The GDG concluded that:

- Overall there is sufficient evidence to support the development of a new WHO recommendation to limit sedentary behaviour to reduce health risks.
- There is moderate certainty evidence of an association between greater time spent in sedentary behaviour and higher all-cause mortality, cardiovascular disease mortality, cancer mortality and incidence of cardiovascular disease and type-2 diabetes.
- There is low to moderate certainty evidence of an association between greater time spent in sedentary behaviour and higher risk of incident endometrial, colon, and lung cancers.
- There is insufficient evidence on the association between sedentary behaviour and measures of adiposity and further research is needed.
- The benefits of limiting sedentary behaviour outweigh any potential risks.

Is there a dose-response association (total volume, frequency, duration, intensity of interruption)?

Overall, moderate certainty evidence indicates a non-linear dose-response relationship between sedentary time (sitting or television viewing time assessed by self-reporting, or by device-based assessments) and all-cause mortality, cardiovascular disease mortality, cancer mortality, and incident cardiovascular disease *(8, 35, 87)*.

A recent meta-analysis provided high certainty evidence on the dose-response relationship between accelerometer assessed total sedentary time and **all-cause mortality** *(65)* reporting that increasing time spent in sedentary behaviour was significantly associated with all-cause mortality. The hazard ratios for increasing quartiles of sedentary time were 1.00 (referent; least sedentary); 1.28 (1.09– 1.51); 1.71 (1.36–2.15); and 2.63 (1.94–3.56), after adjustment for potential confounders including time spent in moderate- to vigorous-intensity physical activity *(65)*. This analysis of dose-response relations between sedentary time and mortality showed risk increased gradually from about 7.5–9 hours and was more pronounced at greater than 9.5 hours. Sedentary behaviour of 10 hours and 12 hours each day were associated with 1.48 (1.22–1.79) and 2.92 (2.24–3.83) higher risk of death, respectively *(65)*.

Another recent meta-analysis assessed dose-response and reported non-linear associations for total sedentary time and **all-cause mortality** (RR per 1 hour/day = 1.01 (1.00–1.01) for ≤ 8 hours/day; and 1.04 (1.03–1.05) for > 8 hours/day of exposure); and **cardiovascular disease mortality** (RR= 1.01 (0.99–1.02) for ≤ 6 hours/day; and RR= 1.04 (1.03–1.04) for > 6 hours/day) after adjustment for physical activity *(87)*. In this same study, a small linear dose-response association between **type-2 diabetes** was observed for total sedentary behaviour (1.01 (1.00–1.01)) when adjusted for physical activity and television viewing (1.09 (1.07–1.12)) *(87)*.

Overall, evidence supports that higher amounts of sedentary behaviour are associated with less favourable health outcomes and it was concluded that there is sufficient evidence to support minimizing sedentary time to reduce health risks. However, given the considerable variations in how sedentary behaviour was assessed across reviews (via self-reported sitting time, television viewing time, or device-based (accelerometer) assessments) and the probability that thresholds for sedentary time might vary across health outcomes, by levels of moderate- to vigorous-intensity physical activity, and among population subgroups, there is insufficient evidence to set a time-based (quantified) recommendation.

In addition to overall volume of sedentary behaviour, evidence on the patterns by which sedentary behaviour is accrued was reviewed. However, there was limited evidence to make recommendations on the frequency and/or duration of breaks in sedentary behaviour.

The GDG concluded that:

- There is insufficient evidence to set quantified (time-based) recommendations on sedentary behaviours.
- There is insufficient evidence to make recommendations on the frequency and/or duration of breaks in sedentary behaviour.

Does the association vary by type and domain of sedentary behaviour?

Some domains or different types of sedentary behaviour may be more detrimental than others, both in terms of their direct associations and in their potential to displace time spent in more healthful physical activity. Although there has been a rapid growth in research on sedentary behaviour, there is limited evidence available directly comparing the association between different types of sedentary behaviour and different health outcomes. For example, some studies report stronger results with sedentary behaviour measured as television viewing compared with total sitting time *(87)*. This may be due to the differential measurement error or residual confounding associated with self-report measures and instruments. Currently, there is insufficient evidence to determine the different associations with different health outcomes and how these may vary by subpopulation.

