days per week. *Recommendation for supporting commentary* *Physical activity undertaken to improve musculoskeletal health can be considered to contribute to the 60 min of MVPA. However, participating in 60 minutes per day of activity which exclusively focuses on musculoskeletal development cannot be considered to be fully achieving the full recommendations, as there is no aerobic component. Many activities (e.g. many sports) combine elements of both aerobic and anaerobic metabolism and can contribute in important ways to both improved cardio-metabolic and musculoskeletal health. It is important to conceptualise children's physical activity in this holistic way – especially younger children - rather than trying to quantify separate 'bouts' of aerobic/anaerobic activity. The merit of developing and maintaining flexibility should also be identified as important*
Recommendation 6	The UK guidelines on physical activity for children and young people should add a statement that additional MVPA beyond 60 minutes and up to several hours a day confers even greater health benefit.
Recommendation 7	The UK guidelines on physical activity for children and young people should include some explanation to convey that the recommended physical activity is above and *beyond* the light physical activity undertaken in the course of normal daily living (e.g. chores, hygiene, and incidental activity).

Recommendation 8	The UK guidelines on physical activity for children and young people should include the concept "accumulate" in describing the recommended amount of physical activity.
Recommendation 9	The UK guidelines on physical activity for children and young people should provide a comment for those children and young people with disabilities (as done in Scottish 2003 guidelines) to ensure the guidelines are as inclusive as possible.
Recommendation 10	It is recommended that the UK physical activity guidelines for children and young people do not include a specific guideline on physical activity for healthy weight gain or the maintenance of weight loss in overweight or obese children and young people; it is recommended that this be a high priority area for further research. *Recommendation for supporting commentary* *Text should clarify that physical activity is important to prevent weight gain and obesity but that to date there is insufficient evidence to identify the exact amount required for optimal benefit and the issue is complex due to the confounding factors related to dietary intake and healthy weight gain due to healthy development of muscle and bone mass. At the current time, there is insufficient evidence to make a specific physical activity recommendation for either weight loss or weight management in children. Nonetheless, it is well accepted that all physical activity contributes to achieving a healthy energy balance, which in turn determines adiposity status, an important health risk.*
Recommendation 11	The UK physical activity guidelines for children and young people should emphasize that the benefits of regular physical activity are considerable and far outweigh the low risks involved in participation.

Appendix 9: Final Recommendations for Adults

Recommendation 1	The UK physical activity guidelines should encourage adults to engage in moderate-intensity aerobic physical activity for at least 150 minutes per week; this physical activity should be spread across the week; and engaging in at least 30 minutes on 5 or more days each week is one example of how this volume can be achieved.
Recommendation 2	The UK guidelines for adults should retain a statement advising that physical activity can be accumulated across multiple bouts throughout the week. Individuals should aim for bouts of at least 10 minutes of moderate intensity activity at a time.
Recommendation 3	The UK physical activity guidelines for adults should recognize that vigorous-intensity activity also provides health benefits for adults, and that 75 minutes of vigorous-intensity activity (also spread across the week) provides comparable health benefits to 150 minutes of moderate-intensity activity.
Recommendation 4	The UK guidelines for adults should recognise that combinations of moderate- and vigorous- intensity activities can provide health benefits and this represents another way of achieving the recommended target volume of activity.
Recommendation 5	The UK physical activity guidelines for adults should include a recommendation to undertake muscle strengthening activities involving the major muscle groups of the body on two or more days per week. Time spent undertaking muscle strengthening activities should be in addition to the primary recommendation of 150 minutes. Although there is currently insufficient evidence to determine an optimal regimen for this muscle strengthening activity, an example of a regimen that has been shown to be beneficial should be included in the explanatory guidance that accompanies the guidelines. *Recommendation for supporting commentary* *The commentary which accompanies the UK guidelines should include a statement that stretching and flexibility training may be beneficial.*
Recommendation 6	The UK physical activity guidelines for adults should recognise that physical activity has an important role in healthy weight management and body composition. It is recommended that a separate set of guidelines on weight management, which includes recommendations on altering energy balance by increasing physical activity and decreasing caloric intake through dietary modifications, is required.

