Public Health England

Protecting and improving the nation's health

# Wider impacts of COVID-19 on physical activity, deconditioning and falls in older adults

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# Glossary

| Term | Explanation |
|---|---|
| Deconditioning | The syndrome of physical, psychological and functional decline that occurs as a result of prolonged inactivity and associated loss of muscle strength. |
| Fall | An event which results in a person coming to rest inadvertently on the ground or floor or other lower level. |
| Faller | A single individual who experiences a fall. |
| Inactive | Undertaking either no physical activity or less than 30 minutes of physical activity per week. |
| Inpatient Admission | The admission of an individual into a hospital that results in a stay of 1 night or more for tests, medical treatment or surgery [1]. |
| Older Adult | An adult aged 65 or older. |
| Physical Activity | Any bodily movement produced by skeletal muscles that requires energy expenditure. It takes many forms, occurs in many settings, and has many purposes (for example, daily activity, active recreation and sport). Health-enhancing physical activity includes multiple types of activity: cardiovascular; muscle and bone strengthening; and balance training. |
| Post-COVID-19 Syndrome | Signs and symptoms that develop during or following an infection consistent with coronavirus (COVID-19) which continue for more than 12 weeks and are not explained by an alternative diagnosis [2]. |
| Strength and Balance Activity | Physical activity which is focused on improving muscle strength and balance and/or coordination. These are activities which are self-reported by individuals. |

# Abbreviations for report and technical appendix

| Abbreviation | Definition |
|---|---|
| A&E | Accident and Emergency |
| ALS | Active Lives Adult Survey |
| CCG | Clinical Commissioning Group |
| CMO | Chief Medical Officer |
| COVID-19 | Coronavirus disease 2019 |
| ELSA | English Longitudinal Study of Ageing |
| FaME | Falls Management Exercise |
| GDP | Gross Domestic Product |
| GP | General Practitioner |
| HEMT | Health Economics and Modelling Team |
| HES | Hospital Episode Statistics |
| HMT | Her Majesty's Treasury |
| HSE | Health Survey for England |
| IDEAL | Improving the Experience of Dementia and Enhancing Active Life |
| IMD | Index of Multiple Deprivation |
| IPC | Institute of Public Care |
| LA | Local Authority |
| MECE | Mutually Exclusive and Completely Exhaustive |
| NFPCG | National Falls Prevention Coordination Group |
| NHS | National Health Service |
| NICE | National Institute for Health and Care Excellence |
| OEP | Otago Exercise Program |
| ONS | Office for National Statistics |
| PHE | Public Health England |
| POPPI | Projecting Older People Population Information |
| RCT | Randomised Control Trials |
| ROI | Return on Investment |
| UCL | University College London |
| UK | United Kingdom |
| WICH | Wider Impacts of COVID-19 on Health |

# Executive summary

In August 2020, Public Health England's COVID-19 Cabinet commissioned the Health Economics and Modelling Team (HEMT) to undertake work to identify the wider public health impacts of COVID-19 and carry out modelling in priority areas to quantify these impacts. One of the areas identified as high priority for further work was older people.

This study looks at how the wider impacts of COVID-19 have affected older people (over 65 year olds), with a focus upon deconditioning and falls. Deconditioning – the loss of physical, psychological, and functional capacity due to inactivity – can occur rapidly in older adults, is not straightforward or quick to remedy and, among other health impacts, increases the risk of falls. This, in turn, creates a risk that, without mitigation, would result in an increase in the rate of falls starting in the summer of 2021 as older adults engage in more physical activity as lockdown restrictions are lifted. This increase is likely to continue if levels of physical activity remain at their current reduced levels. This may increase demand for falls services, the strain on hospitals due to emergency admissions and health and social care costs.

This study models the likely effect of the decrease in strength and balance activity observed during the pandemic on people who experience a fall, the number of falls and associated health and social care costs. It also includes scenario analyses, looking at the impact different changes in strength and balance activity levels may have on the rate of falls and health and social care costs. The modelling is informed by strength and balance physical activity and falls prevalence datasets reported in the recent Sport England's Active Lives Adult Survey (mid-March to mid-May 2020) and Projecting Older People Population Information, respectively. The strength and balance activity levels recorded were compared against 2019 levels from the corresponding period. Strength and balance activity includes activities such as Pilates, tai chi, bowls, swimming, and the Otago exercise programme, but does not include some very popular types of physical activity – most notably walking, which is not proven to reduce falls risk. The relationship between changes in activity and falls prevalence, has been estimated using a meta-regression derived from information taken from a Cochrane systematic review of exercise interventions for preventing falls in older adults, which includes over 100 randomised controlled trials. Health and social care costs of falls are referenced from the PHE Falls Prevention ROI Tool [3].

The report contains recommendations which are intended to address deconditioning and improve older adult mental and physical health while simultaneously reducing falls risk. The report recommends that older adults who have deconditioned increase their levels of strength and balance activities so that they can also safely resume activities they engaged in before the pandemic, such as other forms of physical activity, social activities, accessing healthcare, and work.

This report is intended to inform decision-making in the following areas:

- national and local public health services
- preventive care services within Integrated Care Systems and Falls Prevention services elsewhere within local health and care systems
- national policy teams identifying how ageing populations can best recover from the pandemic

# Key findings

Key findings were:

- 32% of older people were inactive (did either no activity or less than 30 minutes of moderate activity per week) between March to May 2020. This has increased from 27% in the corresponding period in 2019
- average duration of strength and balance activity decreased from 126 to 77 minutes per week in March to May 2020 compared to the corresponding period in 2019
- inequalities in physical activity have persisted, older people in the most deprived group (defined by Index of Multiple Deprivation) were more likely to be inactive than those in the least deprived group in both 2019 and 2020
- older people experienced a considerable reduction in strength and balance activity between March to May 2020, with the greatest change in the 70 to 74 age group with a 45% (males) and 49% (females) decrease observed in activity
- without mitigation, modelling predicts that:
    - 110,000 more older people (an increase of 3.9%) are projected to have at least one fall per year as a result of reduced strength and balance activity during the pandemic
    - the total number of falls could increase by 124,000 for males (an increase of 6.3%) and 130,000 for females (an increase of 4.4%)
    - for each year that the lower levels of strength and balance activity observed during the pandemic persist, there is projected to be an additional cost to the health and social care system as a result of the change in predicted related falls of £211 million (incurred over a 2 and half year period)

# Key recommendations

This report makes recommendations on 2 levels – those intended for the whole population and more targeted action. Targeted recommendations are aimed at individuals whose reduced physical activity has led to appreciable functional loss, transition towards frailty or new fear of

falling as well as individuals with post-COVID-19 syndrome ('long COVID')[1] [4]. These recommendations are intended to enable older adults to meet CMO guidelines on physical activity, and draw on evidence around falls prevention, and were developed in collaboration with health professionals, academics, and colleagues in DHSC, NHS England, and PHE. These recommendations are explained and expanded upon, with links to relevant resources and further considerations, in the Recommendations section.

Key recommendations for the whole population are:

- promotion and increased availability of strength and balance activity for older adults, involving a gradual increase in activity in order to reduce falls risk and to enable safe and confident participation on other forms of exercise and physical activity
- ensuring that physical activity recovery measures reach those who stand to benefit most from them, including older adults who shielded, with multimorbidity, with dementia, in social care settings and from more deprived backgrounds
- identifying locally which older adults have reduced their levels of physical activity during the COVID-19 pandemic, with a focus on populations where the largest reductions are likely to be found. The largest reductions in strength and balance activity identified in this report were seen in males aged 65 to 74 and females aged 65 to 84

Key recommendations for the targeted population are:

- referral of older adults with functional loss, transition towards frailty or fear of falls resulting from deconditioning to appropriate rehabilitations services
- raising awareness amongst health and social care staff of post-COVID-19 syndrome, communicating the risks of building up levels of activity levels too rapidly and the need to refer to post-COVID-19 syndrome clinics where symptoms are severe, in order that clinical judgement can be used about whether graded exercise therapy should be recommended

[1] Note that emerging evidence suggests that the condition referred to in this paper as 'post-COVID-19 syndrome' may encompasses a variety of different syndromes with different aetiologies, for instance 'post-intensive care syndrome, post-viral fatigue syndrome, and long term COVID syndrome,'

# Introduction

## The older adult population

This report defines an 'older adult' as a 'person aged 65 years or over'. Older adults make up 18.4% (10.4 million) of the English population [5]. Before the pandemic there were high levels of physical inactivity in the older adult population. 21.5% of adults aged 65 to 74 were inactive, rising to 34.4% aged 75 to 84 and 57.4% aged 85 and over [6]. Levels of inactivity have risen further during the pandemic, while access to healthcare has fallen. This raises concerns about the effect the wider impacts of COVID-19 may have on the health of older adults in the short and medium term. The cost of falls to the NHS has been estimated at more than £2.3 billion per year [7], so any increase in the number of falls will have significant financial implications in addition to the human costs ('pain, injury, distress, loss of confidence and a greater risk of death' [8]).

## The wider impacts of COVID-19 on older adults

As well as being more likely to experience severe COVID-19 infection, hospitalisation, and mortality, the older adult population was identified early in the pandemic as particularly likely to disproportionately experience the wider impacts of COVID-19[2] [9, 10]. The wider impacts of COVID-19 are the indirect effects of COVID-19 on population health, which do not result from COVID-19 infection, but rather from the measures put in place to limit its spread. These wider impacts include but are not limited to mental health, access to services, employment, and changes in health behaviours (smoking, diet, alcohol consumption, and physical activity) [9]. While this report specifically focusses upon the relationship between physical activity and falls, it is important to acknowledge the complexity of the COVID-19 policy landscape. Levels of physical activity and falls will themselves be negatively affected by some of the wider impacts of COVID-19 – in particular by poor mental health and reduced healthcare access [11, 12]. Deconditioning will, for some older adults, make it difficult for them to undertake activities that would improve mental health, loneliness and their ability to manage health conditions. Some older adults may have lost the functional capacity or motivation to perform activities that they were able to perform before the mitigation measures were put in place. This means that, for some older adults, addressing the wider impacts of COVID-19 may not be as straightforward as lifting COVID-19 mitigation measures.

Anxiety and depression have increased as a result of the pandemic [13, 14], and there are pronounced inequalities in the distribution of mental health problems. Levels of depression are

[2] For more information on these, see PHE's WICH (Wider Impacts of COVID-19 on Health) monitoring tool. Note that this discussion does not encompass the full range of the wider impacts of COVID-19 on older adults.

higher amongst women and adults classified as disabled [14], with loneliness, anxiety and depression all higher amongst older adults who shielded and older adults with multimorbidity [15, 16]. It will therefore be important to ensure these inequalities are taken into account as part of any strategy for overcoming deconditioning, given the beneficial effects that increasing physical activity is likely to have on mental health [17].

Access to healthcare has been reduced during the pandemic, with some services not running, others running at reduced capacity or digitally, and many people unwilling to seek healthcare. Around 50% of older adults with a worsening healthcare condition have not sought medical advice about it during the pandemic [10]. Elective hospital admissions, including regular attenders, are down across the English population for all age groups – with the percentage drop in hospital admissions compared to the previous year around 60% between April to June [18]. Because the rate of elective hospital admissions is far higher in older adults, the change in the absolute number of reduced appointments involving older adults is likely to be much greater than for other age groups.

Between April to June 2020, community delivered healthcare activity was around 30% lower than 2019 levels amongst older adults[3]. This represents a considerable drop in the number of older adults accessing services aimed at maintaining health, managing illness, and supporting independent living in the older adult population – and it is plausible that the health of many older adults will have been affected negatively as a result, raising the concern that unmet need for these services will exacerbate deconditioning in the older adult population.

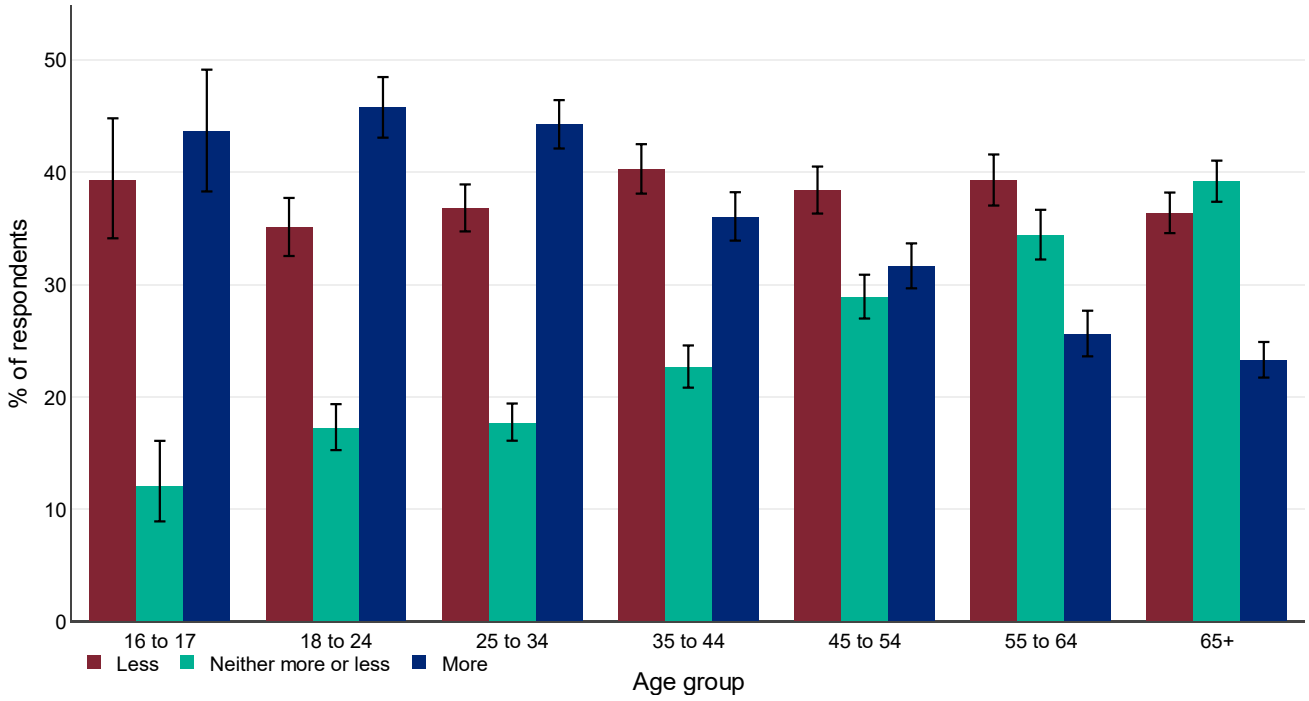
Deconditioning, poorer mental health, and reduced healthcare access will all make it harder for some older adults to resume activities they engaged in before the pandemic. Since the first lockdown (March to May 2020), many older people have reported doing significantly less physical activity than they did before the lockdown, as well as losing confidence in their ability to perform ordinary activities such as leaving the house or engaging with health services [10]. The next section summarises what is currently known about reduced physical activity, deconditioning, and perceived ability to perform ordinary activities in older adults.

[3] At the time of writing, this data does not make it possible to determine which services have been most affected. It is likely that this will vary by Local Authority.

# Reduced physical activity and deconditioning

The first lockdown had a varying effect upon physical activity across the population. While some older adults (approximately 25%) did more physical activity, Sport England's 'Active Lives' Adult Survey (ALS), presented in PHE's WICH tool[4] [10] and included in Figure 1, Figure 2 and Figure 3 below, illustrates that many older people (the 65 years and over age group indicated) were more likely to be doing less physical activity or muscle strengthening activity following COVID-19 than they were before. They were also the least likely to be doing more activity during the first lockdown, and the most likely to be physically inactive.

**Figure 1. Data extracted from the WICH Tool showing the percentage of adults doing more or less physical activity than usual by age group – pooled survey wave from 3 April 2020 to 11 May 2020 [10]**




[4] PHE's Wider Impacts of COVID-19 on Health (WICH) tool presents a range of different metrics which explore the indirect effects of the COVID-19 pandemic on the population's health and wellbeing.

