Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1·9 million participants

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Summary

Background Insufficient physical activity is a leading risk factor for non-communicable diseases, and has a negative effect on mental health and quality of life. We describe levels of insufficient physical activity across countries, and estimate global and regional trends.

Methods We pooled data from population-based surveys reporting the prevalence of insufficient physical activity, which included physical activity at work, at home, for transport, and during leisure time (ie, not doing at least 150 min of moderate-intensity, or 75 min of vigorous-intensity physical activity per week, or any equivalent combination of the two). We used regression models to adjust survey data to a standard definition and age groups. We estimated time trends using multilevel mixed-effects modelling.

Findings We included data from 358 surveys across 168 countries, including 1·9 million participants. Global age-standardised prevalence of insufficient physical activity was 27·5% (95% uncertainty interval 25·0–32·2) in 2016, with a difference between sexes of more than 8 percentage points (23·4%, 21·1–30·7, in men *vs* 31·7%, 28·6–39·0, in women). Between 2001, and 2016, levels of insufficient activity were stable (28·5%, 23·9–33·9, in 2001; change not significant). The highest levels in 2016, were in women in Latin America and the Caribbean (43·7%, 42·9–46·5), south Asia (43·0%, 29·6–74·9), and high-income Western countries (42·3%, 39·1–45·4), whereas the lowest levels were in men from Oceania (12·3%, 11·2–17·7), east and southeast Asia (17·6%, 15·7–23·9), and sub-Saharan Africa (17·9%, 15·1–20·5). Prevalence in 2016 was more than twice as high in high-income countries (36·8%, 35·0–38·0) as in low-income countries (16·2%, 14·2–17·9), and insufficient activity has increased in high-income countries over time (31·6%, 27·1–37·2, in 2001).

Interpretation If current trends continue, the 2025 global physical activity target (a 10% relative reduction in insufficient physical activity) will not be met. Policies to increase population levels of physical activity need to be prioritised and scaled up urgently.

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Introduction

The health benefits of physical activity are well established and include a lower risk of cardiovascular disease, hypertension, diabetes, and breast and colon cancer. Additionally, physical activity has positive effects on mental health, delays the onset of dementia, and can help the maintenance of a healthy weight.[1–5]

In recognition of this strong link between physical activity and major non-communicable diseases, member states of WHO agreed to a 10% relative reduction in the prevalence of insufficient physical activity by 2025, as one of the nine global targets to improve the prevention and treatment of non-communicable diseases.[6] Monitoring current levels and trends of insufficient physical activity is essential to track progress towards this global physical activity target, but also to identify high-risk populations, to assess the effectiveness of policy, and guide future policy and programme planning.

The first compilation of country data to produce global and regional estimates of insufficient physical activity was undertaken in the early 2000s, as part of the Global Burden of Disease study.[7] Bull and colleagues[7] included data for physical activity from 34 mainly high-income countries, mostly focusing on leisure time physical activity. Activity performed in other domains (activity at work, in the household, and for transport) had to be estimated for most countries, in order to get comprehensive and comparable results. Subsequently, two questionnaires including all activity domains were developed: the International Physical Activity Questionnaire[8] and the Global Physical Activity Questionnaire.[9,10] Both questionnaires have since been used in many

Research in context

Evidence before this study

WHO produced the first set of internationally comparable estimates on insufficient physical activity in 2008 for 122 countries. These estimates were updated for 2010, and published in the 2016 *Lancet* Series on Physical activity for 146 countries, showing a global prevalence of insufficient physical activity of 23·3%, with higher levels among women and older age groups. However, no compilation of global data on adult physical inactivity has been undertaken since, and no regional and global trends have previously been developed because data for trends have been considered too scarce.

Added value of this study

This study provides the most complete description of global, regional, and country levels of insufficient physical activity and, for the first time, presents regional and global trends over time. Global age-standardised prevalence of insufficient physical activity was 27·5% (95% uncertainty interval 25·0–32·2) in 2016. The prevalence has been stable since 2001.