A growing number of studies are using device-based measures of physical activity and sedentary time in relation to health outcomes. However, some misclassification may occur from device-based measures of sedentary time as many of these device placements (e.g. wrist, waist) do not currently distinguish between positions (e.g. lying, sitting and standing still). Future research using harmonized reporting, and methods that distinguish between positions, will help to strengthen the knowledge on the patterns of sedentary behaviour.

The GDG concluded that:

- There is insufficient evidence to make recommendations on different types or domains of sedentary behaviour.

Does level of physical activity modify the effect of sedentary behaviour on mortality?

The increased interest in the impact of sedentary behaviour on health outcomes has stimulated investigation into the potential interplay between different levels of physical activity and levels of sedentary behaviour. Based on available research, there is moderate certainty evidence that the relationship between sedentary behaviour and **all-cause mortality**, **cardiovascular disease mortality** and **cancer mortality** varies by amount of moderate- to vigorous-intensity physical activity *(8, 9, 35)*. Overall findings show that the effect of sedentary behaviour is stronger in those who do low amounts of moderate- to vigorous-intensity physical activity or, phrased conversely, that higher amounts of moderate- to vigorous-intensity physical activity can mitigate the unfavourable health outcomes associated with higher levels of sedentary behaviours.

The risk associated with sedentary time and all-cause mortality has been shown to be more pronounced at lower levels of physical activity than at higher levels *(35)*. In a harmonized meta-analysis, Ekelund et al. investigated the joint and stratified effects of sedentary behaviour and physical activity with **all-cause mortality** in more than 1 million men and women, and showed that the associations differed depending on the level of physical activity *(9)*. The analyses used quartiles of sedentary behaviour (sitting) and quartiles of moderate- to vigorous-intensity physical activity, and found that compared with the referent (< 4 hours of sitting per day and highest quartile of moderate- to vigorous-intensity physical activity [> 35.5 MET-hours/week]), there was no increased risk of dying during follow-up in those who sat for more than 8 hours per day but who also reported more than 35.5 MET-hours per week of activity (HR= 1.04 [95% CI: 0.99 to 1.10]). In contrast, those who sat the least (< 4 hours/day) and were in the lowest (< 2.5 MET-hours/week) physical activity quartile had a significantly increased risk of dying during follow-up (HR= 1.27 [95% CI: 1.22 to 1.31]). The study concluded that levels of moderate-to vigorous-intensity physical activity of about 60–75 minutes per day (the highest quartile) can attenuate, and even eliminate, the detrimental association between sedentary behaviour and health outcomes *(9)*.