**Figure 2. Percentage of adults doing more or less muscle strengthening activity than usual by age group – pooled survey wave to 22 June 2020 [10]**

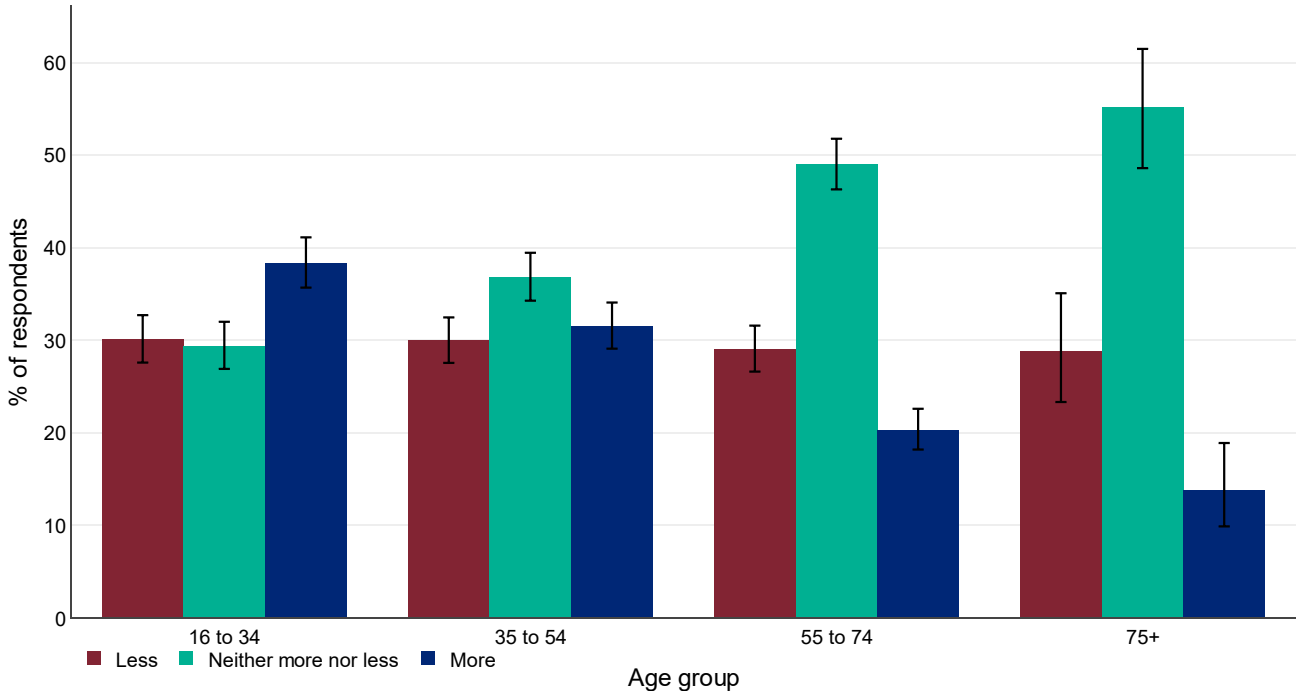
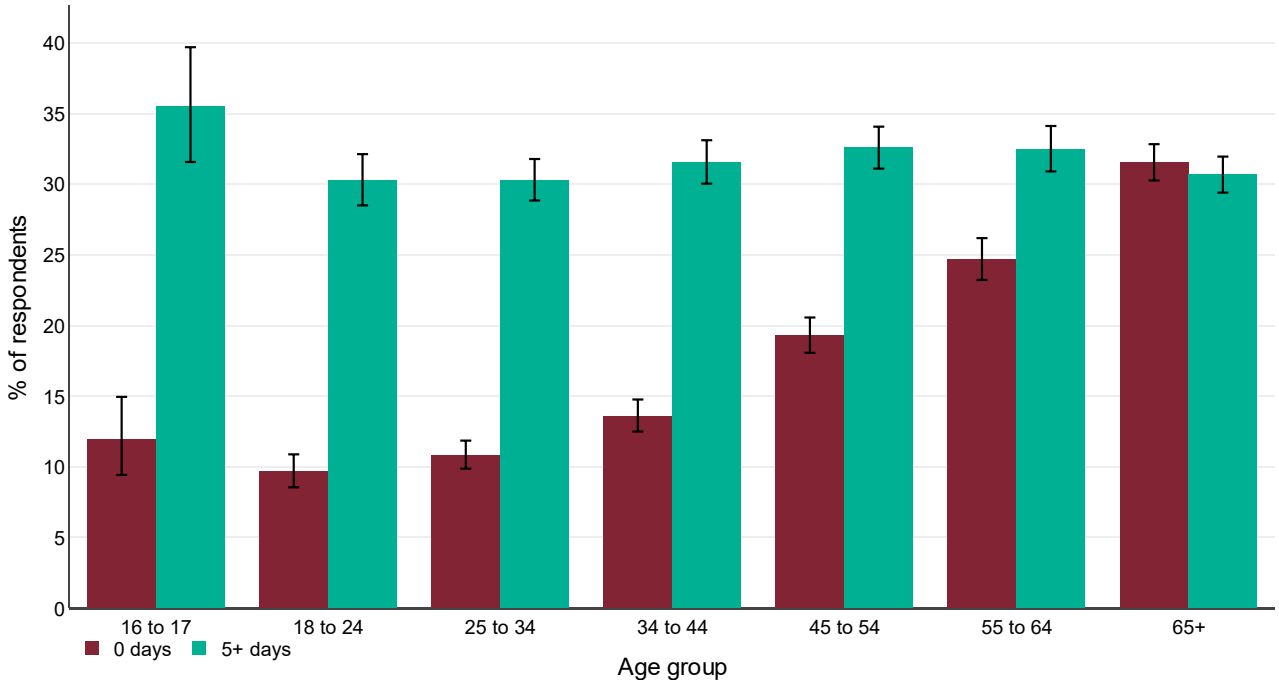



**Figure 3. Percentage of adults doing at least 30 mins physical activity on 0 or 5 or more days in the last week by age group – pooled survey wave from 3 April 2020 to 3 August 2020 [10]**



Further, inactivity levels increased more amongst individuals with more long-term health conditions or disability than those without and drops in physical activity varied by ethnicity, with the largest drops amongst Asian (excluding Chinese), Black and Other ethnic backgrounds [19]. This reported drop in activity levels amongst older adults, combined with the concern that the drop is unequally distributed amongst the population, raises the concern that many individuals will have experienced deconditioning.

Deconditioning is the syndrome of physical, psychological and functional decline that occurs as a result of prolonged inactivity and associated loss of muscle strength. Deconditioning can occur at any age, but amongst older adults can occur more rapidly and be more severe [20, 21]. Older adults, particularly those with multiple long-term conditions, have often been subject to stricter restrictions than the general population. National shielding guidelines (where older and vulnerable people are encouraged to stay indoors) have placed older adults at even greater risk of increasing sedentary behaviour and deconditioning.

Reduced physical activity and sedentary behaviours are associated with reduced muscle mass which affects strength, mobility and balance. Very low daily step counts (less than 1,413 steps) have rapidly reduced muscle mass, limited muscle growth and impaired insulin resistance in older adults within 14 days [22]. Greater and more rapid deficits are observed with increasing levels of immobility. In healthy adults, 3 days of immobility was sufficient to significantly decrease muscle mass, tone and force [23].

A cross-sectional analysis of falls found that self-reported prolonged sitting (greater than 8 hours a day) was independently associated with falls in the past 12 months [24]. A one-year prospective study of falls in men aged over 70 found that greater periods of physical inactivity were related to higher risk of falls in a dose-dependent manner [25].

Furthermore, routine health and social care delivery has been impacted with many community and healthcare services aimed at maintaining or improving mobility among older adults, like falls prevention activities, suspended for both people already under the care of falls services and for those newly referred. Re-engaging with services may present a challenge due to loss of confidence in everyday activity or loss of physical capacity, and fear of social interactions that may lead to COVID-19 exposure.

The Physiological Society and Centre for Ageing Better have set out a range of impacts that may result from the decline in physical activity seen during the pandemic [26].

Immediate impacts include:

- cardiovascular, respiratory, and metabolic deconditioning

- loss of strength and balance
- insulin resistance and increased fat mass
- increased social isolation
- worse mental health and wellbeing

Medium and long-term impacts include:

- falls
- depression
- type II diabetes
- cardiovascular disease
- musculoskeletal problems

As well as this, there is evidence that deconditioning due to reduced physical activity during the pandemic has had an impact upon the ability of many older people to carry out everyday activities, indicating that many are likely to struggle to perform activities that were previously straightforward.

Data from a survey conducted by Age UK and Kantar Polling [27] in August and September 2020 showed that[5]:

- 1 in 3 respondents reported feeling more anxious since the start of the pandemic
- 1 in 3 agreed they felt less motivated to do the things they enjoy
- 1 in 3 have less energy
- 1 in 4 respondents not being able to walk as far as they used to
- 1 in 5 are finding it harder to remember things
- 1 in 5 say they feel less steady on their feet
- 1 in 3 felt less confident taking public transport, 2 in 5 felt less confident going to the shops or 1 in 4 felt less confident spending time with family

These results are more pronounced amongst people with long-term health conditions, and amongst people from more disadvantaged socioeconomic backgrounds:

- 43% of people with a long-term health condition are unable to walk as far as before, compared to 13% of people without a long-term health condition
- 22% of older people from more disadvantaged socioeconomic backgrounds say they feel less steady on their feet compared to 14% from the most advantaged

[5] Based on representative online polling of 1,364 people over the age of 60, conducted by Kantar Polling in September 2020. Of the people polled, nearly half were over the age of 70 and 40% were already living with a long-term condition before the start of the COVID-19 pandemic.

- 39% of older people from more disadvantaged socioeconomic backgrounds say they have less energy compared to 26% of those from the most advantaged

These results – including inequalities for people with long term conditions and from more disadvantaged social backgrounds, remained similar in the January to February 2021 survey wave, which may indicate that the wider impacts of COVID-19 on health did not change appreciably between September 2020 to February 2021. Additionally, forthcoming research from the IDEAL COVID-19 Dementia Initiative suggests that around 40% of individuals with dementia reported deterioration in their functional abilities as a result of lockdown, with reduced physical activity and cancellation of services identified as important contributing factors [28].

Another point this report considers is that many older adults have experienced deconditioning due to Post-COVID-19 Syndrome ('Long COVID') and may have symptoms which overlap with deconditioning due to physical inactivity. While Post-COVID-19 syndrome is a direct, rather than an indirect, impact of COVID-19, and hence isn't included as the main focus of the report, this issue is addressed in the Recommendations section). It is included because, despite the overlap of symptoms, in some cases these 2 conditions (deconditioning due to Post-COVID-19 Syndrome and deconditioning due to physical inactivity) may need to be managed differently due to their different aetiologies.

As set out earlier in the report, many of the negative wider impacts of COVID-19 look to have disproportionately affected individuals with existing health conditions as well as the most deprived. In order to quantify the effect of deconditioning on the older adult population, PHE's Health Economics and Modelling Team have used data from Sport England's Active Lives Adult Survey (ALS) to provide a detailed picture of changes in older adults' physical activity during the pandemic, and modelled the effect that reduced strength and balance activity is likely to have on falls.

# Study objectives

When this work was commissioned, the impact of the pandemic on falls was not known, but a reduction in physical activity had been observed. Falls are a health outcome that the reduction in physical activity and deconditioning more generally might plausibly impact in the short-to-medium-term, particularly because older adults are already more vulnerable to falls. This report was therefore commissioned in order to a) fill a gap in the public health knowledge base about falls and COVID-19, and b) act as an illustration of the anticipated wider consequences of COVID-19 for the health of older adults.

The remainder of this report has the following main objectives:

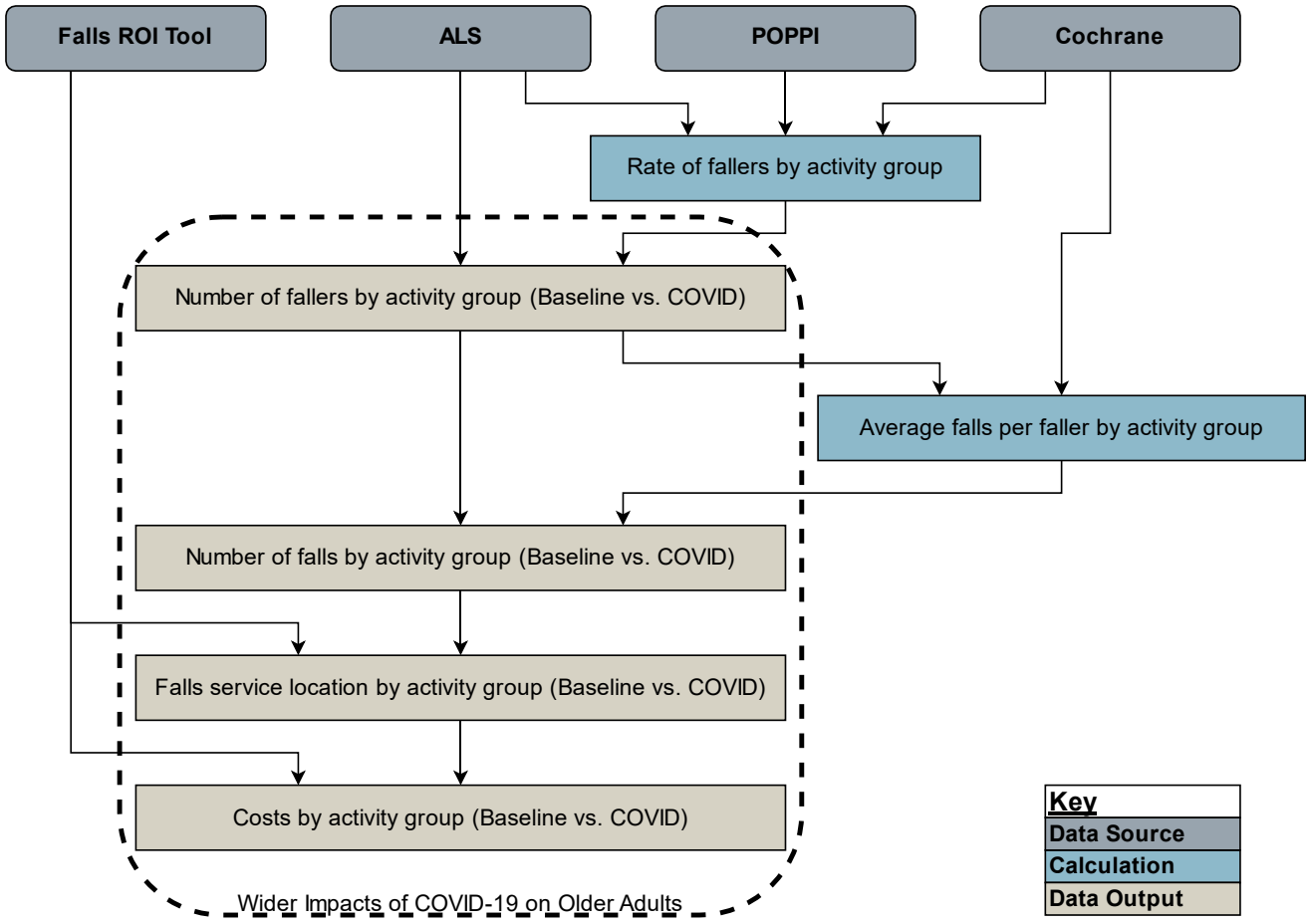
1. Estimate in detail the impact of COVID-19 on physical activity levels in older adults (65 years and over).
2. Quantify how many more falls may occur due to deconditioning (resulting from reduced strength and balance physical activities) at a national level, and the short-term health and cost implications.
3. Inform policymaking and service provision around physical activity by developing a set of recommendations to mitigate the effects of deconditioning and restore older adult health to pre-pandemic levels or better.

# Modelling the impact of reduced physical activity on falls

The first 2 aims of this work were to estimate the impact of COVID-19 for older adults on physical activity levels, risk of falls and related health and social care costs. Because of the absence of evidence around the connection between both physical activity and deconditioning, and between deconditioning and falls, we took the decision to focus the modelling using the most appropriate available evidence on the relationship between physical activity and falls. The model looks at the relationship between a subset of physical activity (strength and balance activity) and falls, as strength and balance activity has the greatest effect upon falls risk [29].

A summary of the modelling exercise is set out in this section, along with an assessment of its strengths and limitations. Technical details related to the modelling are presented in the Technical Appendix of this report, with a summary of the modelling process presented in Figure 4.

**Figure 4. Summary of the modelling methodologies which were used to assess the wider impacts of COVID-19 on older adults in terms of strength and balance activity, the rate of falls and associated costs.**



In the modelling work, we took values and observations from a variety of data sources including the PHE Falls Prevention ROI Tool, Active Lives Adult Survey (ALS), Projecting Older People Population Information (POPPI) and the Cochrane Review by Sherrington, and others, and used these to calculate the rate of people who fall and the average number of falls among people who fall by activity level. We then estimated the number of people who fall, the number of falls, their care pathways and associated costs under several scenarios. Results of this modelling work are provided in the next section, with a discussion of these results and the estimated differences between scenarios in the Discussion section. Policy recommendations which follow are given in the Recommendations section.

# Data sources

Several different data sources were used to estimate the impacts of COVID-19 and mitigation measures on physical activity, the number of falls, and related health and social care costs. A summary of these sources is given in Table 1.

**Table 1. Data source summary table**

| Data set | Source or publisher | Summary |
|---|---|---|
| Active Lives Adult Survey (ALS) [19] | Sport England | This dataset provides the self-reported, weekly duration of physical activity undertaken in England and has been used to determine the change in duration of physical activity between 2019 and 2020. |
| Projecting Older People Population Information (POPPI): Falls [30] | Oxford Brookes University/Institute of Public Care | This dataset contains falls prevalence data by age, sex, local authority and region, in England for 2020. |
| Falls Severity and Costs [3] | PHE Falls Prevention ROI Tool | This PHE tool is built on data sources which outline the consequence of each fall event in terms of severity and subsequent health and social care costs incurred. |
| GDP Deflator [31] | HM Treasury | This index was used to inflate the costs taken from the PHE Falls Prevention ROI Tool. |
| Sherrington, and others [29] | Cochrane Review | This systematic review, published in 2019, includes studies which assess the effect of exercise interventions for preventing falls in older adults and has been used to estimate the relationship between physical activity and the rate of people who fall and falls. |

# Activity levels

The Active Lives Adult Survey (ALS) from Sport England is an annual, nationally representative survey of physical activity in adults aged 16 and over. Within each 12-month period covered by ALS, there are approximately 190,000 individual-level records, of which approximately 53,000 relate to older adults (65 years and over). Full year results are published each April (covering the previous mid-November to mid-November period) and interim results are published in October, which cover the previous mid-May to mid-May period. This study has used data from mid-March to mid-May for 2019 and 2020.

ALS contains a wide range of demographic variables for analysis, the full details of which can be found in the Technical Appendix to this report. A subset of these variables was chosen for analysis because of the impact on the risk of falls and whether there was sufficient sample size, the details of these are given in Table 2. Stratifying ALS data as detailed in Table 2 gives approximately 100 to 1,900 records within each of the strata for any given 12-month period.

**Table 2. Summary of the demographic variables from ALS which were used to disaggregate model results and their justication for inclusion**

| Variable | Justification | Notes |
|---|---|---|
| Age | Falls risk varies significantly by age. Therefore, disaggregation contributes to model accuracy | The age data is provided in single years in the ALS, so this was combined to match the age groups used in the POPPI dataset. |
| Sex | Falls risk varies by significantly by sex. Therefore, disaggregation contributes to model accuracy | Records including a sex of Other have been excluded from the modelling exercise due to the small sample size. |
| Region | Disaggregation of results by region is relevant to local planning | Descriptive statistics at a regional level are provided in Appendix A but not used for modelling purposes as the sample size did not enable breakdown by age group, sex and region. |
| Index of Multiple Deprivation (IMD) | IMD is a determinant of inequality. Disaggregation is relevant for reporting on health inequalities. | Descriptive statistics within the report are given by IMD quartile only but not used for modelling purposes as the sample size did not enable a breakdown by age, sex and IMD. |

Different forms of physical activity and exercise have different impacts on falls prevention, with those that are most beneficial referred to within this report as strength and balance activity[6]. A taxonomy was produced in 2016 for a variety of physical activities from the Scottish Health Survey, categorising these based on whether they would be classified as a strength and balance exercise [32]. Using this taxonomy and guidance from experts, we calculated the breakdown of physical activity per week for individuals in ALS into time spent undertaking strength and balance exercises and time spent undertaking all other activity. Full details of this classification, assumptions and associated methodologies are detailed in the Technical Appendix to this report.

The interim publication of ALS in October 2020 covers activity levels to mid-May 2020, therefore only covering the start (the first lockdown was announced on 23 March 2020 [33]) of the COVID-19 pandemic and associated restrictions. To account for seasonality on physical activity, we assigned mid-March to mid-May in 2019 as the period to be used for our baseline scenario, and the comparable period from mid-March to mid-May in 2020 as the period related to the scenario examining changes in physical activity levels as a result of the pandemic and related restrictions during the first wave.

This data was cleaned[7] and summarised to obtain the proportion of older adults undertaking various levels of activity per week. This data was extracted for the defined time periods, broken down by the activity categorisation and disaggregated by age group and sex.