Recommendation 7	The UK physical activity guidelines for adults should emphasise the health benefits of activity for those adults who are already overweight or obese. They should indicate that overweight and obese adults achieving the recommended weekly volume of activity (5 x 30/ 150 minutes/week) will gain multiple health benefits even in the absence of reductions in body weight.
Recommendation 8	The UK physical activity guidelines for adults should be supported by commentary that outlines the health benefits derived from the recommended dose of physical activity with a special emphasis on the role of physical activity in aiding the prevention of mental illness (such as depression and dementia) and improving mental well being (such as mood, self-perception and sleep).
Recommendation 9	The UK physical activity guidelines for adults should recognise that those who are least active are most at risk of poor health and increasing their physical activity (even if it does not meet the public health target of 150 minutes of moderate-intensity activity per week) will have health benefits.
Recommendation 10	The UK physical activity guidelines for adults should include a specific statement to recognise that higher volumes of activity (>150 minutes) are associated with even greater health benefits. The accompanying commentary to the guidelines should explain that as volume and intensity of physical activity increase, there are small increases in risk.
Recommendation 11	The UK physical activity guidelines for adults should include a statement clarifying that the risks of ill health from inactivity are very high and outweigh the very low risk of injury from engaging in health promoting physical activity.
Recommendation 12	The UK physical activity guidelines for adults should include a statement to recognize that the physical activity guidelines written for generally healthy adults should be tailored for individuals based upon their needs and abilities, particularly for persons with disabilities and any special health issues.
Recommendation 13	The UK physical activity guidelines for adults do not need to differ for sub populations based on gender or race/ethnicity; however it is noted that the communication strategies and "messaging" of the physical activity guidelines to different sub population may differ to be most effective.

Appendix 10: Final Recommendations for Older Adults

Recommendation 1	The UK physical activity guidelines should encourage older adults to engage in moderate-intensity aerobic physical activity for at least 150 minutes per week; this physical activity should be spread across the week; and engaging in at least 30 minutes on 5 or more days each week is one example of how this volume can be achieved.
Recommendation 2	The UK guidelines for older adults should retain a statement advising that physical activity can be accumulated across multiple bouts throughout the week. Individuals should aim for bouts of at least 10 minutes of moderate intensity activity at a time.
Recommendation 3	The UK physical activity guidelines for older adults should recognize that vigorous-intensity activity also provides health benefits for adults, and that 75 minutes of vigorous-intensity activity (also spread across the week) provides comparable health benefits to 150 minutes of moderate-intensity activity.
Recommendation 4	The UK guidelines for older adults should recognise that combinations of moderate- and vigorous- intensity activities can provide health benefits and this represents another way of achieving the recommended target volume of activity.
Recommendation 5* * See also a link to recommendation 15 for older adult on balance	The UK physical activity guidelines for older adults should include a recommendation to undertake muscle strengthening activities involving the major muscle groups of the body on two or more days per week. Time spent undertaking muscle strengthening activities should be in addition to the primary recommendation of 150 minutes. Although there is currently insufficient evidence to determine an optimal regimen for this muscle strengthening activity, an example of a regimen that has been shown to be beneficial should be included in the explanatory guidance that accompanies the guidelines. *Recommendation for supporting commentary* *The commentary which accompanies the UK guidelines should include a statement that stretching and flexibility training may be beneficial.*
Recommendation 6	The UK physical activity guidelines for older adults should recognise that physical activity has an important role in healthy weight management and body composition. It is recommended that a separate set of guidelines on weight management, which includes recommendations on altering energy balance by increasing physical activity and decreasing caloric intake through dietary modifications, is required.
Recommendation 7	The UK physical activity guidelines for older adults should emphasise the health benefits of activity for those adults who are