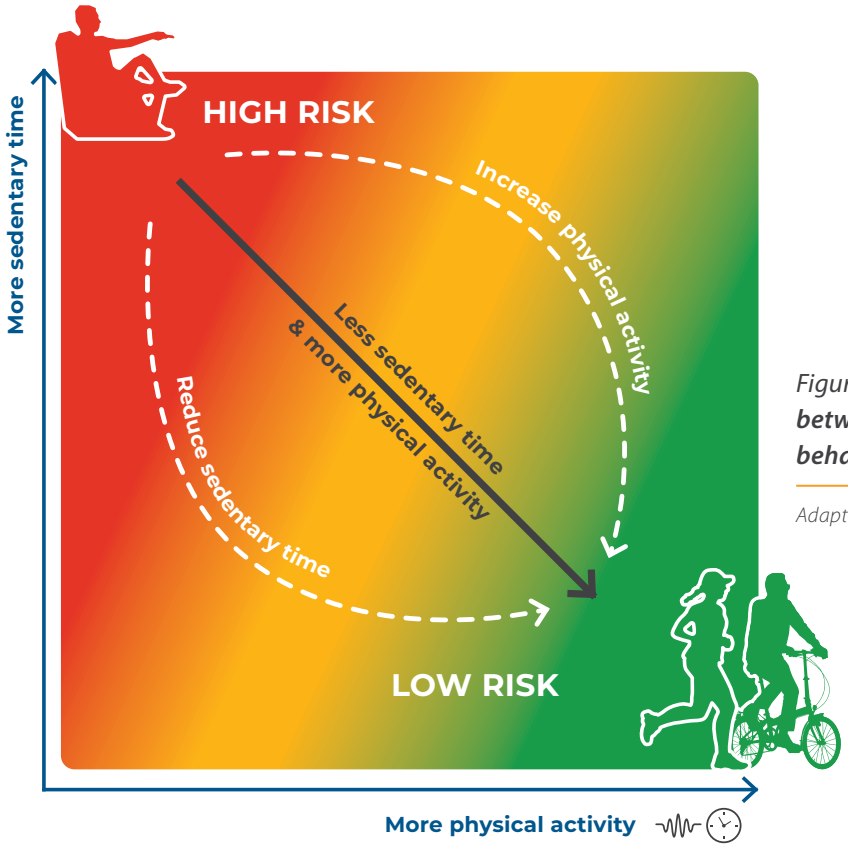

Figure 2: ***The relationship between levels of sedentary behaviour and physical activity***

Adapted from PAGAC

This relationship between levels of sedentary behaviour and moderate- to vigorous-intensity physical activity was summarized in the systematic review by PAGAC *(35)* as shown in **Figure 2**.

Another recent study provided new evidence investigating the same associations with cause-specific mortality and showed similar findings *(8)*. In a large harmonized meta-analysis (9 studies, *n*= 850 000, CVD mortality; 8 studies, *n*= 777 000, cancer mortality), results showed that higher levels of moderate- to vigorous-intensity physical activity mitigated the increased risk of **cardiovascular disease mortality** with high levels of sedentary behaviour, whether measured as time spent sitting or time spent viewing television *(8)*. The study showed that in individuals who were sitting for more than 8 hours per day, there was an association with higher risk of death, except in the most active quartile, where the association was mitigated. More specifically, the hazard of cardiovascular disease mortality was 32% higher in those who sat for more than 8 hours per day compared with the reference group (< 4 hours/day) (*p* for trend < 0.001). The results were less pronounced but remained significant compared with the reference group for the other quartiles of physical activity (2nd quartile, HR= 1.11 [95% CI: 1.03 to 1.20]; 3rd quartile, HR= 1.14 [95% CI: 1.03 to 1.26]). Similar associations were observed for television time and cardiovascular disease mortality across strata of moderate- to vigorous-intensity physical activity *(8)*. The associations for **cancer mortality** were more mixed, although generally showed that higher levels of physical activity attenuated the detrimental effects of sedentary behaviour when assessed as total sitting time.

Based on this evidence, it was agreed that higher levels of moderate- to vigorous-intensity physical activity should be recommended for those individuals who undertake high levels of sedentary behaviour and that the benefits would outweigh the risks.

The GDG concluded that:

- There is moderate certainty evidence that the relationship between sedentary behaviour and all-cause mortality, cardiovascular disease and cancer mortality varies by amount of moderate- to vigorous-intensity physical activity.
- Higher amounts of moderate- to vigorous-intensity physical activity can attenuate the detrimental association between sedentary behaviour and health outcomes.

OLDER ADULTS
(aged 65 years and older)

PHYSICAL ACTIVITY RECOMMENDATION

For older adults, physical activity can be undertaken as part of recreation and leisure (play, games, sports or planned exercise), transportation (wheeling, walking and cycling), work, or household chores, in the context of daily occupational, educational, home or community settings.

In older adults, physical activity confers benefits for the following health outcomes: improved all-cause mortality, cardiovascular disease mortality, incident hypertension, incident site-specific cancers, incident type-2 diabetes, mental health (reduced symptoms of anxiety and depression), cognitive health, and sleep; measures of adiposity may also improve. In older adults, physical activity helps prevent falls and falls-related injuries and declines in bone health and functional ability.

It is recommended that:

- **All older adults should undertake regular physical activity.**

  Strong recommendation, moderate certainty evidence

- **Older adults should do at least 150–300 minutes of moderate-intensity aerobic physical activity; or at least 75–150 minutes of vigorous-intensity aerobic physical activity; or an equivalent combination of moderate- and vigorous-intensity activity throughout the week, for substantial health benefits.**

  Strong recommendation, moderate certainty evidence

- **Older adults should also do muscle-strengthening activities at moderate or greater intensity that involve all major muscle groups on 2 or more days a week, as these provide additional health benefits.**

  Strong recommendation, moderate certainty evidence

- **As part of their weekly physical activity, older adults should do varied multicomponent physical activity that emphasizes functional balance and strength training at moderate or greater intensity, on 3 or more days a week, to enhance functional capacity and to prevent falls.**