# Baseline number of people who fall and falls

The Projecting Older People Population Information (POPPI) system is produced by the Institute of Public Care (IPC) and estimates the number of older adults who experience at least one fall in any 12-month period. This was done by applying the percentages of individuals reporting a fall in the 2005 Health Survey for England (HSE), (a special edition that focused on the health of older people, aged 65 and over) summarised in Table 3, to the relevant ONS populations data. This allows for a baseline estimate of the number of people who experience at least one fall to be extracted, disaggregated by age group and sex.

[6] Within Sherrington and others, these activities are referred to as balance and functional exercises. Within Strain and others, these activities are referred to as strengthening and balance and/or coordination.

[7] For example, by removing individuals recording a greater number of activity minutes than possible in a single week.

**Table 3. Percentage of individuals who report experiencing at least one fall in a 12-month period by age and sex – HSE 2005 via POPPI [30]**

| Age | Proportion of Individuals Categorised as Fallers (%) | |
|---|---|---|
| | Male | Female |
| 65-69 | 18 | 23 |
| 70-74 | 20 | 27 |
| 75-79 | 19 | 27 |
| 80-84 | 31 | 34 |
| 85+ | 43 | 43 |

Using the rate of falls and the rate of people who experience at least one fall in the control groups within the meta-analysis produced by Sherrington, and others, we estimated the average baseline number of falls for each individual who falls within a given 12-month period for older adults to be approximately 1.77[8]. As with the estimates for the number of people who experience at least one fall and the number of falls, it should be noted that this does not include the impact of policy changes nor economic or global health impacts of the COVID-19 pandemic or other events.

We applied this estimate to the baseline data for the number of people who experience at least one fall, extracted from POPPI to obtain a baseline estimate of the number of falls, disaggregated by age group and sex.

# Impact of activity levels on fallers and falls

To model the impact of changes in physical activity due to the COVID-19 pandemic on falls in older adults, we needed to quantify how a change in activity impacts the rates of falls and fallers within this population. We did this by applying a meta-regression to identify the rate ratio for the rates of fallers and falls caused by an increase in the duration of physical activity performed per week.

The Cochrane review by Sherrington, and others, was undertaken to assess the effect of exercise interventions for preventing falls in older adults in the community. The review identified 108 Randomised Control Trials (RCTs) which included 23,407 study participants, in 25 countries, aged 60 and over. The review excluded studies which focused on specific conditions, for example stroke, Parkinson's, multiple sclerosis. The review found that exercise reduced the rate of falls

[8] This is calculated using the rate of falls per person-years and the rate of fallers per person-years in the control groups across all studies. The meta-analysis performed in this systematic review give these values as 0.85 and 0.48 respectively.

when compared to a control intervention (one thought not to reduce falls). Exercise interventions that mainly involved balance and functional training had showed this effect with a high degree of certainty. Programmes involving multiple types of exercise (most commonly balance and functional training combined with resistance exercises) showed this effect with a moderate degree of uncertainty, whilst Tai Chi showed this with a moderate degree of uncertainty (although it did show a reduction in the rate of people who fall with a high degree of uncertainty). The review was inconclusive as to of the effect of programmes that were primarily resistance training, dance[9] or walking on the rate of falls and the rate of people who fall. No trials identified within the review included interventions that were primarily flexibility or endurance exercises [29].

The evidence used for this meta-regression was extracted from the systematic review by Sherrington, and others, and includes the duration of an intervention in minutes per week, the length of an intervention in weeks, the intervention adherence and sample size, and the effect of the intervention on the rate of falls and/or fallers in person-years.

The linear model chosen for the meta-regression links the effect size to the duration of the intervention activity, adjusted for adherence and normalised so that an activity programme of zero minutes would have no impact.

Using this meta-regression, we ascertain the impacts of changes to strength and balance activity to be as given in Table 4. Using a similar approach to our earlier calculation, we can also identify the impact of these changes on the average number of falls per faller within a given 12-month period.

**Table 4. Summary of the meta-regression results in terms of the impact of additional activity on the falls rate, fallers rate and the average falls per faller.**

| Value | Impact of additional activity per week | | | |
|---|---|---|---|---|
| | 1 minute | 30 minutes | 1 hour | 2 hours |
| Falls Rate | -0.20% | -5.94% | -11.53% | -21.73% |
| Fallers Rate | -0.14% | -4.12% | -8.08% | -15.50% |
| Average Falls per Faller | -0.06% | -1.90% | -3.75% | -7.37% |

[9] Although this review classified exercise interventions that were primarily dance as a separate category, for which there was no conclusive evidence from the included trials around their impact on the rates of falls and fallers, we have classified dance as a strength and balance activity for the purposes of our analysis. This classification was based on expert guidance from the advisory group for this report. Hence, any change in the duration of dance activities undertaken by an individual due to the COVID-19 pandemic will have the same result as a change in the duration of any other strength and balance activity on the estimated changes in falls and fallers.

It should be noted that this meta-regression (and the underlying evidence) calculates the impact of increasing activity undertaken and this relationship is assumed to hold proportionally in reverse, with a decrease in activity undertaken causing an increase in the rates of fallers and falls.

There is evidence from forced bed-rest studies which suggest that deconditioning occurs quicker due to sedentary behaviour and greater levels of activity levels are needed to compensate. However, suitable studies quantifying this effect in older adults could not be identified for use in this modelling study.

# Number of fallers and falls by activity level

To estimate the number of fallers by activity level, we first calculated the calibrated risk of being a faller for a given level of activity, by age group and sex using the proportions in the baseline year extracted from ALS and the impact of activity on the rate of fallers identified through the meta-regression.

We then combined this with the proportions in the scenario year extracted from ALS and the total number of fallers expected in the baseline year extracted from POPPI to get an estimate for the total number of fallers in a given scenario year by activity level, age group and sex.

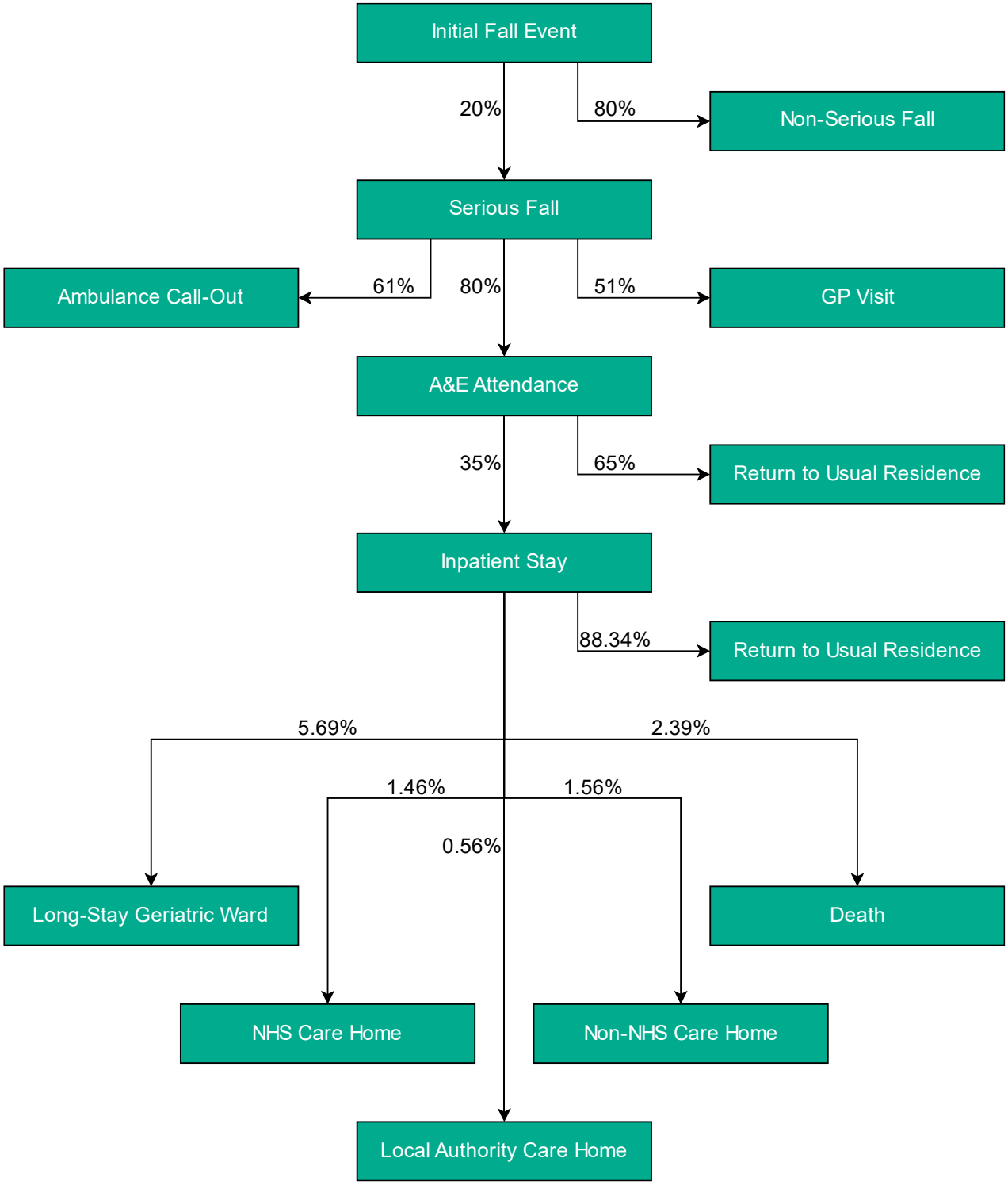
To estimate the number of falls by activity level, we performed a similar methodology as for the number of fallers, combining the estimated number of falls with the population level average falls per faller in the baseline year from Sherrington, and others, and the impact of activity on the average falls per faller identified through the meta-regression. Full details of this methodology and how to extend it to estimate the number of fallers and falls under an intervention scenario are given in the Technical Appendix of this report.

# Care pathway and costs following a fall event

The PHE Falls Prevention ROI Tool [3] was used to estimate the severity of each fall event and the subsequent required care pathway and implications in terms of health and social care costs.

A summary of the care pathways is given in Figure 5. It should be noted that some percentages may sum to more than 100% (such as the care pathways directly following a serious fall). This reflects that multiple care pathways may need to be carried out simultaneously (for example, a serious fall may require an ambulance call-out and A&E attendance).

**Figure 5. Summary of the care pathways in terms of the percentage of individuals who experience a serious fall, require each service and their respective service location following a fall event taken from the PHE Falls Prevention ROI Tool [3]**



As with the PHE Falls Prevention ROI Tool, we assumed that when modelling the initial fall event, 20% of fall events are classified as serious and have associated health implications and system costs (see Figure 5). The remaining 80% are classified as non-serious and are assumed to have no such implications or costs. We assumed that the severity of a fall and the care pathway following a severe fall is the same for all older adults and is not impacted by activity level or demographic factors.

It is plausible that older age groups and females would suffer from a higher proportion of serious falls, however evidence allowing us to adjust the proportion of severe falls and the subsequent care pathways to account for such difference could not be identified for use in our modelling.

Social care is defined as nursing and residential care, provided by local authorities and the NHS, it does not include informal care. In line with the PHE Falls Prevention ROI Tool, we also assume that the duration of a stay in a care home is equal to 2.5 years and calculate the associated social care costs appropriately.

Full details of the pathways and the costs of each step is detailed in the Technical Appendix of this report and the published documentation accompanying the PHE Falls Prevention ROI Tool. It should be noted that within the tool, costs are from 2015 to 2016 and have been appropriately inflated. We have inflated these costs to 2019 to 2020 using the GDP Deflators published by HM Treasury [31].

# Results produced

We performed this methodology for 3 distinct scenarios:

1. A baseline scenario, with the population undertaking the same duration of activity as they did pre-COVID (based on the ALS data for mid-March to mid-May 2019).
2. A COVID scenario, with the population undertaking the duration of activity reported during the pandemic (based on the ALS data for mid-March to mid-May 2020).
3. An intervention scenario, with the population undertaking a 10% increase in activity compared to the duration of activity reported during the pandemic.

For each of these scenarios, we produced:

1. The number of people who fall and the number of falls by activity level, age group and sex.
2. The number of health and social care services used by activity level, age group and sex.

3. The health and social care costs associated with falls by activity level, age group and sex.

A summary of these results is given in the Results section. These are given with activity levels as detailed in Table 5, which were chosen considering guidance from relevant experts and the guidelines issued by the Chief Medical Officer (CMO) regarding physical activity [34].

**Table 5 Summary of the activity levels, in terms of duration, chosen for reporting**

| Duration of physical activity performed (minutes/week) |
|---|
| $x < 30$ |
| $30 \leq x < 60$ |
| $60 \leq x < 120$ |
| $120 \leq x < 180$ |
| $180 \leq x$ |

The CMO guidelines defines inactivity as undertaking less than 30 minutes of physical activity per week and specifies that older adults should undertake strength and balance activities on at least 2 days per week but does not state the duration of these activity sessions. Given this definition and the large proportion of older adults undertaking less than 60 minutes of physical activity per week, defining the lowest group as up to 30 minutes per week was useful to provide a more detailed summary of activity levels. Similarly, due to the proportions observed in ALS, it was decided to report results related to individuals performing more than 3 hours per week as a single category.

# Results

## Impact on physical activity

The first objective of this report was to provide a detailed estimation of the impact of COVID-19 on physical activity in the older adult population. We have already observed in the literature, as described in the introduction, that many older adults were likely to be doing less physical activity as a result of COVID-19, but further analysis of the Active Lives Adult Survey (ALS) provides more granular data on these changes in physical activity.

Figure ***6*** shows the difference in moderate activity levels in older people between March to May 2019 and March to May 2020, once there was community COVID-19 transmission and mitigation measures put in place in England[10]. Between March to May 2019, 28% of females and 25% of males, were already inactive (did less than 30 minutes of moderate activity per week). An additional 5% of female and 4% of male older adults were inactive between March to May 2020. This is equivalent to an additional 3,081 inactive older people per local authority (upper or single tier) and 4,388 per clinical commissioning group (CCG).

[10] In the figures referenced, each minute undertaking vigorous activity is assumed to be equivalent to undertaking 2 minutes of moderate activity. This is consistent with the CMO guidelines.

**Figure 6. Percentage of older adult population (greater than or equal to 65 years) undertaking a given level of moderate activity in 2019 (red) and 2020 (green), for females (left graph) and males (right graph), extracted from ALS [19]**

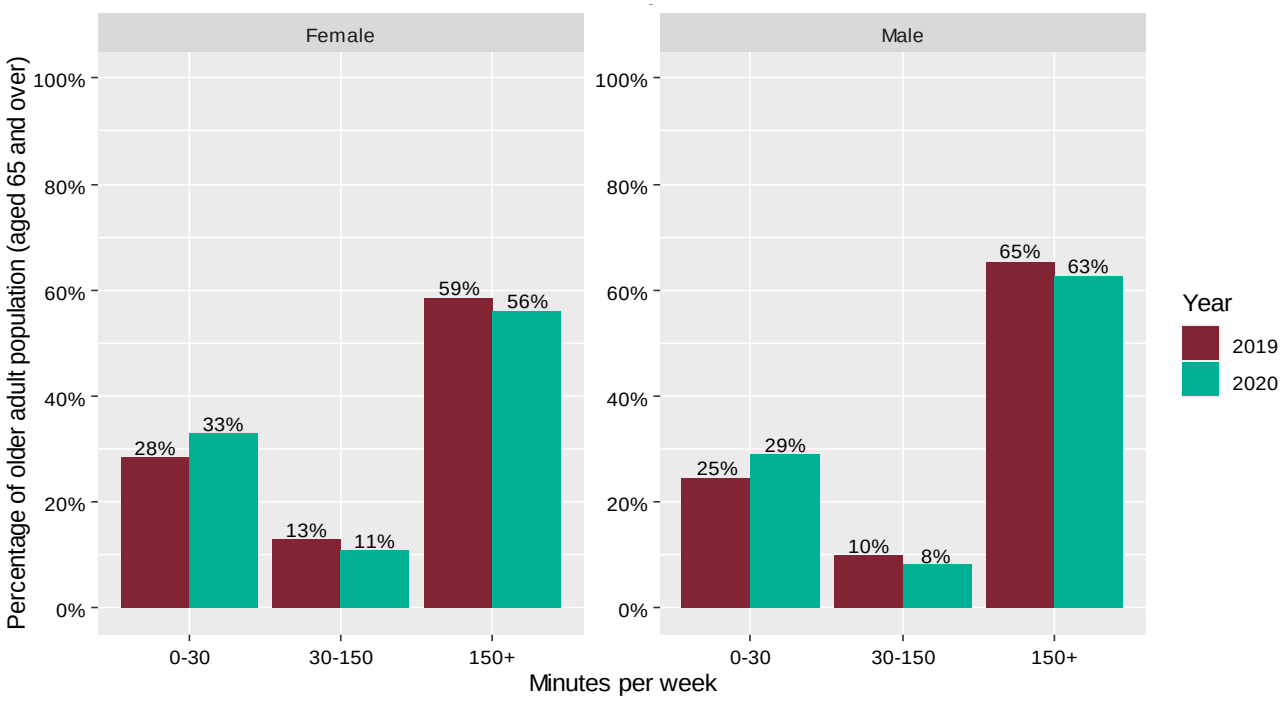
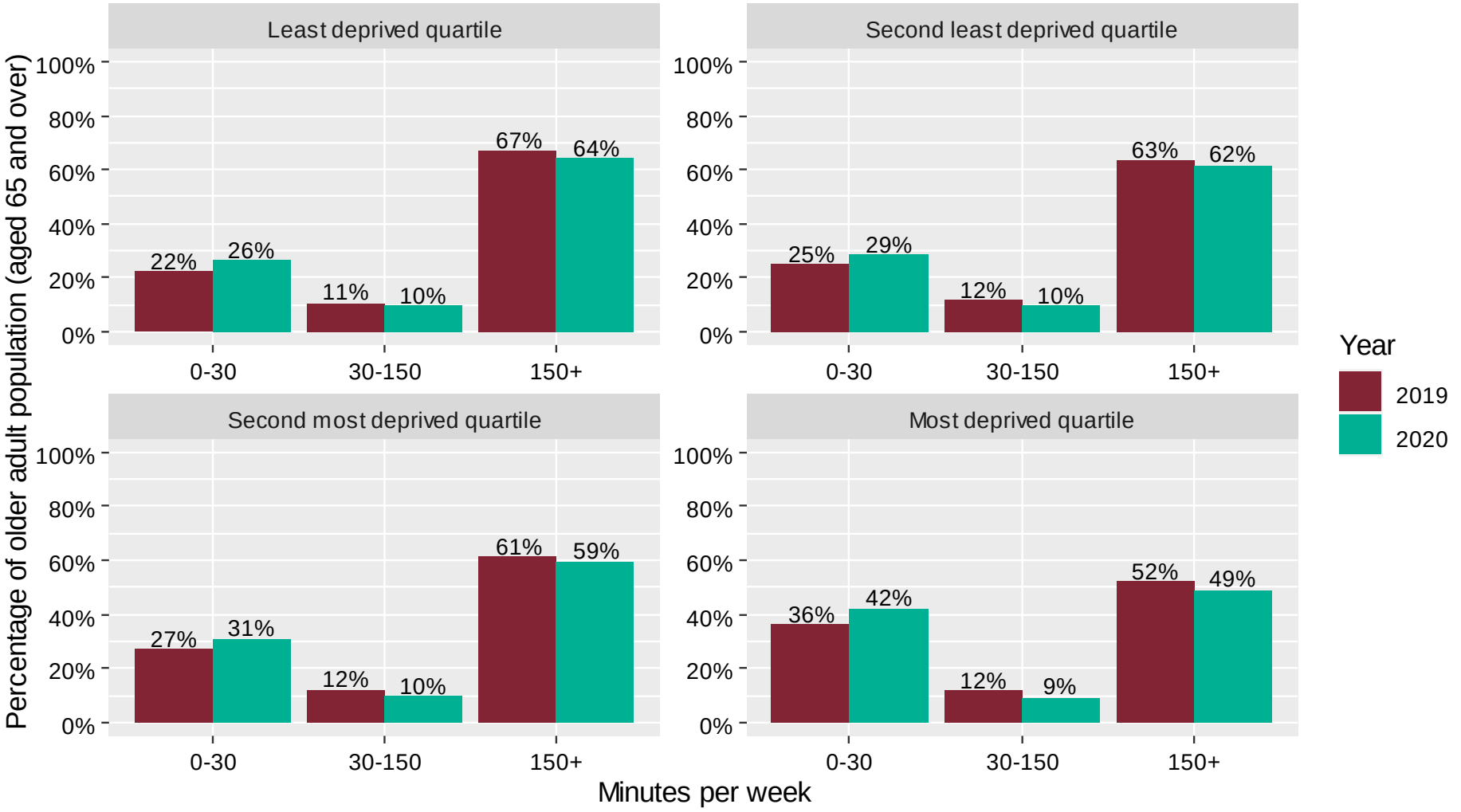