	already overweight or obese. They should indicate that overweight and obese adults achieving the recommended weekly volume of activity (5 x 30/ 150 minutes/week) will gain multiple health benefits even in the absence of reductions in body weight.
Recommendation 8	The UK physical activity guidelines for older adults should be supported by commentary that outlines the health benefits derived from the recommended dose of physical activity with a special emphasis on the role of physical activity in aiding the prevention of mental illness (such as depression and dementia) and improving mental well being (such as mood, self-perception and sleep).
Recommendation 9	The UK physical activity guidelines for older adults should recognise that those who are least active are most at risk of poor health and increasing their physical activity (even if it does not meet the public health target of 150 minutes of moderate-intensity activity per week) will have health benefits.
Recommendation 10	The UK physical activity guidelines for older adults should include a specific statement to recognise that higher volumes of activity (>150 minutes) are associated with even greater health benefits. The accompanying commentary to the guidelines should explain that as volume and intensity of physical activity increase, there are small increases in risk.
Recommendation 11	The UK physical activity guidelines for older adults should include a statement clarifying that the risks of ill health from inactivity are very high and outweigh the very low risk of injury from engaging in health promoting physical activity.
Recommendation 12	The UK physical activity guidelines for older adults should include a statement to recognize that the physical activity guidelines written for generally healthy adults should be tailored for individuals based upon their needs and abilities, particularly for persons with disabilities and any special health issues.
Recommendation 13	The UK physical activity guidelines for older adults do not need to differ for sub populations based on gender or race/ethnicity; however it is noted that the communication strategies and "messaging" of the physical activity guidelines to different sub population may differ to be most effective.
Recommendation 14	The UK physical activity guidelines for older adults should include a specific recommendation that older adults should gradually increase physical activity levels over time. It can be appropriate for inactive older adults with low fitness to first build up to 10 minutes bouts of activity.

Recommendation 15	The UK physical activity guidelines for older adults should include a specific recommendation on the benefits of physical activity involving balance training on two or more days per week for the prevention of falls in those at increased risk of falls. *Recommendation for supporting commentary* *The commentary which accompanies the guidelines should acknowledge that although this should be in addition to the primary recommendation of 150 minutes, there should be acknowledgement that some aerobic activities enhance balance (e.g. dancing), and that some movements simultaneously strengthen muscles and improve balance (e.g. Tai Chi exercise).*

Appendix 11: Additional Recommendations on Physical Activity Guidelines in the UK

Recommendation 1	It is strongly recommended that a comprehensive communication strategy is undertaken for effective dissemination of physical activity guidelines to a variety of audiences across the UK.
Recommendation 2	It is recommended that consultation with relevant agencies/ departments that collect, analyse and report the national physical activity data is undertaken to review the implications of the updated Physical Activity Guidelines for children and young people, adults and older adults.
Recommendation 3	It is recommended that the UK should use objective, time-stamped measurement techniques in population surveillance and the monitoring of trends over time.
Recommendation 4	It is recommended that the UK work in cooperation and collaboration with other countries to standardize data cleaning, reduction and analysis procedures for objective physical activity monitoring devices.
Recommendation 5	It is recommended that the UK work in cooperation and collaboration with other countries to standardize data cleaning, reduction and analysis procedures for objective physical activity monitoring devices.
Recommendation 6	It is recommended that the UK should establish a process to develop physical activity guidelines for adults and for children and young people with non-communicable disease (e.g. cardiovascular disease, diabetes, cancer, mental health conditions) as a matter of priority.
Recommendation 7	The development of guidelines on sedentary behaviour is a priority, particularly for children and young people. Although beyond the scope of this work due to other complimentary work underway, the findings should be integrated into the physical activity guidelines.
Recommendation 8	Planned reviews (and revisions if necessary) of the UK Physical Activity Guidelines should be completed every 5 years in collaboration and coordination with other jurisdictions (e.g. World Health Organisation, Canada, U.S., Australia and elsewhere). International collaboration will result in more robust, less costly and scientifically harmonized evidence and interpretation while providing an opportunity for scientific and communication exchange and cross-fertilization.