  Strong recommendation, moderate certainty evidence

- **Older adults may increase moderate-intensity aerobic physical activity to more than 300 minutes; or do more than 150 minutes of vigorous-intensity aerobic physical activity; or an equivalent combination of moderate- and vigorous-intensity activity throughout the week, for additional health benefits.**

  Conditional recommendation, moderate certainty evidence

GOOD PRACTICE STATEMENTS

- Doing some physical activity is better than doing none.
- If older adults are not meeting the recommendations, doing some physical activity will bring benefits to health.
- Older adults should start by doing small amounts of physical activity, and gradually increase the frequency, intensity and duration over time.
- Older adults should be as physically active as their functional ability allows, and adjust their level of effort for physical activity relative to their level of fitness.

Supporting evidence and rationale

For these guidelines, for older adults, the comprehensive synthesis of evidence undertaken by PAGAC *(35)* was used and updated. Fifteen reviews met the inclusion criteria and informed the examination of the association between physical activity and health-related outcomes specific to older adults (falls prevention, fall-related injuries, physical function, frailty, and osteoporosis).

The evidence for falls prevention used and updated the 2019 Cochrane Collaboration Systematic Review by Sherrington et al. *(42)*, with evidence published from the end search date of their original review, to November 2019 (9 new studies). A search for existing systematic reviews on osteoporosis and sarcopenia was conducted in PubMed for reviews published from 2008 through to November 2019 and identified no new reviews and 8 new studies.

Full details of the methods, data extraction and evidence profiles can be found in the Web Annex: Evidence profiles.

In older adults (aged 65 years and over), what is the association between physical activity and health-related outcomes?

The primary evidence base for assessing the associations between physical activity and health outcomes, such as all-cause and cause-specific mortality, cardiovascular disease, type-2 diabetes, cancer incidence, adiposity, mental health, and cognitive outcomes in older adult populations was the same scientific literature collated and reviewed for adult populations. This same body of evidence was accepted and extrapolated to older adults because the majority of studies stated no upper age limit criterion and therefore included adults over the age of 65 years.

A further review of evidence was conducted to examine and inform on the association between physical activity and health-related outcomes specific to older adults, including falls prevention, fall-related injuries, physical function, frailty and osteoporosis.

Declining physical capacity in older people often manifests in falls and fall-related injuries that can have serious consequences. Accidental falls are due to a combination of extrinsic (environmental) and intrinsic (e.g. musculoskeletal or nervous system abnormalities affecting postural control) factors. Evidence demonstrates that physical activity – in particular multicomponent physical activity programmes that include combinations of balance, strength, endurance, gait, and physical function training – is associated with a reduced rate of **falls** and risk of **injury from falls** in older adults. Recent evidence demonstrates that exercise may reduce the rate of falls by as much as 23% (pooled rate ratio (RaR) 0.77 [95% CI: 0.71 to 0.83]) in older adults, which can significantly reduce the risk of injury from falls, including severe falls that result in bone fracture, head trauma, open wound, soft tissue injury, or any other injury requiring medical care or admission to hospital *(42)*. This evidence was consistent with, and reaffirmed findings in, other reviews *(35)*.

After reaching a peak in early adulthood, muscle and bone mass tends to decline with increasing age (i.e. sarcopaenia and osteopaenia/osteoporosis), and this can be associated with declining strength and physical function. Evidence demonstrates that regular physical activity improves **physical function** and reduces the risk of age-related loss of physical function in older adults. Findings show beneficial effects on dynamic balance (SMD= 1.10 [95% CI: 0.29 to 1.90]); muscle strength (SMD= 1.13 [95% CI: 0.30 to 1.96]); flexibility (SMD= 1.22 [95% CI: 0.39 to 2.04]); and cardiorespiratory fitness (SMD= 1.48 [95% CI: 0.42 to 2.54]) *(94)*. Evidence also shows that higher levels of physical activity may improve bone health and thus prevent **osteoporosis** in older adults (pooled standardized effect size 0.21 [95% CI: 0.06 to 0.36]) *(95)*. Physical activity interventions may improve lumbar spine and femoral neck (hip) bone mineral density.