Figure 7 presents data on the changes in physical activity in 2019 and 2020 for each Index of Multiple Deprivation (IMD) quartile. Analysis shows that in 2019 (mid-March to mid-May), there were inequalities in the levels of physical activity with the highest proportion of older adults in the least active group (less than 30 minutes per week) from the most deprived quartile and highest proportion of older adults in the most active group (greater than or equal to 150 minutes per week) in the least deprived quartile.

COVID-19 has resulted in an increase in the proportion of older adults who are physically inactive (increase in the 0 to 30 minutes per week group, far-left bar in each of the graphs for 2020 in Figure 7). Inequalities in physical activity have persisted, and there is reason to think that older adults with multimorbidity, and older adults who have been shielding, will have been particularly likely to reduce their levels of activity. There is therefore cause for concern that a large number of older adults, particularly with multimorbidity or health conditions that have resulted in them shielding, may have suffered from deconditioning during the pandemic.

**Figure 7. Percentage of older adults (aged greater than or equal to 65 years) undertaking a given level of moderate activity in 2019 (red) and 2020 (green), by IMD quartile (least deprived in the top left, second least deprived in the top right, second most deprived in the bottom left and most deprived in the bottom right), extracted from ALS [19]**



Further, one of the most important components of physical activity, when it comes to the prevention of falls, is strength and balance activity. There has been a particularly large reduction in the number of older adults engaging in adequate strength and balance activity. This is likely to be related to the reduction in the availability of strength and balance classes, as well as the reduced likelihood of older adults being able to attend them.

The average weekly duration of strength and balance activities undertaken (in minutes) by older adults (65 year olds and over) is presented in Table 6 and shows that all age-sex groups decreased their level of activity in mid-March to mid-May 2020 compared to the same period in 2019. The greatest percentage change occurred in the 70 to 74 age group for both males and females with a 45% and 49% decrease observed in activity, respectively. For males, the younger age groups experienced the greatest decrease in activity, but this decline lessened in the older male age groups. However, amongst females, the older age groups 75 to 79 years and 80 to 84 years experienced greater decline compared to those aged 65 to 69. The smallest change in activity was observed in the oldest age group, aged 85 and over for both sexes.

**Table 6. Summary of the average weekly duration of strength and balance activity during mid-March to mid-May in 2019 and 2020 for different age-sex groups, extracted from ALS [19]**

| Sex | Age | Average activity performed (mins/week) | | Change in average activity (%) |
|---|---|---|---|---|
| | | 2019 | 2020 | |
| Male | 65-69 | 179 | 107 | -40 |
| Male | 70-74 | 169 | 92 | -45 |
| Male | 75-79 | 125 | 78 | -38 |
| Male | 80-84 | 104 | 70 | -33 |
| Male | 85+ | 52 | 41 | -20 |
| Female | 65-69 | 125 | 87 | -30 |
| Female | 70-74 | 122 | 62 | -49 |
| Female | 75-79 | 77 | 51 | -33 |
| Female | 80-84 | 54 | 36 | -34 |
| Female | 85+ | 29 | 29 | -3 |

The decrease in mean duration of activity is examined further in Figure 8 and Figure 9, which show the percentage point change in the proportion of people in each activity duration group by age group and sex, Males in the 70 to 74 age group saw the greatest percentage point increase in the number of people in the least active group (0 to 30 minutes of activity per week) of 13.4% with all other activity duration groups experiencing a decrease. For females in the same age group, a 11.7% increase in the least active group (0 to 30 minutes of activity per week) was also recorded. The most active group (greater than 180 minutes) also saw the greatest percentage point decrease of 10.9% for males and 10.6% for females. This magnitude of this decline cannot

be entirely attributed to individuals moving into the intermediate duration activity groups (30-60 minutes, 60 to 120 minutes, 120 to 180 minutes), therefore it is mainly due to individuals moving into the lowest duration activity group of less than 30 minutes of activity per week.

For both males and females, the oldest age group, aged 85 and over, experienced the smallest percentage change in average weekly duration, although greater for males compared to females. A summary of the change in the weekly duration of strength and balance activity at a regional level is provided in Figure 20 in Appendix A: regional change in strength and balance.

**Figure 8. Percentage point change in the weekly duration of strength and balance activity undertaken by age groups, for males, extracted from ALS [19]**

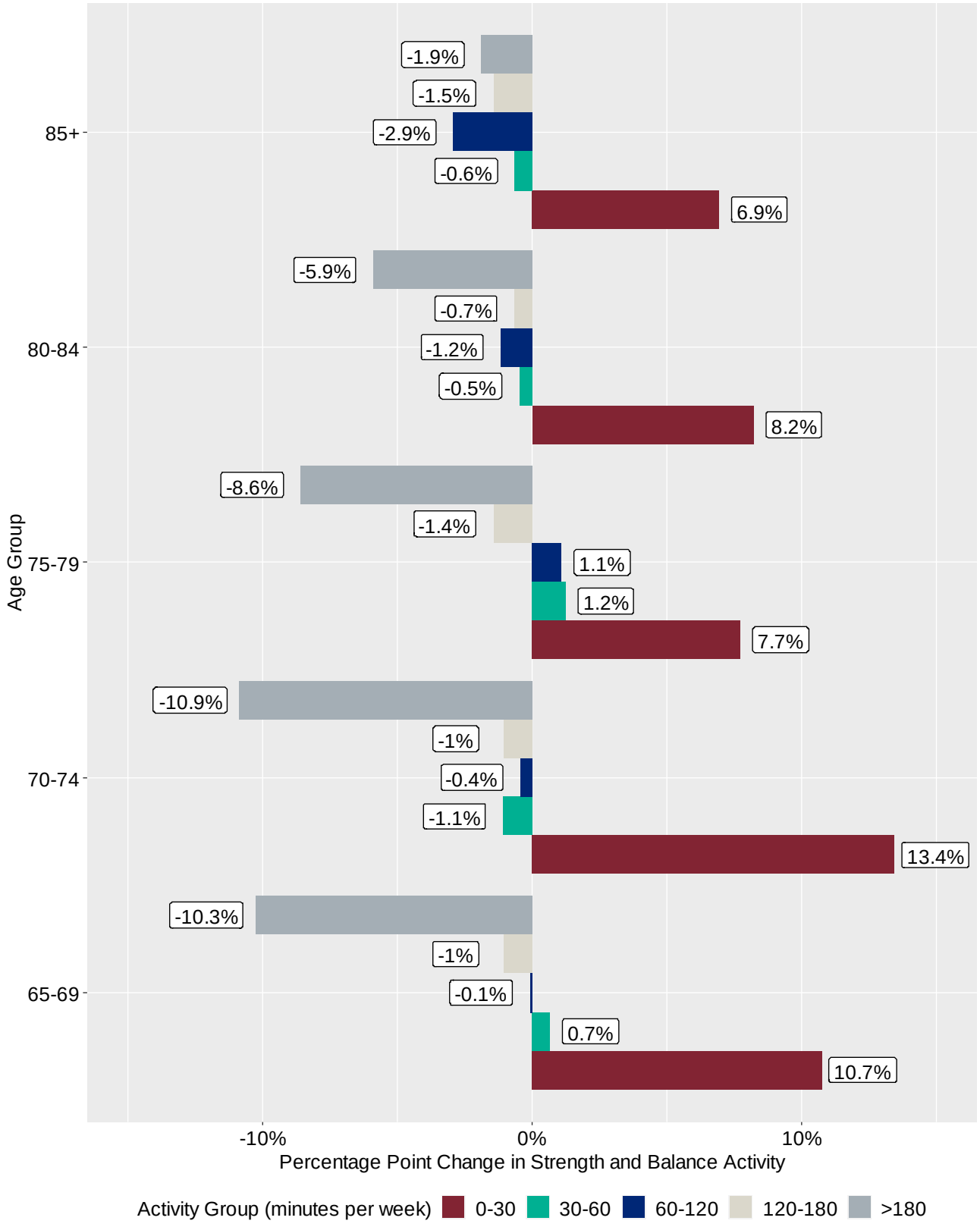
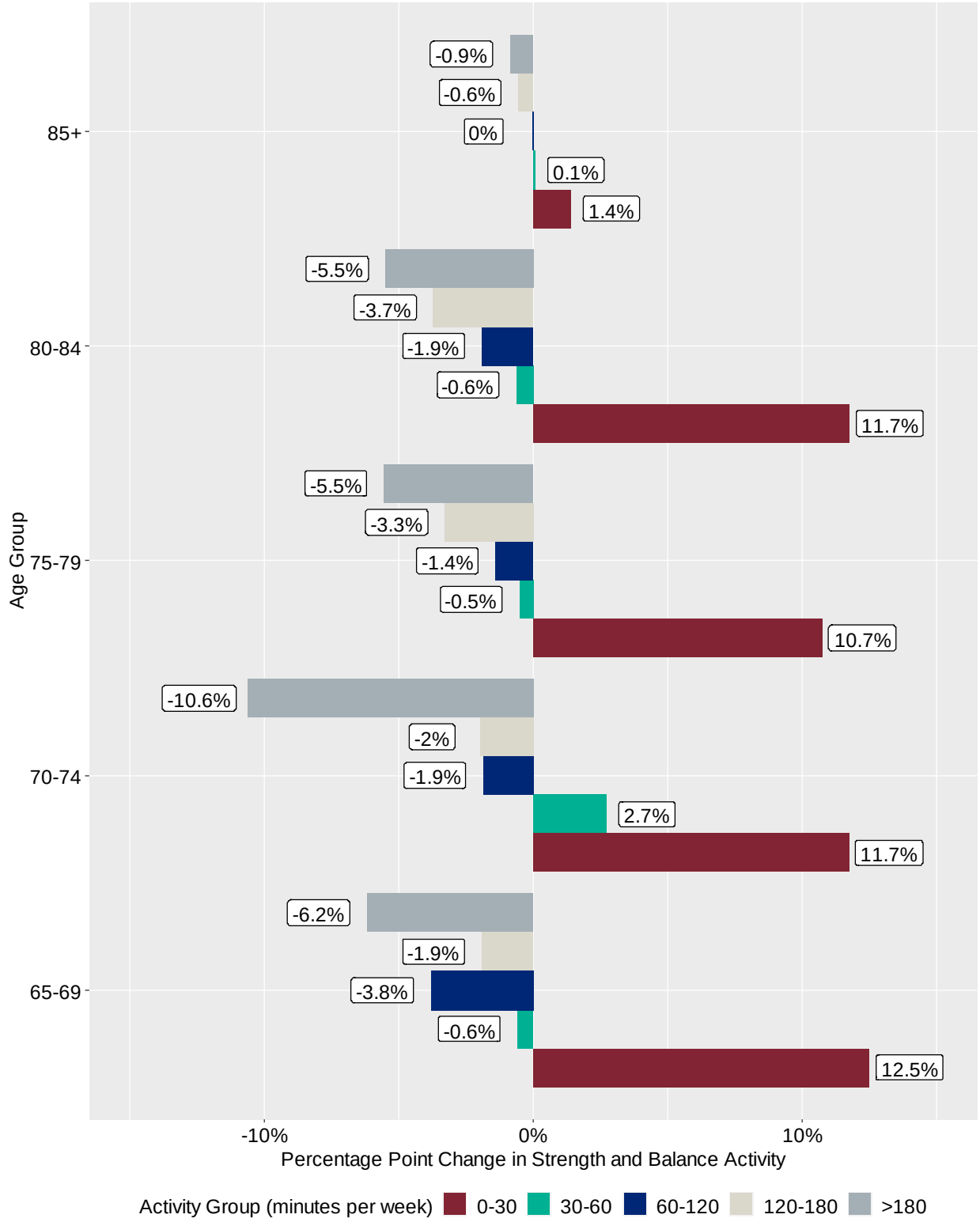


**Figure 9. Percentage point change in the weekly duration of strength and balance activity undertaken by age group, for females extracted from ALS [19]**



# Impact on the number of fallers and falls

As can be seen in Figure 10, we project that the COVID-19 pandemic may lead to an increase in the number of older adults experiencing at least one fall across all age-sex groups. Due to the differences in the size of each age-sex group, this data has also been analysed as a percentage change, presented in Figure 11. The percentage change is greater for males compared to females in all age groups, and greater for younger age groups compared to older age groups, highest in age group 70 to 74 (7.2% for males and 6.1% for females) and 65 to 69 (6.8% for males and 4.2% for females). The increase in falls amongst the younger age groups, is a key concern given that an initial fall can lead to increase in fear of future falls and subsequent decline in activity, therefore accelerating the process of deconditioning. Compared to 2019 baseline figures and using the appropriate sex weighting for the shaded bars in Figure 11, the projected percentage change due to the COVID-19 pandemic in the annual number of older adults who experience at least one fall is 3.9%.

**Figure 10. Projected change in the annual number of people who experience at least one fall due to the COVID-19 pandemic**

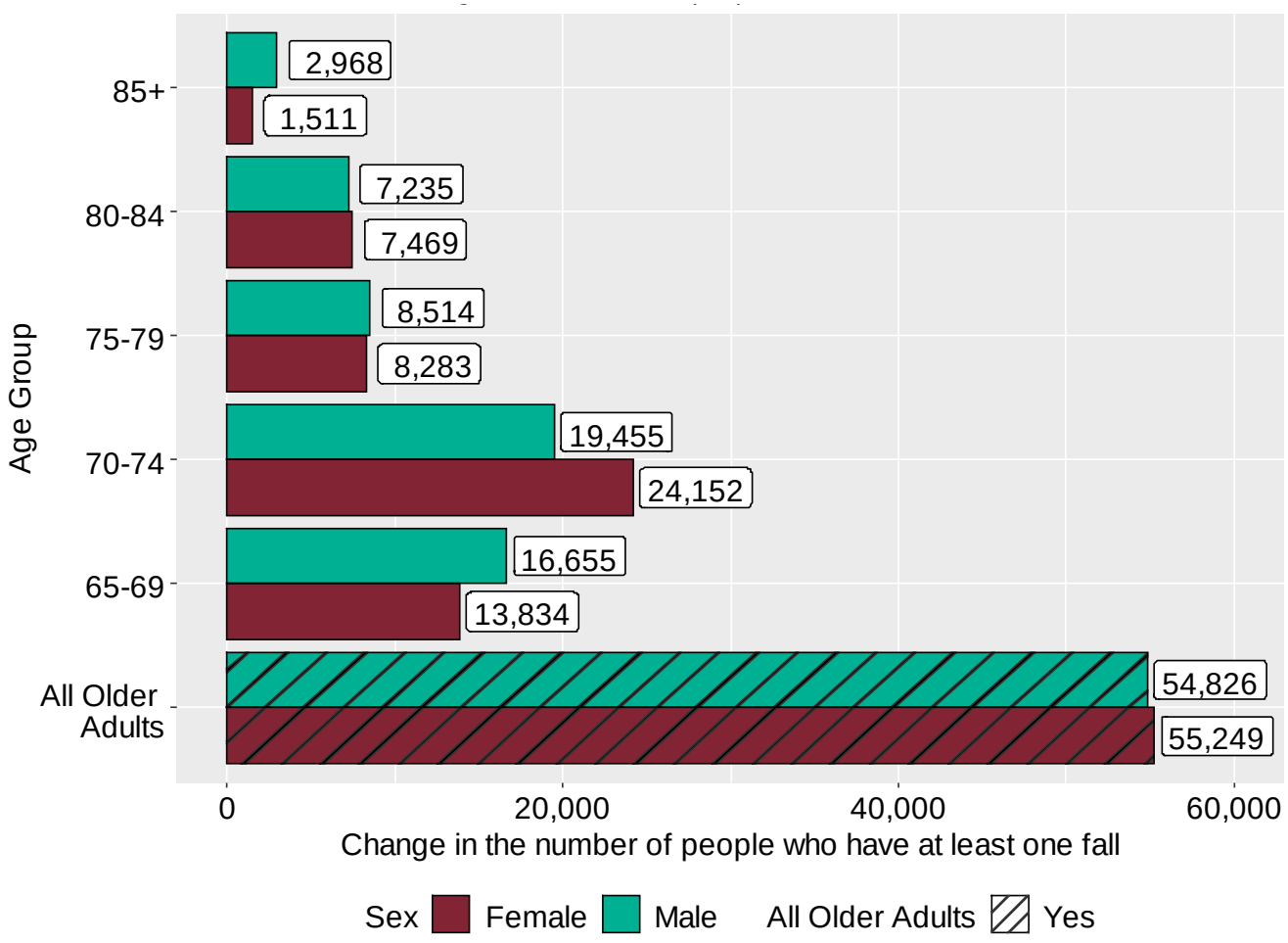
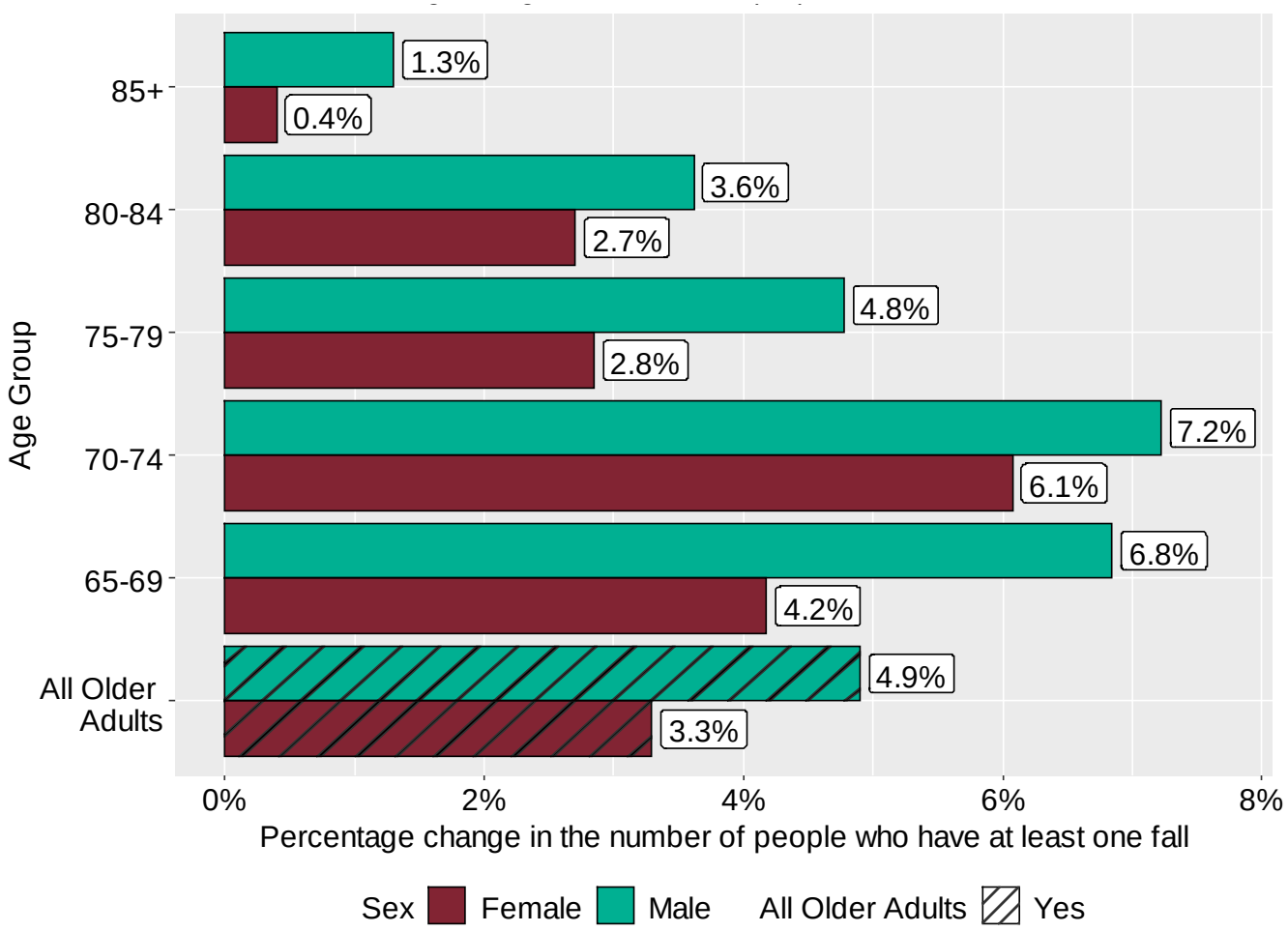


**Figure 11. Projected percentage change in the annual number of fallers due to the COVID-19 pandemic, by age group and sex, females (red) and males (green)**




As can be seen in Figure 12, we project that the COVID-19 pandemic may also lead to an increase in the number of falls for older adults across all age-sex groups. As with changes in the number of people who experience at least one fall, this data has also been analysed as a percentage change, presented in Figure 13. These figures show that for all age groups, males are projected to experience a greater percentage increase in falls compared to females.

**Figure 12. Projected change in the annual number of falls due to the COVID-19 pandemic, by age group and sex, females (red) and males (green)**

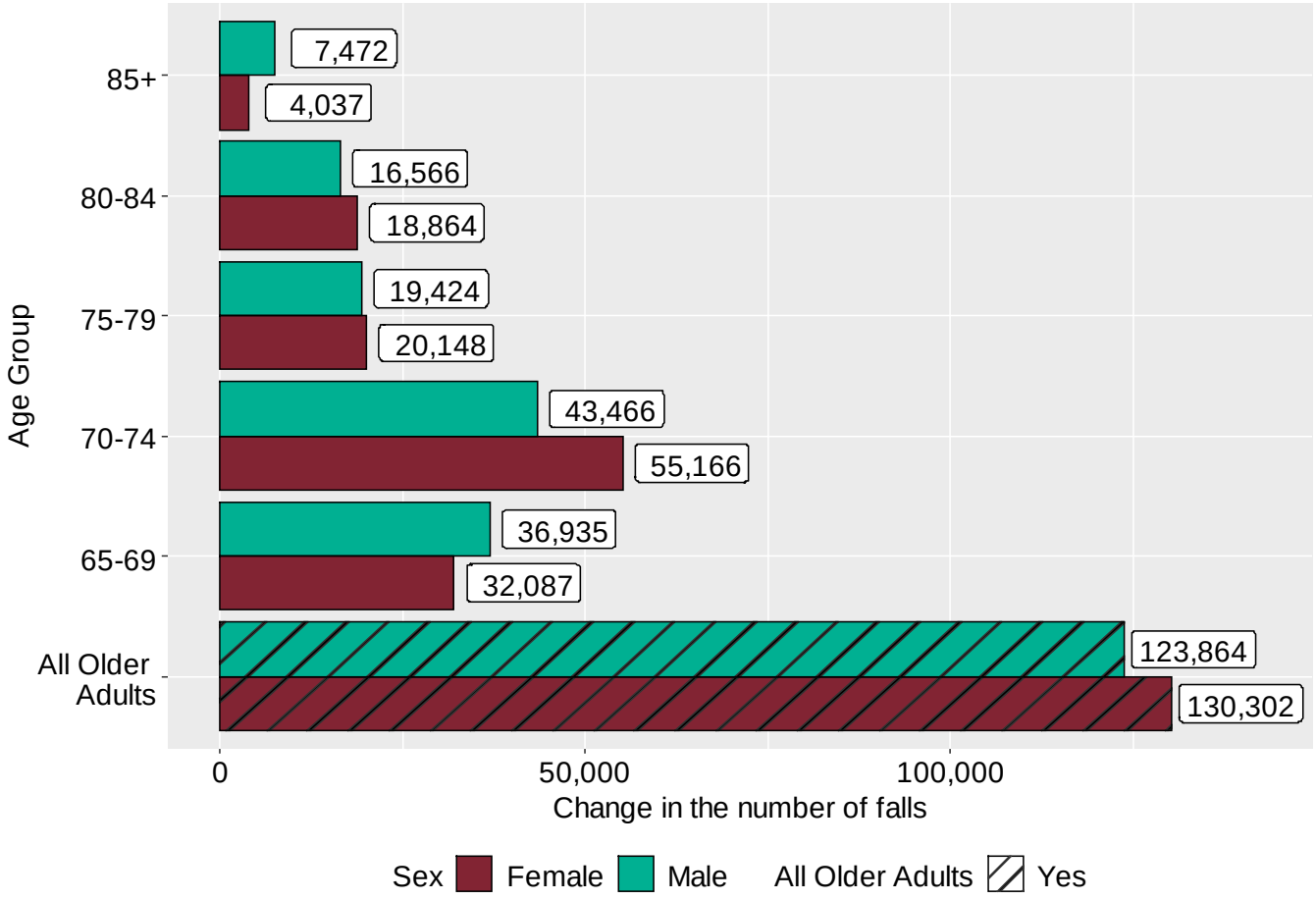
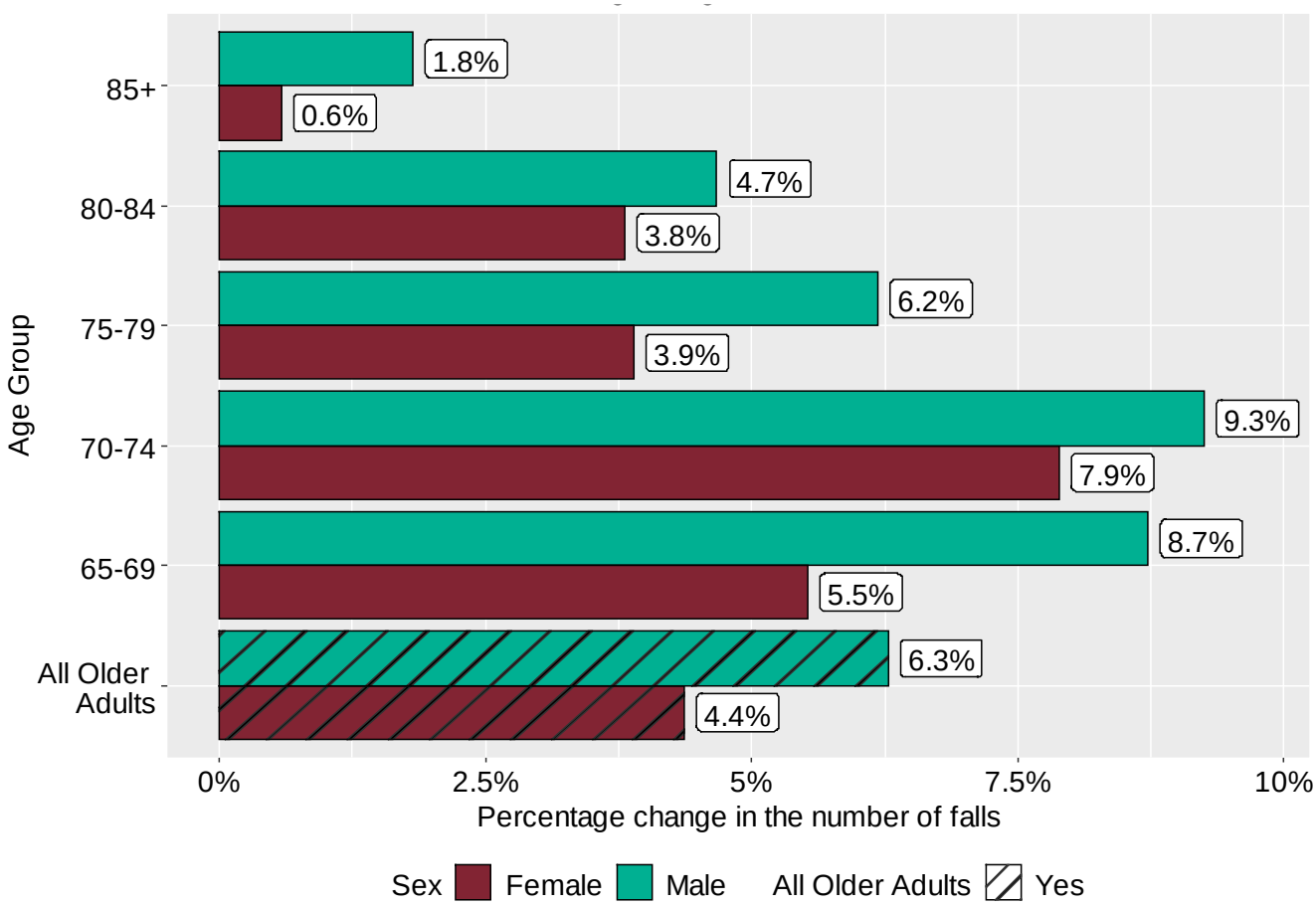


**Figure 13. Projected percentage change in the annual number of falls due to the COVID-19 pandemic, by age group and sex, females (red) and males (green)**




# Impact on the health and social care system

A summary of the number of fallers and falls within older adults, and the associated health and social care costs at baseline (based on the ALS data for mid-March to mid-May 2019) and under the COVID-19 pandemic scenario (based on the ALS data for mid-March to mid-May 2020) are presented in full in the Technical Appendix. The wider impacts of COVID-19, in terms of the number of people who fall (fallers), falls and costs are outlined in Table 7. For each year that the levels of strength and balance activity observed during the pandemic (those reported in ALS from mid-March to mid-May 2020) persist compared to the pre-pandemic levels (those reported in ALS from mid-March to mid-May 2019), the additional cost to the health and social care system as a result of related falls is projected to be £211 million (incurred over a 2 and half year period).

**Table 7. Summary of outcomes – projected impacts of COVID-19 pandemic (the difference between the baseline and COVID-19 scenario) on the number of fallers, falls and health and social care costs.**

| Age | Sex | Fallers (000s) | Falls (000s) | Costs (£ million) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Health | Social (NHS) | Social (LAs) | Total |
| 65-69 | Male | 17 | 37 | 24.3 | 0.5 | 5.9 | 30.7 |
| 70-74 | Male | 19 | 43 | 28.6 | 0.6 | 7.0 | 36.1 |
| 75-79 | Male | 9 | 19 | 12.8 | 0.2 | 3.1 | 16.1 |
| 80-84 | Male | 7 | 17 | 10.9 | 0.2 | 2.7 | 13.8 |
| 85+ | Male | 3 | 7 | 4.9 | 0.1 | 1.2 | 6.2 |
| All older adults | Male | 55 | 124 | 81.5 | 1.6 | 19.9 | 102.9 |
| 65-69 | Female | 14 | 32 | 21.1 | 0.4 | 5.1 | 26.7 |
| 70-74 | Female | 24 | 55 | 36.3 | 0.7 | 8.8 | 45.8 |
| 75-79 | Female | 8 | 20 | 13.3 | 0.3 | 3.2 | 16.7 |
| 80-84 | Female | 7 | 19 | 12.4 | 0.2 | 3.0 | 15.7 |
| 85+ | Female | 2 | 4 | 2.7 | 0.1 | 0.6 | 3.4 |
| All older adults | Female | 55 | 130 | 85.7 | 1.7 | 20.9 | 108.3 |
| 65-69 | All | 30 | 69 | 45.4 | 0.9 | 11.1 | 57.4 |
| 70-74 | All | 44 | 99 | 64.9 | 1.3 | 15.8 | 82.0 |
| 75-79 | All | 17 | 40 | 26.0 | 0.5 | 6.3 | 32.9 |
| 80-84 | All | 15 | 35 | 23.3 | 0.5 | 5.7 | 29.4 |
| 85+ | All | 4 | 12 | 7.6 | 0.1 | 1.8 | 9.6 |
| All older adults | All | 110 | 254 | 167.2 | 3.2 | 40.8 | 211.2 |

# Impacts of a hypothetical scenario to improve activity levels

Additional modelling has been completed to estimate the impacts of increasing levels of strength and balance activities in older adults. A hypothetical scenario where the weekly duration of strength and balance activity observed in 2020 was increased by 10% across the entire older adult population, was explored to determine how the resumption of physical activity could affect the rate of falls in future. The predicted impacts of this scenario on the change in the number of people who experience at least one fall is presented in Figure 14. Results show that for individuals aged 65 and over, this number is predicted to decrease by 4,663 for males and 4,600 for females. These results have also been presented in terms of the percentage change in the number of people who experience at least one fall shows that for each age group the percentage decrease in the number of people who experience at least one fall is greater for males than for females, with an overall percentage decline, for older adults aged 65 and over, of 0.4% for males and 0.27% for females.