The GDG concluded that:

- There is moderate certainty evidence that physical activity improves physical function and reduces risk of age-related loss of physical function in the general ageing population.
- There is low-certainty evidence that the risks for the amounts and types of physical activity recommended for older adults are low and are outweighed by the benefits.

Available online at https://apps.who.int/iris/bitstream/handle/10665/336657/9789240015111-eng.pdf

Is there a dose-response association (volume, duration, frequency, intensity)?

Evidence shows an inverse relationship between the amount of physical activity performed by older adults and the risk of physical function limitations. In general, more physical activity (frequency, duration and/or volume) is associated with greater benefits *(35)*. Evidence suggests that fast-intended velocity resistance training may be superior to moderate-velocity resistance training for improvements in general functional capacity (SMD= 0.41 [95% CI: 0.18 to 0.65]; and SPPB (SMD= 0.52 [95% CI: 0.10 to 0.94])) *(96)*.

There is limited evidence examining the dose-response relationship between physical activity and prevention of falls; however the majority of studies providing supportive evidence show testing a programme consistent with 3 days per week.

The GDG concluded that:

- There is high certainty evidence of an inverse dose-response relationship between volume of aerobic physical activity and risk of physical functional limitations in the general older adult population.

Does the association vary by type or domain of physical activity?

Physical activity programmes that include combinations of balance, strength, endurance, gait, and physical function training are associated with a reduced rate of falls and risk of injury from falls in older adults.

Evidence from a review of 11 RCT showed that by engaging in a variety of different physical activity interventions (commonly balance and functional exercises plus resistance exercises), older adults can reduce rate of falls by up to 28% (RaR= 0.72 [95% CI: 0.56 to 0.93]) *(42)*. The effect of resistance exercises was uncertain and based on limited data (RR= 0.97 [95% CI: 0.14 to 6.49]; 1 trial; *n*= 73) *(42)*.

Evidence also suggests that programmes which include multiple exercise types have greater positive effects on bone health (standardized effect size 0.45 [95% CI: 0.20 to 0.71]; *p*= 0.001), compared with those which do not *(95)*.

The GDG concluded that:

- There is high certainty evidence that higher levels of physical activity that combines balance, strength, gait, and functional training (e.g. multicomponent physical activity) are associated with a reduced rate of falls and risk of injury from falls in older adults.
- There is moderate certainty evidence that programmes involving multiple exercise types may have significant effects on bone health and osteoporosis prevention.

SEDENTARY BEHAVIOUR RECOMMENDATION

For older adults, sedentary behaviour is defined as time spent sitting or lying with low energy expenditure, while awake, in the context of occupational, educational, home and community settings and transportation.

In older adults, higher amounts of sedentary behaviour are associated with the following poor health outcomes: all-cause mortality, cardiovascular disease mortality and cancer mortality, and incidence of cardiovascular disease, cancer and incidence of type-2 diabetes.

It is recommended that:

- **Older adults should limit the amount of time spent being sedentary. Replacing sedentary time with physical activity of any intensity (including light intensity) provides health benefits.**

  Strong recommendation, moderate certainty evidence

- **To help reduce the detrimental effects of high levels of sedentary behaviour on health, older adults should aim to do more than the recommended levels of moderate- to vigorous-intensity physical activity.**

  Strong recommendation, moderate certainty evidence

Supporting evidence and rationale

Sedentary behaviour was not included in the 2010 *Global recommendations on physical activity for health (1)*. Due to a lack of population-specific evidence, the primary evidence base for assessing the associations between sedentary behaviour and health outcomes in older adult populations was the same scientific literature collated and reviewed for adult populations because the majority of studies stated no upper age limit criterion and therefore included adults over the age of 65 years. The findings from evidence on sedentary behaviours in the general adult population were reviewed, including assessing if there was evidence that the outcomes would be any different, or would not apply to, or would be contraindicated, for older adults.

Full details of the methods, data extraction and evidence profiles can be found in the Web Annex: Evidence profiles.

Available online at https://apps.who.int/iris/bitstream/handle/10665/336657/9789240015111-eng.pdf

PREGNANT AND POSTPARTUM WOMEN

These guidelines address physical activity and maternal and fetal health outcomes during pregnancy and the postpartum period. They are for all pregnant and postpartum women, irrespective of age, cultural background, or socioeconomic status. Pregnancy and the period after delivery are stages in a woman's life, and the benefits of being physically active throughout adulthood are detailed in the recommendations provided for adults.