**Figure 14. Projected change in the annual number of people who experience at least one fall if strength and balance activity increased by 10% from 2020 levels, by age group and sex, females (red) and males (green)**

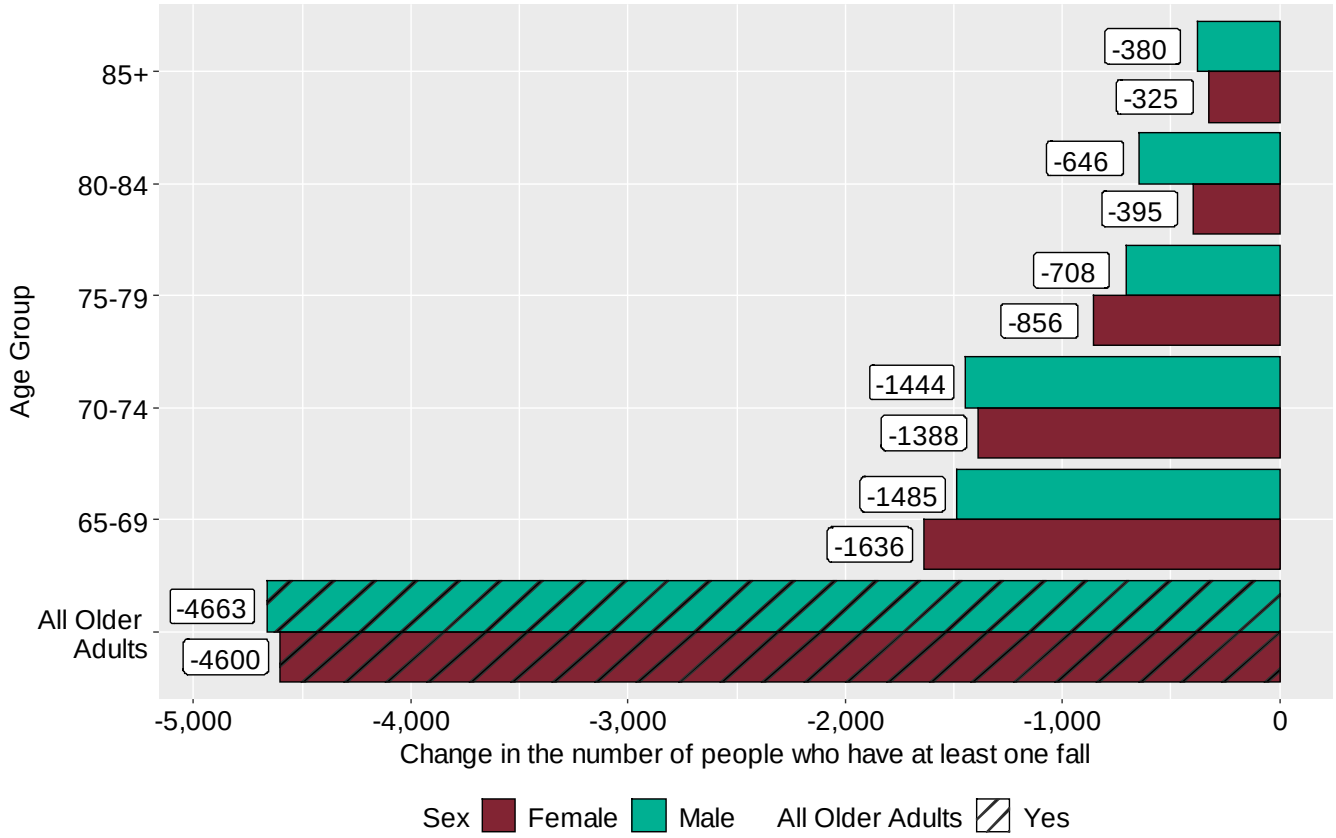
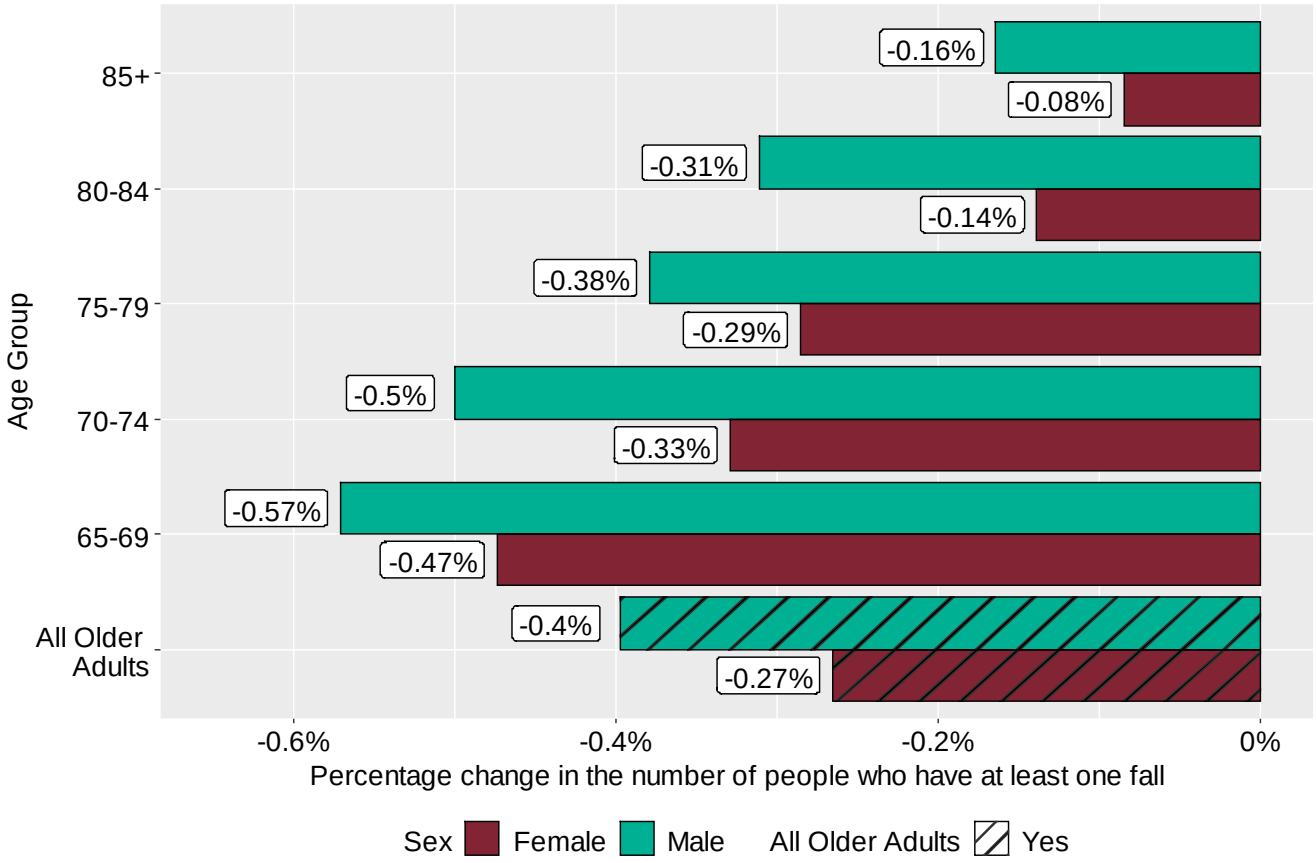


**Figure 15. Projected percentage change in the annual number of people who have at least one fall, if strength and balance activity levels increased by 10% from 2020 levels, by age group and sex, females (red) and males (green)**




The projected change in the number of falls, if activity levels increased by 10% from the 2020 level, is illustrated in Figure 16. The number of falls would decrease in all age groups, with an overall decrease of 9,339 for males and 9,506 for females for all older adults, aged 65 and over. The projected percentage change in the number of falls is shown in Figure 17, which shows the percentage decline would be greater for males in all age groups compared to females with an overall decrease of 0.45% compared to 0.31%.

**Figure 16. Projected change in the annual number of falls if activity strength and balance activity increased by 10%, by age group and sex, females (red) and males (green)**

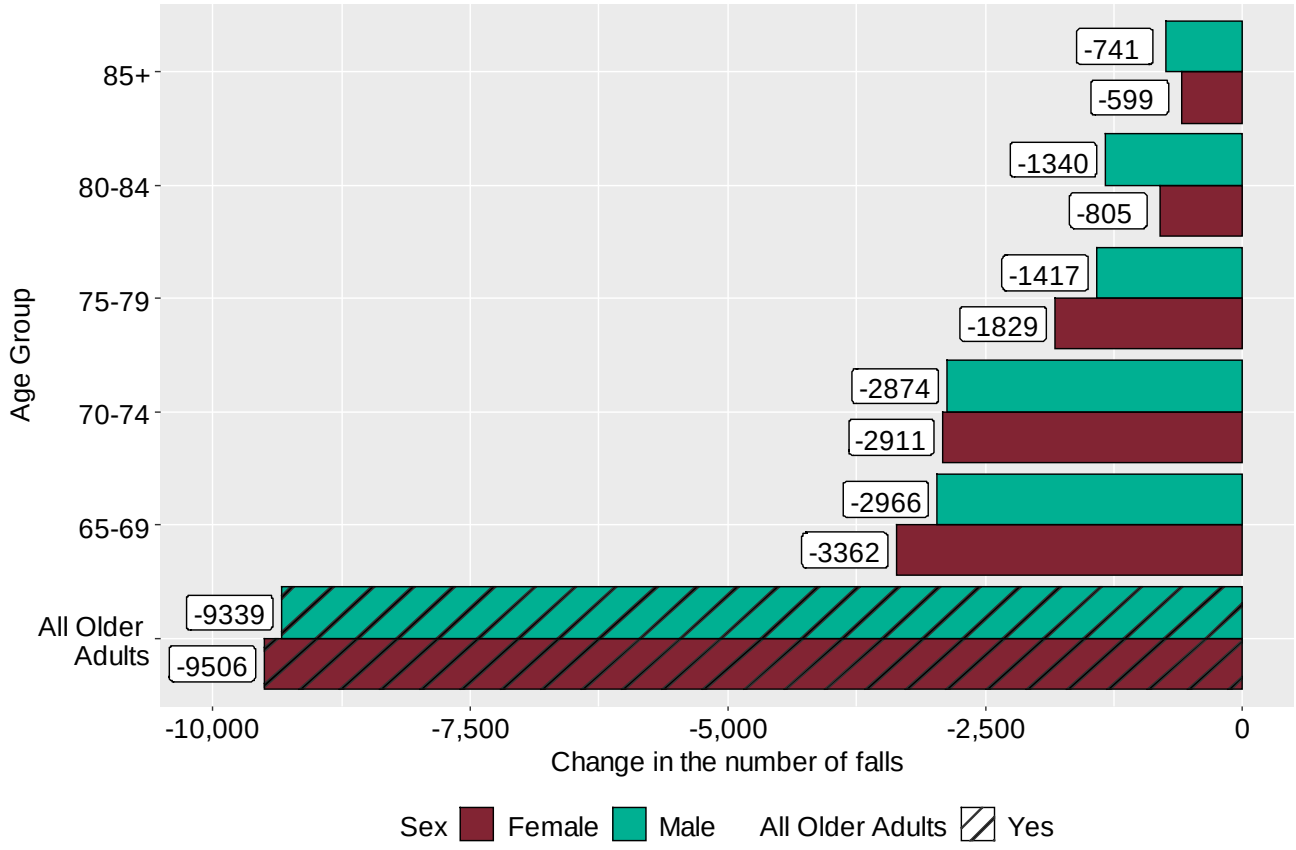
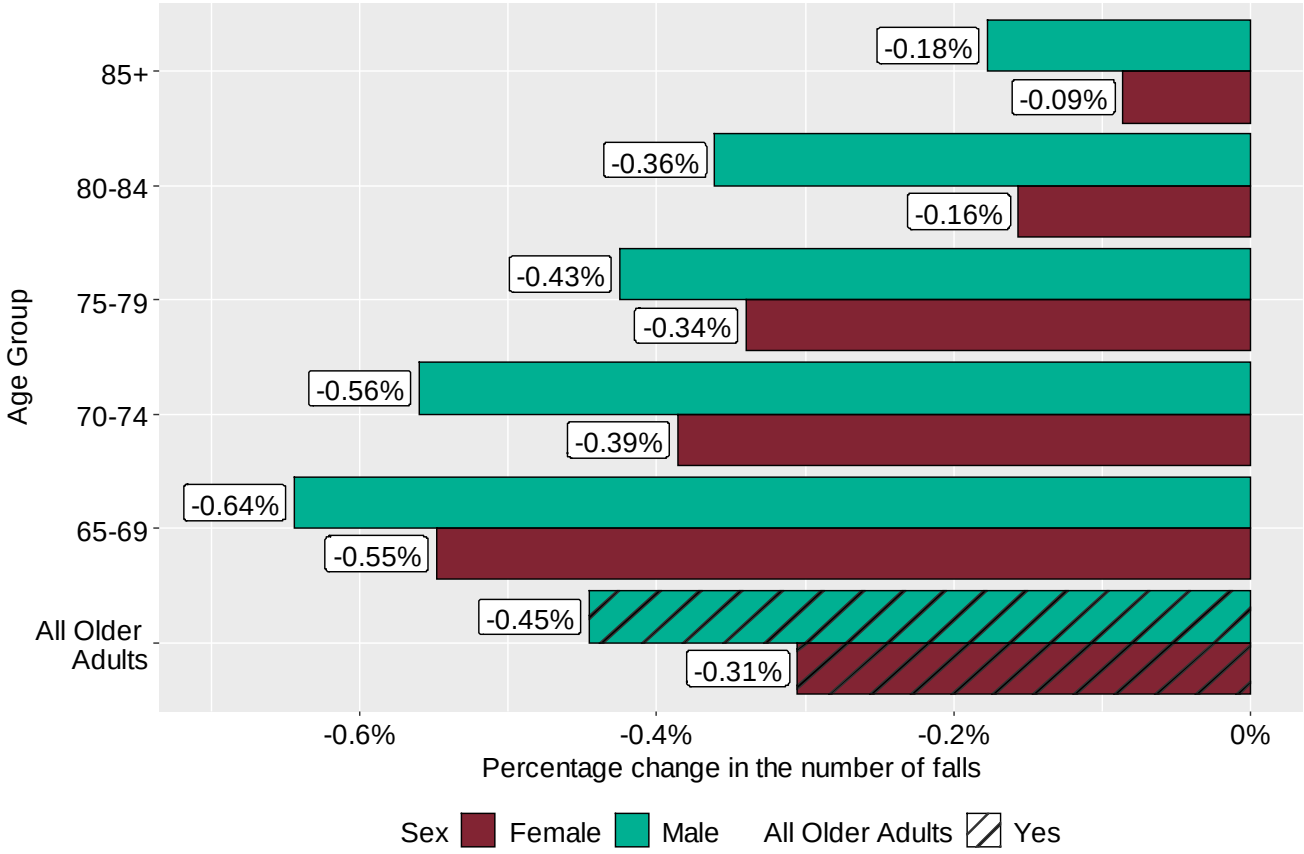


**Figure 17. Projected percentage change in the annual number of falls if activity increased by 10%, by age group and sex, females (red) and males (green)**




The change in health and social care costs if activity levels increased by 10% across all age groups is shown in Table 8. The results show a saving of approximately £16 million in falls related costs.

**Table 8. Summary of outcomes, showing the projected impact of increasing strength and balance activity by 10% (from the COVID-19 scenario 2020 levels) across all age-sex groups, in terms of the number of fallers, falls and health and social care costs**

| Age | Sex | Fallers | Falls | Costs (£ 000s) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Health | Social (NHS) | Social (LAs) | Total |
| 65-69 | Male | 1,485 | 2,966 | 1,951 | 38 | 476 | 2,465 |
| 70-74 | Male | 1,444 | 2,874 | 1,891 | 37 | 461 | 2,389 |
| 75-79 | Male | 708 | 1,417 | 933 | 18 | 227 | 1,178 |
| 80-84 | Male | 646 | 1,340 | 882 | 17 | 215 | 1,114 |
| 85+ | Male | 380 | 741 | 488 | 9 | 119 | 616 |
| All older adults | Male | 4,663 | 9,339 | 6,145 | 119 | 1,498 | 7,762 |
| 65-69 | Female | 1,636 | 3,362 | 2,212 | 43 | 539 | 2,794 |

| Age | Sex | Fallers | Falls | Costs (£ 000s) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Health | Social (NHS) | Social (LAs) | Total |
| 70-74 | Female | 1,388 | 2,911 | 1,916 | 37 | 467 | 2,420 |
| 75-79 | Female | 856 | 1,829 | 1,203 | 23 | 293 | 1,520 |
| 80-84 | Female | 395 | 805 | 530 | 10 | 129 | 669 |
| 85+ | Female | 325 | 599 | 394 | 8 | 96 | 498 |
| All older adults | Female | 4,600 | 9,506 | 6,255 | 121 | 1,525 | 7,901 |
| 65-69 | All | 3,120 | 6,327 | 4,163 | 81 | 1,015 | 5,259 |
| 70-74 | All | 2,833 | 5,786 | 3,807 | 74 | 928 | 4,808 |
| 75-79 | All | 1,564 | 3,246 | 2,136 | 41 | 521 | 2,698 |
| 80-84 | All | 1,041 | 2,146 | 1,412 | 27 | 344 | 1,783 |
| 85+ | All | 705 | 1,340 | 882 | 17 | 215 | 1,114 |
| All older adults | All | 9,263 | 18,845 | 12,400 | 240 | 3,022 | 15,662 |

# Discussion

## Key findings

The results show that physical activity levels have decreased across all older adult age groups. The greatest changes have been observed in the 70 to 74 age group, in contrast with the oldest age group (85-year-olds and over) that has experienced the smallest change. One explanation for this difference is that people in the younger age group were previously undertaking more activity in 2019 (prior to COVID-19 mitigation measures) and therefore have been more affected by the COVID-19 shielding regulations in place during the first lockdown.

Modelling predicts that these changes in strength and balance activity levels as a likely consequence of COVID-19 mitigation measures are projected to result in 110,000 more individuals who fall at least once in a year in the older adult population and this equates to an additional cost to the health and social care system as a result of over 254,000 related falls of £211 million (incurred over a 2 and half year period). Modelling also explored potential future scenarios to mitigate these impacts. Increasing strength and balance activity by 10% in all older adults compared to the level observed during the pandemic could reduce the number of falls by 9,339 for males and 9,506 for females.

## Relationship to existing evidence and implications for policy

The analysis in this report shows that the number of older adults undertaking low or no levels of physical activity (less than 30 minutes per week) has increased during COVID-19, with continuing inequalities between the most and least deprived groups. Further research points to other inequalities affecting persons shielding or with multimorbidity. The ELSA COVID-19 Shielding Substudy reports that 33.4% of older adults who were not requested to shield were undertaking less physical activity than normal and 38.4% doing more sitting than normal. This is compared to the shielding group, in which 47.4% of older adults were doing less physical activity than normal and 48.1% doing more sitting [15]. ELSA data also indicates that adults with multimorbidity were more likely to be doing less physical activity than normal (40.2%) and doing more sitting than normal (36.2%) than adults without multimorbidity [16].

Additionally, Brown, and others, found that 42% of individuals aged 76 to 97 were less active than before lockdown [35] and UCL's COVID-19 Social Study found that around a third of adults aged 60 years and over reported doing less exercise in the most recent lockdown (January 2021) than the first (in March to May 2020), with around half doing about the same, and around 10% doing more [36]. This may indicate that levels of physical activity have declined further than in the first

lockdown. During October 2020, The Physiological Society commissioned an online survey to explore how people aged 50 years and over in the UK had been impacted by the pandemic and lockdown measures. When asked to compare their levels of physical activity since the first national lockdown ended (after 4 July 2020) with their activity levels prior to lockdown 36% said their physical activity levels were lower. This was most marked in the 75 and older age group where 42% said they were less active [26].