Pregnant and postpartum women should be under the care of a health-care provider for antenatal and postnatal care who can advise on special considerations given their medical history and any contraindications to participating in physical activity during pregnancy or in the postpartum period. These guidelines are public health and population-based. Clinical guidance should be sought for women with complications associated with pregnancy or delivery.

Pregnant and postpartum women should try to meet these recommendations where possible, as able, and without contraindication.

PHYSICAL ACTIVITY RECOMMENDATION

For pregnant and postpartum women, physical activity can be undertaken as part of recreation and leisure (play, games, sports or planned exercise), transportation (wheeling, walking and cycling), work, household chores, in the context of daily occupational, educational, home and community settings.

> In pregnant and postpartum women, physical activity during pregnancy and postpartum confers benefits on the following maternal and fetal health benefits: decreased risk of pre-eclampsia, gestational hypertension, gestational diabetes, excessive gestational weight gain, delivery complications and postpartum depression, and fewer newborn complications, no adverse effects on birthweight; and no increase in risk of stillbirth.

It is recommended that all pregnant and postpartum women without contraindication should:

- **undertake regular physical activity throughout pregnancy and postpartum;**

  Strong recommendation, moderate certainty evidence

- **do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week for substantial health benefits; and**

  Strong recommendation, moderate certainty evidence

- **incorporate a variety of aerobic and muscle-strengthening activities. Adding gentle stretching may also be beneficial.**

  Strong recommendation, moderate certainty evidence

In addition:

- **Women who, before pregnancy, habitually engaged in vigorous-intensity aerobic activity, or who were physically active, can continue these activities during pregnancy and the postpartum period.**

  Strong recommendation, moderate certainty evidence

GOOD PRACTICE STATEMENTS

- Doing some physical activity is better than doing none.
- If pregnant and postpartum women are not meeting the recommendations, doing some physical activity will benefit their health.
- Pregnant and postpartum women should start by doing small amounts of physical activity, and gradually increase frequency, intensity and duration over time.
- Pelvic floor muscle training may be performed on a daily basis to reduce the risk of urinary incontinence.

Additional safety considerations for pregnant women when undertaking physical activity are:

- Avoid physical activity during excessive heat, especially with high humidity;
- Stay hydrated by drinking water before, during, and after physical activity;
- Avoid participating in activities which involve physical contact; pose a high risk of falling; or might limit oxygenation (such as activities at high altitude, when not normally living at high altitude);
- Avoid activities in supine position after the first trimester of pregnancy;
- When considering athletic competition, or exercising significantly above the recommended guidelines pregnant women should seek supervision from a specialist health-care provider;
- Pregnant women should be informed by their health-care provider of the danger signs alerting them as to when to stop; or to limit physical activity and consult a qualified health-care provider immediately should they occur;
- Return to physical activity gradually after delivery, and in consultation with a health-care provider, in the case of delivery by Caesarean section.

Supporting evidence and rationale

For these *Guidelines on physical activity and sedentary behaviour* (2020) for pregnant and postpartum women, the evidence syntheses from 7 systematic reviews addressing the critical and important outcomes *(28–34)* were used and updated. Four of the 7 reviews met inclusion criteria.

Full details of the methods, data extraction and evidence profiles can be found in the Web Annex: Evidence profiles.

In pregnant and postpartum women, what is the association between physical activity and health-related outcomes?

Physical activity before and during pregnancy can help reduce the risk of common complications of pregnancy. Engaging in physical activity during pregnancy is significantly associated with reduced **gestational weight gain** (MD= 1.14 kg [95% CI: 1.67 to 0.62]) *(97)*, and a reduced risk of **gestational diabetes** (RR= 0.71 [95% CI: 0.57 to 0.89]) *(97)*, as is being physically active before pregnancy (OR= 0.70 [95% CI: 0.57 to 0.85]) *(31, 34, 97)*, including in women with overweight or obesity *(97)*.

Physical activity during pregnancy does not appear to increase the incidence of **gestational hypertension or preeclampsia** *(31)*. Evidence suggests that among pregnant women with overweight or obesity, there is no significant difference in the incidence of gestational hypertension (RR= 0.63 [95% CI: 0.38 to 1.05]) or in preeclampsia (RR= 1.39 [95% CI: 0.66 to 2.93]) between physical activity intervention groups versus standard antenatal care *(97)*.