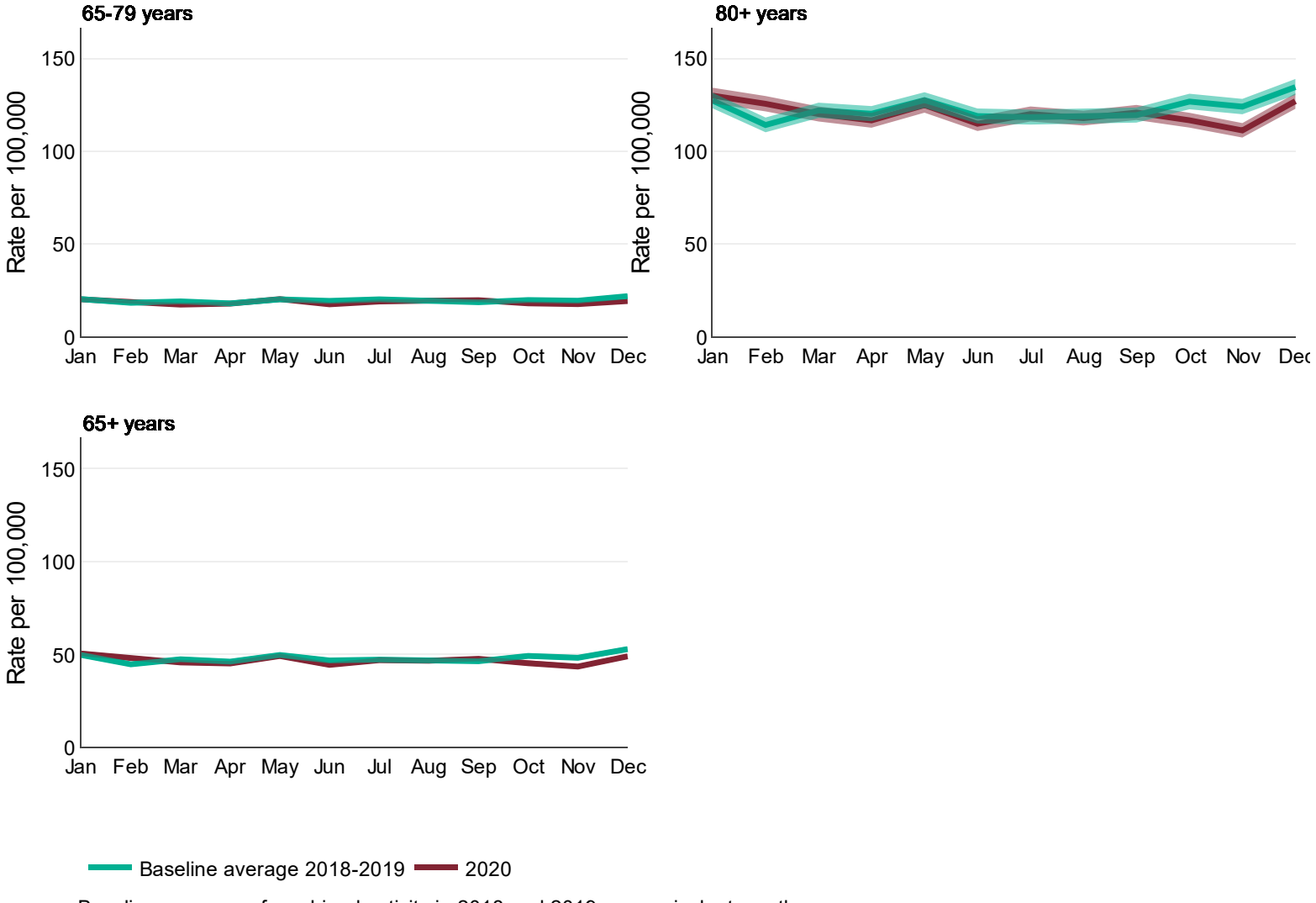
Sport England's recent report referencing data from the Active Lives Adult Survey gathered between November 2019 and November 2020 suggests that activity levels amongst adults aged 55 to 74 are recovering. However, it is not clear whether there has been an improvement in strength and balance activity, or how activity levels have been affected by the most recent lockdown. Further, Sport England have also reported that since May 2020, when the first lockdown ended, older adults aged 75 years and over 'saw consistently large drops throughout the period with no real sign of recovery' [37]. This is likely to be driven, at least in part, by a reduction in perceived opportunity to exercise – Sport England reported a drop in perceived opportunity to exercise amongst adults aged 75 and over between mid-July and mid-November 2020 [37].

The analysis in this report has also shown a specific reduction in strength and balance activity, and this is reflected in a Chartered Society of Physiotherapy and Sport England survey from March 2021, which found that 36% of adults aged 55 years and over reported that their general strength has declined since the COVID-19 outbreak. This rises to 44% for adults with a longstanding physical or mental health condition [38]. As discussed above, this is likely to be due to the reduction in availability of strength and balance classes seen during the pandemic. This is consistent with Sport England's analysis of how the pandemic affected the population, which notes 'large drops in activities that were severely restricted at the start of the pandemic' [19]. Sport England also report an increase in generic fitness training being undertaken at home since March 2020 [37]. However, this does not appear to have prevented the decline in strength and balance activity amongst older adults described in this study and suggests that the current provision of self-led fitness training has not, in its current form, led to older adults engaging in strength and balance activity. In order to increase physical activity – in particular, strength and balance activity – amongst older adults it is plausible that other forms of exercise need to be made more readily available. These are discussed further in the Recommendations section below.

The modelling work undertaken here predicts a significant increase in the number of falls (4.4% for females, 6.3% for males) as a result of the wider impacts of COVID-19. Due to the limited way in which some falls services are operating, and the unwillingness of many individuals to engage with healthcare services during the pandemic [10], it is difficult to ascertain whether there has been any increase in falls during the pandemic thus far. However, 2 measures of falls incidence

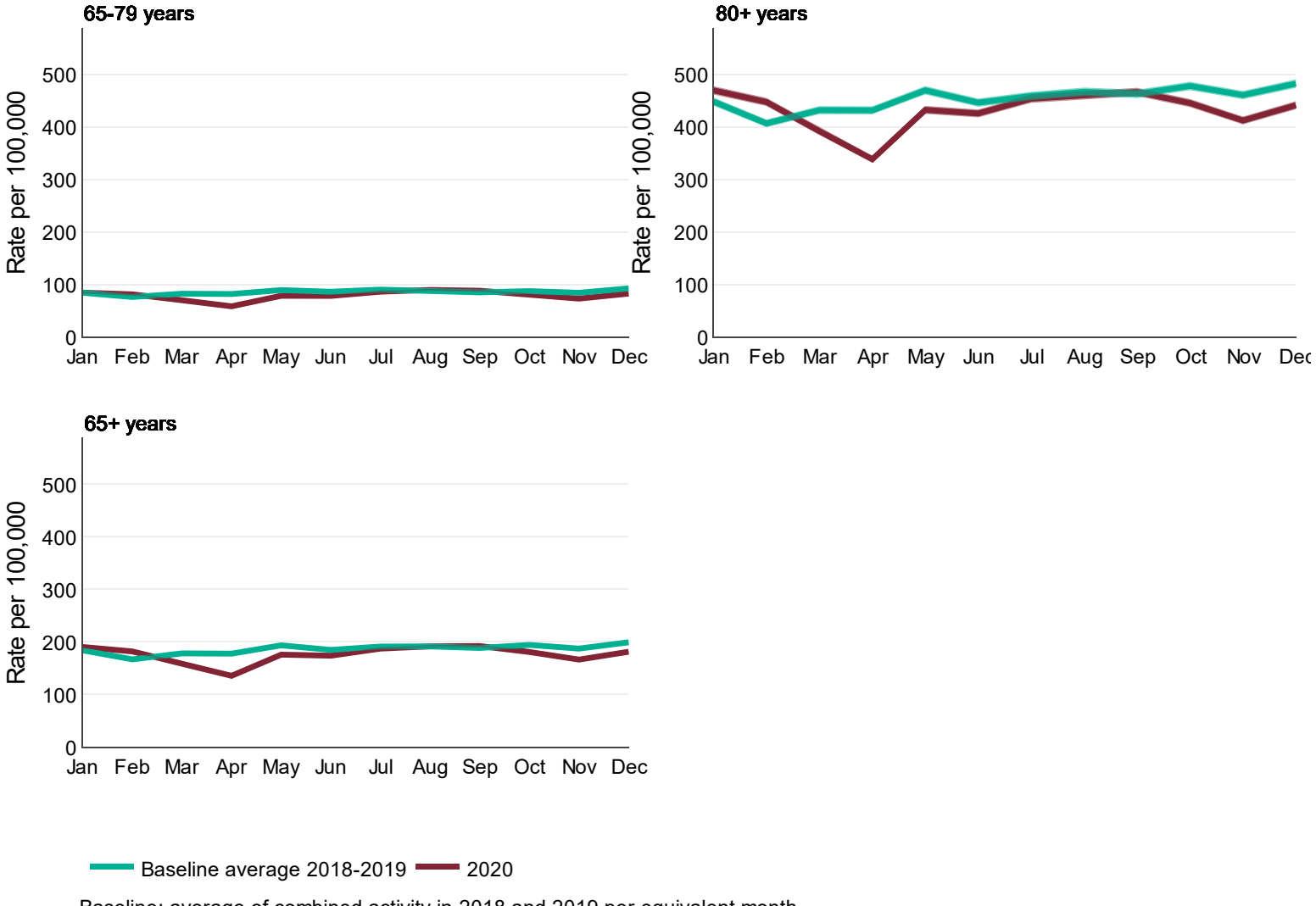
that are currently available are the hospitalisations for hip fractures and hospitalisations for falls. Data from PHE's WICH Tool [10] on this is set out in Figure 18 and Figure 19.

**Figure 18. Monthly trend in hospital admissions for hip fractures in 2018 to 2019 (baseline average, green) and 2020 (red) for all older adults (65 years and over), 65 to 79 year-olds and over 80-year-olds, sourced from the PHE WICH tool [10]**




Baseline: average of combined activity in 2018 and 2019 per equivalent month

**Figure 19. Monthly trend in hospital admissions for falls in 2018 to 2019 (baseline average, green) and 2020 (red) for all older adults (65 years and over), 65 to 79 year olds and over 80 year olds, sourced from the PHE WICH tool [10]**




Baseline: average of combined activity in 2018 and 2019 per equivalent month

It is clear from these figures that there has not been any measured increase in fall hospitalisations or hip fractures at a national level in 2020. This is of particular interest given the results of the model which, again, suggest that predicted an increase in falls as a result of physical inactivity. There are 3 plausible and mutually compatible explanations that may account for this.

Firstly, there is little evidence about the timescale over which deconditioning takes place. While deconditioning can occur very rapidly in individuals who are bedbound, it is unclear how fast this process occurs in a situation in which an older adult becomes significantly more, but not totally, inactive. This makes it difficult to determine the point in time at which one might reasonably see an increase in the number of falls.

Secondly, it may be that the reduction in physical activity observed during the pandemic has not yet led to an increase in falls requiring hospitalisation but has led to an increase in the number of mild or moderate falls. These falls would not be reported in the data shown Figure 18 and Figure 19 and may also have gone unreported due to reduced engagement with health and social care services.

Thirdly, it has been established that individuals who are inactive fall more than those who are moderately active or very active, but do so in safe environments [39]. Because many older adults are spending significantly more time in their own homes – which constitute a safe, familiar environment – one may only expect to see an increase in falls with more severe consequences once older adults begin spending more time in different environments. The data used to model the impact of changes in activity on the likelihood of a fall were based on reported impacts from physical activity interventions pre-COVID, so would not include impacts from mitigation measures where individuals are spending significantly more time in their own homes. As COVID-19 mitigation measures are lifted further, one might therefore expect to see falls and severe falls increase. All of this could suggest that, while there has not yet been an increase in falls visible in the data, it would still be reasonable to assume that a future increase in the number of falls is likely and to prepare mitigation measures accordingly.

Fourthly, while there has been no increase in hip fractures or falls in national level data, one paper reports a significant increase in hip fractures and inpatient falls in one hospital between March to May 2020 [40]. There are several considerations relevant to interpreting how this result bears on the national picture. Firstly, it is unclear whether one would expect to see deconditioning cause any change in the rate of hip fractures or falls this early in the first lockdown, as it is plausible that deconditioning may take place over a longer timescale. Other possible causes which are related to the introduction of lockdown measures and which might increase the rate of falls include reduction to falls-related community service provision or difficulties accessing social support. Secondly, it may be that the data collection undertaken in this paper is different from national-

level data collection, which in turn raises the possibility that national data does not at present represent an increase in falls which has in fact occurred. Thirdly, it may simply be that that there are considerable regional and local variations in rates of hip fractures and falls underlying the national picture.

The scenario analysis set out in this report illustrates that a 10% increase in strength and balance activity across the older adult population, while having some overall health benefit, is unlikely to be enough for falls to revert to the pre-existing rates when activity resumes. This has several implications for policy and service delivery. Firstly, it demonstrates the need for older adults to greatly increase strength and balance activity from the levels seen during the pandemic (which for most age groups showed a 40 to 50% drop in activity levels). Population-level interventions should aim to ensure all older adults do at least 2 sessions of strength and balance activity per week. Secondly, it suggests combining population-level and targeted approaches to this issue. Targeted interventions should be aimed at those individuals who are doing the least strength and balance activity – individuals who fall into the less than 30 minutes per week group – as these individuals are likely to benefit most. Targeted interventions should also look to address the inequalities in physical activity that have persisted or developed during the pandemic – inequalities affecting people from more deprived areas, who shielded, or with multimorbidity [15, 16].

# Limitations and future improvements

The modelling presented in this report shows the impact of the change in physical activity amongst older adults due to the restrictions in place because of the COVID-19 pandemic. However, the results of the modelling should be interpreted in the context of its strength and current limitations, understanding these will provide a foundation for refining the model and expanding its functionality, in future work. The key relationship examined in this analysis, is the change in the weekly duration of strength and balance activity and the impact of this on deconditioning, specifically falls in older adults.

The dataset used to determine the change in physical activity, the Active Lives Adult Survey (ALS), is a self-reported survey. The nature of this survey enables a large sample size and break down by demographic characteristics. We were unable to identify an alternative dataset that provided a large enough sample size and where the data were recorded with an accelerometer. However, there may be limitations in terms of the quality and potential bias within the dataset as a result of data being self-reported. Implausible values (for example reporting more activity than minutes available in a week) have been mitigated through the exclusion of individual data points from the dataset analysed. Also, the levels of activity were placed into groups with the longest duration as 180 minutes or more per week (see Table 5 for details on activity level groupings), therefore reducing the model's sensitivity to individuals reporting very high levels of activity (for

example greater than 2 hours a day). Equally, the evidence does not support that these very high levels of activity would further reduce the risk of falls. Future work could compare data from ALS with other datasets that are recorded with an accelerometer.

Strength and balance activity were categorised in the model by duration of activity per week. The current CMO guidelines do not provide a recommendation on weekly duration of strength and balance activity, and only state that activities which strengthen muscles or improve balance should take place twice per week [34]. Guidance provided by the Project Advisory Group for this project was that the evidence of strength and balance does not support the assumption that more vigorous activity is of greater benefit than less vigorous or moderate activity, therefore all minutes of strength and balance activity were counted equally in the analysis. Future work could analyse each activity separately to inform this model assumption.

This study has assumed that physical activity in 2020 would have remained at 2019 levels in the absence of the pandemic restrictions and has therefore used 2019 as the comparator. In future, this assumption could be further explored by examining several years of past data reported by ALS and determining an average baseline trend in activity. Sport England have reported that the trend in physical activity amongst all adults (aged 16 years and over) from mid-May 2019 onwards was increasing for 10 months prior to the pandemic but the decrease in mid-March 2020 to mid-May 2020 was sufficient to offset these gains producing a stable level across the whole year. Furthermore, ALS has reported an increasing trend for adults aged 75 years and over in mid-November 2015 to mid-November 2016, 33% were active, which increased to 40% in mid-May 2019 to mid-May 2020 [19]. The activity data are also limited by the time period covered and only capture the initial period of the COVID-19 related restrictions (mid-March to mid-May 2020). Future work could incorporate data from the next full publication covering the period until mid-November 2020, which may also provide insight on the impact of local restrictions applied using the tier system at a regional and local authority level. This could also be used in conjunction with Sport England's COVID-19 survey, to explore whether reported changes in attitudes, had a measurable effect on physical activity.

The negative consequences of reducing physical activity have been limited to deconditioning and falls in older adults in this analysis. However, there are other negative consequences of less activity and falls that are not solely the results of physical deconditioning. Falls were chosen as an outcome that could be quantified and where there were enough data and evidence available for modelling. Future work could consider whether this modelling could be expanded to consider other outcomes. Mental health and lack of access to healthcare services are 2 areas discussed in this report that are likely to affect deconditioning and falls risk, but which are not part of the model.

The data source POPPI, used to estimate the number of individuals who fall in a year, is based on data from the Health Survey for England (HSE) in 2005 which has been applied to modelled projections of the ONS population for England in 2020. As a result, the final data used are modelled estimates and not the raw data based on actual reported number of individuals who fall. The use of 2020 ONS population projections has enabled the estimates from HSE to be updated based on the most recent numbers of older adults across different age and sex groups, however, these population projections do not account for changes that may have been observed in the underlying rates of falls. Alternative more recent falls prevalence rates from the English Longitudinal Study of Ageing (ELSA) are compared and shown to be comparable in the Technical Appendix [41]. The POPPI dataset was agreed to be the most appropriate source to use in this study because the analysis was based on a cohort aged 65 and above (in line with the definition of older adults), compared to ELSA where individuals aged 60 and above were included in the analysis. POPPI also provides a larger breakdown of age groups (a key risk factor for falls) and data were also reported at a regional level. However, due to sample size limitations it not possible to model the impact by age, sex and region. Hospital Episode Statistics (HES) was also considered as a potential data source on falls, however it has a narrower scope and only captures A&E and hospital admissions for falls whereas POPPI includes all falls which occur in both the community and care settings. Therefore, the use of HES in place of the POPPI data would reduce the scope of this report to focusing on falls which result in hospital admissions (whereas deconditioning is much broader). One option was to combine both the POPPI and HES data, however there is limited information on the types of falls reported in POPPI and their combination would have result in double counting of the falls requiring admission. Given the available evidence and focus of the study, it was deemed more appropriate to use the modelled estimates extracted from the POPPI dataset. As detailed in the Methods section, the model developed in this study used this data source to estimate the number of fallers in 2019, combining this with results from Sherrington, and others, [29] to obtain a corresponding estimate of the number of falls. Changes in activity levels were then used to estimate the equivalent values for 2020 based on the reported activity levels.

The consequences of falls in terms of severity and subsequent impact on health, healthcare and social care costs were quantified using the PHE Falls Prevention ROI Tool [3]. This tool was published in 2018 and costs referenced in the tool were uplifted to account for inflation. A limitation of this approach is that any more recent cost estimates for the health and social care pathways in relation to falls were not included in this analysis. Therefore, the costs may be either under or overestimated based on changes in unit costs of treatments or advances in treatments available. Future work could review whether any of these unit costs have changed over the last couple of years. In the tool, 20% of falls are serious (based on Scottish Ambulance Service data [42]) and have consequences in terms of health, healthcare and social care costs, whereas the remaining 80% of falls do not have any costs associated with them. The approach used in this study assumes that increasing activity can prevent a fall regardless of severity, whereas Sherrington, and others, have found that although increasing activity does prevent falls, the evidence on preventing serious falls (falls requiring medical attention, hospital admission or fractures) is less

certain due to the low number of studies which reported these measures [29]. Further research would enable a more accurate estimation of the link between changing activity levels and the severity of falls

In addition, the care pathway from the Falls Prevention ROI Tool (Figure 5) which is followed experiencing a fall does not vary by demographic characteristics, despite age and sex affecting the prevalence of falls. Further research on this, could provide more relevant outcomes on the care pathway for specific age-sex groups. In this tool, 80% of falls are non-serious and have no further consequences in terms of the impact on health and social care costs. The tool also assumes that second and subsequent falls occur at the same level of severity as the initial fall. Given that the fear of falling after a first fall can contribute to reduced physical activity, a key area for future research would be to investigate if initial non-serious falls can lead to subsequent serious falls and how the severity of the second and subsequent falls compares to the severity of an initial fall.

# Recommendations for addressing deconditioning

## Methodology

The recommendations presented in this section are derived from consultation with a range of stakeholders, as well as existing evidence about effective falls prevention interventions. Stakeholders from the project's expert advisory group, including health professionals, academics, and colleagues in DHSC, NHS England, and across PHE, were invited to submit recommendations based upon their knowledge of relevant evidence and service delivery. These recommendations were then collated and re-shared with the same stakeholders to ensure that they were consistent and in line with current policy and service delivery. Many of the recommendations are intended to increase levels of strength and balance activity amongst the population. Evidence about the effectiveness of the activities set out in the report for reducing falls risk informs the meta-regression described in the Data and methods section and the Technical Appendix to this report, as well as being discussed in the Cochrane review this report draws on [29].

## Recommendations for addressing deconditioning in the context of COVID-19

As COVID-19 restrictions are lifted, more of the medium-term impact of COVID-19 will become apparent. Recovery strategies will need to anticipate the direct and indirect impacts of COVID-19 and ensure there is sufficient capacity to respond to rehabilitation demand [43]. Strategies for addressing deconditioning are made more complex by 2 important issues: the challenges involved in restarting services (for example, increases in demand, reassessment of existing service users, COVID-secure operating procedures and changes in behaviours amongst older adults and vulnerable populations when reengaging with services in the context of potential fear of COVID-19), as well as post-COVID-19 syndrome ('Long COVID'). Regarding the first point, the strategy must ensure that individuals who have deconditioned are directed to services in a targeted and appropriate way, to ensure demand on services can be managed appropriately [43, 44].

Regarding the second point, it is plausible that (a) post-COVID-19 syndrome will lead to deconditioning in some individuals, and (b) the approach to post-COVID-19 syndrome recovery will be similar to the approach to deconditioning recovery in patients (gradually increasing levels of light exercise). However, it is important to note that some individuals with post-COVID-19 syndrome will require specialised treatment, and that it is unclear whether individuals with severe COVID-19 related fatigue may benefit from evidence-based structured strength and balance

exercise [45]. Many patients experiencing post-COVID-19 syndrome are not expected to require specialist services. Referral to post-COVID-19 syndrome clinics should be necessary only where individuals have severe symptoms or experiences significant functional impact, or in cases deemed clinically complex by the appropriate healthcare professional. Approximately 10% of adults aged 70 years and over are estimated to experience fatigue 5 weeks after COVID-19 infection [46]. Taken together, these considerations point to the need for a nuanced approach in which all individuals who have experienced deconditioning receive appropriate support, and in which the cause and extent of deconditioning are considered.

The strategy recommended in this report is one of supported self-management. This comprises some recommendations that are aimed at the whole population, as well as some that are targeted. Where possible, individuals should be empowered to improve their own physical condition, with support from their family, community, and health and social care services. Where individuals have experienced more severe deconditioning – including falling one or more times within the past year, or significant deterioration in gait or balance – or are experiencing severe post-COVID-19 syndrome, more targeted evidence-based interventions and support will be required [3]. It is important to consider the functional levels of the individual and signpost to the most appropriate local or online programmes available.

There is no single service that should be expected to address deconditioning alone – the most effective strategy will involve an integrated system that involves individuals who have deconditioned, their family and friends, unpaid carers, and health and social care professionals. This will ensure that increases in physical activity can become integrated into daily life. This may mean a ‘triage’ type system locally that knows all the available services in the area (online, face to face, evidence-based falls prevention and more health promotion strength and balance sessions). Those at highest risk of falls should be seen by a multi-disciplinary team and offered evidence-based falls prevention programmes (for example, FaME (Falls Management Exercise) and Otago) delivered by appropriately qualified individuals (Physiotherapists, trained rehabilitation assistants, Postural Stability Instructors and Otago Exercise Programme Leaders). Others, who have not transitioned into frailty but need to work on their strength and balance so they are confident in increasing their general physical activity, can be directed to community based face to face and online options delivered by Personal Trainers and other qualified exercise instructors. For individuals with long-term conditions, increasing physical activity from levels seen during the pandemic should be considered as part of a general approach to supporting individuals to manage their own conditions. Finally, it is important to note some of the differences in activity levels between different groups of older adults, with the largest reductions in physical activity seen in males aged 65 to 74, and females aged 65 to 84 – suggesting that efforts aimed at encouraging resumption of past physical activity should be particularly focussed upon these groups.

Increasing strength and balance activity provides a way of addressing deconditioning by reducing falls risk but, more broadly, it should be considered as a way of enabling older adults to safety resume activities and exercise which they may have ceased during the pandemic. An important example of this is walking. Walking, particularly at moderate or vigorous intensity, has many cardiovascular health benefits and is one of the most common physical activities that older adults report [34]. However, walking does not reduce falls risk – a rapid review by Public Health England has shown insufficient evidence to conclude that walking improved clinical measures of balance, it has a low beneficial effect for either bone health or falls reduction and only small gains in muscle strength reported [47]. Reviews on the benefits of different types of exercise and physical activity on falls prevention conclude that walking programmes do not reduce the risk or rate of falls [29] and that brisk walking, in particular, could actually increase risk of falls and fractures [48].

In order for older adults to safely and confidently gain the health benefits from activities which may expose them to greater risk of falls, such as walking, it is important that unpaid carers, health and social care professionals, and older people are aware that walking needs to be in addition to, or pre-empted by strength and balance exercises if an older adult's balance or stamina is poor. Walking has many health benefits but if someone has poor balance and is deconditioned, perhaps due to many months indoors, then they are likely to tire easily. Brisk walking appears to be detrimental to falls risk to these individuals, as it is tiring and fatigue inducing and environmental hazards (like uneven pavements) present a greater risk when someone is tired [49]. Strength and balance activity will help to improve balance and stamina and mitigate this increased exposure to risk.

Online strength and balance programmes aimed at older adults during the pandemic have become more widely available. However, there are issues with deprivation, leading to less ability to access these opportunities (for example, the cost of internet access and large screen devices) [50]. Some of these programmes are of high quality – such as those set up by local falls teams so that people were able to continue their falls rehabilitation, but most are sessions where the instructor cannot see the person, nor assess their abilities before the session starts, and therefore cannot ascertain the level of balance challenge or strength intensity that is appropriate. This report recommends that specialist exercise instructors with appropriate qualifications (Postural Stability Instructors and Otago Exercise Programme Leaders) should lead evidence-based falls prevention programmes and these should involve a pre-exercise assessment (online or face to face) before starting the individual in either a one to one or small group online programme. Efforts should be made to ensure that more deprived individuals are able to engage with these services.

For those who are more active and less frail, there are many online programmes led by personal trainers or those with an exercise referral qualification that would be appropriate to be signposted to. Some examples of these are set out in the Whole population recommendation section below. There are also a number of self-management strength and balance digital applications which

have been peer-reviewed with 4 apps and 6 websites which can be recommended [44]. Engagement in starting to be more active after a long period of sedentary behaviour or indeed following health problems, such as a stroke, means that building light activity into your day is the starting point and many organisations recommend 'Make Movement Your Mission' which runs 15 minute movement 'snacks' 3 times a day, 7 days a week on Facebook and YouTube. It is important to consider the functional levels of the individual and signpost to the most appropriate local or online programmes available.

# Whole population recommendations

To ensure deconditioning is identified where it exists, it is important that awareness is raised about the phenomenon, and that individuals and those supporting them are given suitable strategies to use to address it. For the majority of individuals who have deconditioned, it is plausible that the most suitable response to deconditioning will simply be to gradually increase physical activity in order to reach levels in line with CMO recommendations [34]:

- older adults should participate in daily physical activity to gain health benefits. Some physical activity is better than none: even light activity brings some health benefits compared to being sedentary
- older adults should break up prolonged periods of being sedentary with light activity when physically possible, or at least with standing, as this has distinct health benefits for older people
- older adults should maintain or improve their physical function by undertaking activities aimed at improving or maintaining muscle strength, balance and flexibility on at least 2 days a week
- each week older adults should aim to accumulate at least 150 minutes (2½ hours) of moderate intensity aerobic activity, building up gradually from current levels

Measures below should be promoted to older adults and amongst the staff and services identified above. To ensure that adults at greatest risk of deconditioning are reached, special efforts should be made to support older adults (and those involved in their care):

- who shielded
- living with multimorbidity
- living with dementia
- living in social care settings
- from more deprived backgrounds

The measures used to achieve this consist of the whole population component of the supported self-management strategy described above and include the details given in Table 8.

**Table 8. Whole population recommendations for addressing deconditioning**

| Recommendation | Relevant resources/considerations |
|---|---|
| Promoting awareness of deconditioning, and the need to gradually build up activity levels to individuals, family and friends, unpaid carers, and health and social care professionals | A 'Make Every Contact Count' approach to this provides an example of how to embed messaging into the existing system. An example of relevant training resources for this can be found on the YHPHN webpage for Falls and Frailty. |
| Focusing on non-seated exercise that involves careful challenge to balance | Some suitable activities and helpful resources aimed at self-management of falls risk can be found on the Chartered Society of Physiotherapy webpage, Self-management: older people and falls management. |
| | Self-management strength and balance apps which have been peer-reviewed with 4 apps and 6 websites which can be recommended [44]. |
| | PHE's Active at Home booklet provides practical guidance to older adults on home-based activities to maintain their strength and balance. |
| Increasing access to and promotion of strength and balance activity for all as a means of falls prevention – particularly focussing on community programmes and a person-centred approach | Detailed recommendations about developing effective strength and balance services [3] are set out in the Centre for Ageing Better's Raising the Bar on Strength and Balance [51]. |
| | The PHE publication Strength and Balance Quality Markers: Supporting Improvement [52] sets out 7 quality markers for strength and balance exercise that can be used as criteria supporting local areas in carrying out self-audit for quality improvement. |
| Ensuring that falls prevention activities are promoted in a way that engages older adults and increases uptake. | Positive messaging about the benefits, fun, and social connections made possible by physical activity should be emphasised. Detailed suggestions can be found in the JSFS article, Enablers and barriers to older people's participation in strength and balance activities: a review of reviews. |
| | Community falls prevention activities should be developed to appeal to the specific community they are embedded in, considering identity, language, and social norms in the target population. Further suggestions about this can be found in the NCBI article, Recommendations for promoting the |

| Recommendation | Relevant resources/considerations |
|---|---|
| | engagement of older people in activities to prevent falls. |
| | For individuals with long term conditions, the benefits for mood, managing conditions and symptoms, and increased independence should be emphasised. More details about this can be found on the Chartered Society of Physiotherapists webpage Strength messaging report. |
| Ensuring that strategies promoting physical activity consider the barriers to being physically active identified by older adults. | Barriers can include physical barriers (such as health conditions), psychological barriers (such as fear or lack of motivation), social barriers (such as lack of support for physical activity) or practical barriers (such as cost and time) [53]. |
| Increasing volume of light activity throughout the day, building physical activity into daily routines | Engagement in starting to be more active after a long period of sedentary behaviour or following health problems, such as a stroke, means that building light activity into your day is the starting point and many organisations recommend Make Movement Your Mission which runs 15 minute movement snacks 3 times a day, 7 days a week on Facebook and YouTube. |
| Identifying locally which older adults have functional levels below normal levels for their age | An example of this is the Functional Fitness MOT at Home [54, 55] where people self-assess their functional strength, balance, stamina and flexibility with functional tests and questionnaires at home and then have a conversation with an activity co-ordinator about which components of fitness they could work on and offer local and online opportunities to help engagement. |
| Identifying locally which older adults have reduced their levels of physical activity during the COVID-19 pandemic, with a particular focus on populations where the largest reductions are likely to be found. | The largest reductions in strength and balance activity identified in this report were seen in males aged 65 to 74, and females aged 65 to 84. |
| Social prescribing, to increase physical activity, address loneliness and social isolation, and build support networks. Signposting as appropriate to group exercise classes, when these reopen, or online opportunities. | Potential activities that can be signposted included Pilates, tai chi, bowls, swimming, Otago Exercise Program (OEP) and FaME group exercise (led by Postural Stability Instructors). |

# Targeted recommendations

For individuals whose reduced physical activity has led to appreciable functional loss or transition towards frailty – indicated by one or more falls in the past year, or signification deterioration in gait or balance – or whose deconditioning involves severe post-COVID-19 syndrome, a different approach will be required. Individuals with severe post-COVID-19 syndrome will need to be referred to post-COVID-19 syndrome clinics, and clinical judgement used as to whether physical exercise is an appropriate therapy. Individuals with appreciable functional loss or transition towards frailty will require support from physiotherapists and/or falls services as required.

Further, it is plausible that many falls which have occurred during the pandemic will have been under-reported (apart from falls that have led to emergency care), as many older adults have been unwilling or unable to access health and social care services. Adults who have fallen may find it difficult to increase their levels of physical activity due to the fear of falling again. These adults will require specialist falls services, with support from individuals specifically trained to help overcome a fear of falls.

This targeted component of the approach recommended here again requires widespread awareness of the phenomenon of deconditioning, plus ensuring that individuals are supported and directed to appropriate services. With that in mind, the report recommends the items given in Table 9.

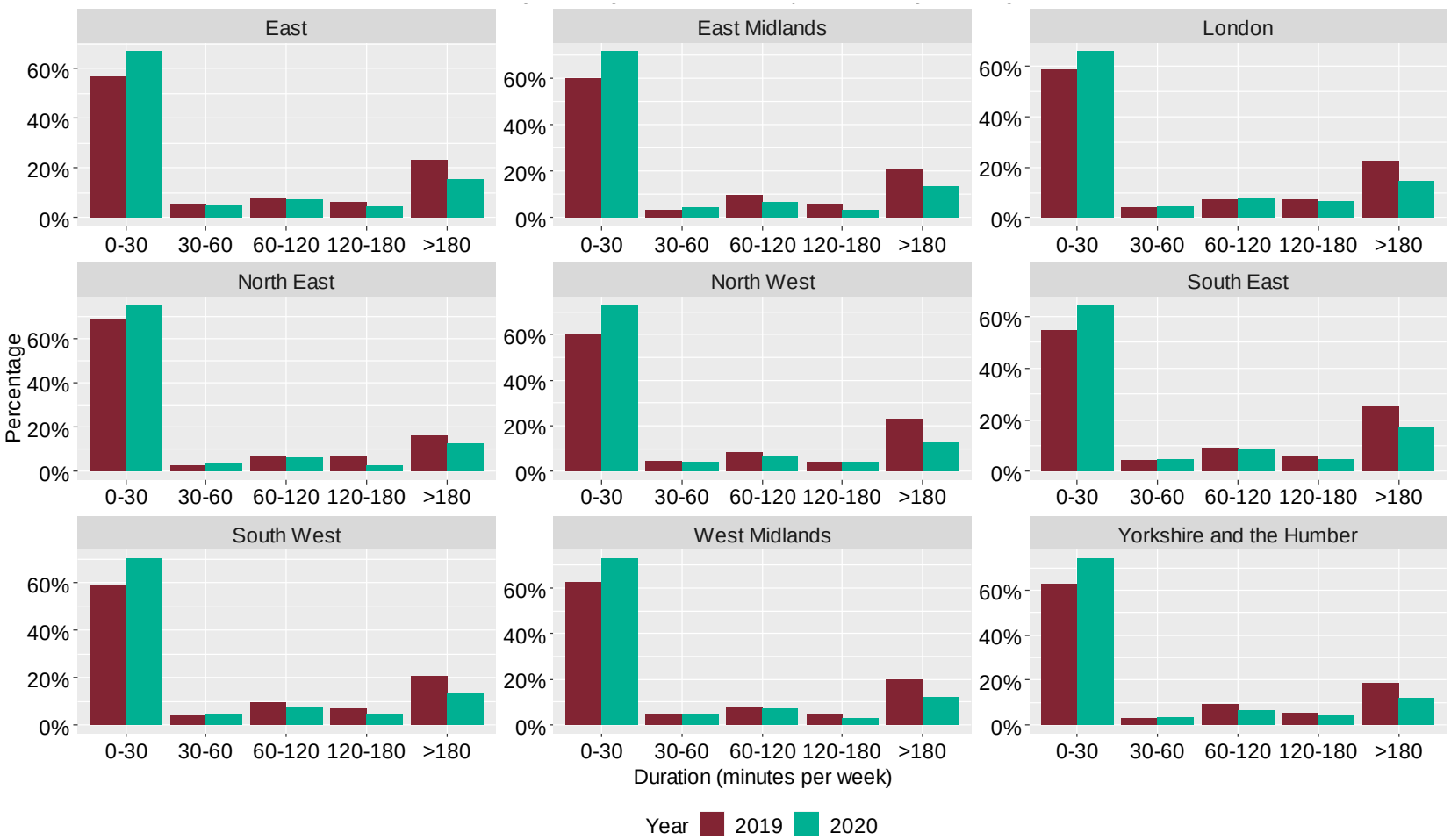
**Table 9. Targeted recommendations for addressing deconditioning**

| Recommendations | Relevant resources/considerations |
|---|---|
| Increased awareness of functional loss or fear of falls resulting from deconditioning, and the need to refer to appropriate physiotherapy, rehabilitation or falls services as appropriate. | |
| Awareness of post-COVID-19 syndrome, caution about building up levels of activity levels too rapidly, and the need to refer to post-COVID-19 syndrome clinics where symptoms are severe, in order that clinical judgement can be used about whether graded exercise therapy should be recommended. | Information can be found about current NHS service provision related to post-acute COVID-19 syndrome. |
| | Current guidance aimed at individuals with post-COVID-19 syndrome related fatigue can be found at the My COVID Recovery website. |
| | Information aimed at physiotherapists working with older adults on rehabilitation after COVID-19 can be found on the Chartered Physiotherapists Working with Older People website. |

| Recommendations | Relevant resources/considerations |
|---|---|
| Quick and effective referral pathways into falls, physiotherapy, and post-COVID-19 syndrome services from health and care services, community groups, and charities. | |

# Appendix A: Regional change in strength and balance

**Figure 20. Proportion of older adult population (greater than or equal to 65 years) undertaking a given level of strength and balance activity in 2019 (red) and 2020 (green) by region, extracted from ALS [19]**



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# About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, research, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health and Social Care, and a distinct delivery organisation with operational autonomy. We provide government, local government, the NHS, Parliament, industry and the public with evidence-based professional, scientific and delivery expertise and support.

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