There have been long-standing concerns about potential adverse effects of maternal physical activity on the developing fetus and delivery. However, recent evidence demonstrates that physical activity is not associated with increased risk of the incidence of **miscarriage, stillbirth or delivery complications** *(32)*. Evidence suggests no difference in the incidence of Caesarean delivery among pregnant women with overweight or obesity between physical activity intervention groups versus standard antenatal care *(97)*.

Physical activity during pregnancy is not associated with increased risk of adverse effects on **birthweight** *(98)* or preterm birth *(32)*, and may even be protective, reducing the overall risk *(98)*, even among pregnant women with overweight or obesity (RR= 1.02 [95% CI: 0.54 to 1.92]) or

Available online at https://apps.who.int/iris/bitstream/handle/10665/336657/9789240015111-eng.pdf

large-for-gestational-age babies (RR= 0.90 [95% CI: 0.65 to 1.25]) between physical activity intervention groups versus standard antenatal care) *(97)*.

In the postpartum period, mothers can experience many physical and emotional changes. Evidence demonstrates that physical activity during pregnancy may be inversely associated with **postpartum depression** *(29)*. Evidence from a meta-analysis of 6 trials and 11 observational studies of physical activity during pregnancy *(99)* showed a significant inverse relationship between physical activity during pregnancy and postpartum depression (SMD= 0.58 [95% CI: 1.09 to 0.08]). The effect was stronger when limited to 5 studies with at least moderate-intensity interventions (SMD= 0.70 [95% CI: 1.19 to 0.22]) *(99)*.

The GDG concluded that:

- There is high certainty evidence that physical activity during pregnancy may reduce gestational weight gain and risk of gestational diabetes mellitus.
- There is moderate to high certainty evidence that physical activity does not increase the incidence of gestational hypertension.
- There is moderate certainty evidence that physical activity does not increase the incidence of miscarriage, stillbirth or delivery complications; and moderate certainty evidence of a reduced risk of preterm birth for mothers engaged in vigorous-intensity physical activity.
- There is low to moderate certainty evidence that physical activity does not increase the risk of low birth weight, or small-for-gestational-age, or large-for-gestational-age babies.
- There is low certainty evidence that physical activity during pregnancy is associated with lower levels of postpartum depression.
- The risks for the amounts and types of physical activity recommended for pregnant and postpartum women are low and are outweighed by the benefits.

Is there a dose-response association (volume, duration, frequency, intensity)?

Across the evidence on physical activity during pregnancy and the postpartum period, the interventions varied in the amount (i.e. dose) of physical activity, both in duration in minutes and frequency per week. In general, the evidence available reflected a frequency of aerobic physical activity of at least 3 times per week, typically for between 30 and 60 minutes. This evidence is taken from studies assessing the health impact of a dose broadly consistent with the amount of activity recommended for the general adult population – namely 150 minutes of moderate-intensity physical activity per week.

While more physical activity (frequency, duration and/or volume) is generally found to be associated with greater benefits, further research is needed to understand in more detail the dose-response relationship. Participating in higher versus lower amounts of leisure time physical activity pre-pregnancy is associated with a significantly lower risk of gestational diabetes (OR= 0.54 [95% CI: 0.34 to 0.87]) *(100)*. There is also evidence of a small, but significant, reduced risk of preterm birth in babies of mothers who engaged in vigorous-intensity physical activity (RR= 0.20 [95% CI: 0.36 to 0.03]) *(98)*. No evidence was identified regarding the safety or additional benefit of exercising at levels significantly above the recommendations.

The GDG concluded that:

- There is insufficient evidence to determine a dose-response association between physical activity and specific critical health outcomes during pregnancy and the postpartum period.
- The overall evidence shows benefits to critical health outcomes and is based on interventions that are broadly consistent with the amount of physical activity recommended for the general adult population, namely 150 minutes of moderate-intensity physical activity per week.
- There was no reason to alter the amount or frequency of recommended moderate-intensity physical activity for pregnant and postpartum women compared with the general adult population.
- There is moderate certainty evidence of a reduced risk of preterm birth for mothers engaged in vigorous-intensity physical activity.