Implications of all the available evidence

Progress towards achieving the global target of a 10% relative reduction of insufficient physical activity by 2025, has been too slow. Accelerated action is needed to reverse trends in central and eastern Europe, high-income Western countries, Latin American and the Caribbean, and south Asia. Policies and programmes are also needed to achieve or maintain low levels of inactivity in other regions and in lower-income countries. Implementation of targeted evidence-based interventions presented in the Global Physical Activity Action Plan 2018–2030 will improve population health and help deliver many of the 2030 Sustainable Development Goals.

surveys, including several large, international surveys such as the World Health Survey,[11] the Eurobarometer surveys,[12] and the WHO Stepwise Approach to NCD Risk Factor Surveillance.[13,14] Mainly based on data from these questionnaires, WHO produced comparable estimates of insufficient physical activity in 122 countries in 2008, and updated them for 2010 for 146 countries. Both sets of estimates were published in *The Lancet* Physical Activity Series[4,15] and used to calculate the effect of insufficient physical activity on non-communicable diseases.[16]

However, in *The Lancet* Physical Activity 2016 Series, Sallis and colleagues[4] noted that consistent data for trends in adult physical activity are still scarce. As a consequence, no article has reported regional and global trends of insufficient physical activity. We updated previously published[4,15,17] country, regional, and global estimates of adult prevalence of insufficient physical activity with new data and new methods, and estimated, for the first time, global and regional trends from 2001 to 2016.

Methods

Study design

We estimated the prevalence of insufficient physical activity in adults aged 18 years and older, in 168 countries, for three World Bank income groups,[18] nine regions (appendix p 1),[19,20] and globally for 2001–16. Insufficient physical activity was defined as adults not meeting the WHO recommendations[3] on physical activity for health—ie, at least 150 min of moderate-intensity, or 75 min of vigorous-intensity physical activity per week, or any equivalent combination of the two.

See Online for appendix

Data sources

We included data that fulfilled the following criteria: (1) the survey questionnaire explicitly included physical activity across four key domains—ie, for work, in the household (paid or unpaid), for transport to get to and from places (ie, walking and cycling), and during leisure time (ie, sports and active recreation); (2) data were collected through random sampling with a sample size of at least 200, and were representative of a national or defined subnational population; (3) prevalence of insufficient physical activity was reported by age and sex, according to current WHO,[3] or former physical activity recommendations.[21] These former guidelines recommended for adults to spread out their activity during the week in doing at least 30 min of moderate activity on at least 5 days, or equivalent. They were in place until an update of evidence in 2008,[1] when this requirement was removed.

Physical activity data collected using wearable devices, such as accelerometers or pedometers, were not included because of the limited comparability with self-reported data. Where available, we used individual-level data to calculate the prevalence of insufficient physical activity, taking the sampling designs into account. Where raw data were not available, we used aggregated data as reported. We included all data that met the inclusion criteria and that were provided before the end of September, 2017.

We obtained data from WHO and other international surveys.[11–14] We also did a systematic literature search of PubMed, up to October, 2015, for articles published in English, Portuguese, German, Spanish, Chinese, and Italian, including the International Physical Activity Questionnaire and the Global Physical Activity Questionnaire as search terms. To identify additional data sources, we also analysed and verified results of the 2017 WHO NCD Country Capacity Survey,[22] in which each WHO member state answered a question on the inclusion of physical activity in national risk factor surveys. We also had personal communications with WHO regional focal points, personal networks, and directly with researchers, including inquiries about additional data from authors of published studies. Finally, we had a 6-week consultation with all WHO

member states in which countries commented on the first draft of estimates and submitted any additional data. After the consultation, the estimates were updated during October, 2017, with new data that were submitted. In total, 358 surveys from 168 countries were included in the analysis (appendix pp 2–15).

Statistical analysis

Survey data were sometimes not comparable because of differences in study design. We applied four key adjustments to survey data using linear regression modelling to improve comparability (appendix pp 17–27). First, we converted definitions. For surveys in which data were reported only for the former recommendation on physical activity for health,[21] and not for the current recommendation,[3] we converted data to the current recommendation, our target indicator.

Second, we adjusted for over-reporting in the International Physical Activity Questionnaire. This questionnaire over-reports physical activity, leading to an underestimation of the prevalence of insufficient activity.[23–26] To correct for this over-reporting, we applied an adjustment factor to surveys that used the International Physical Activity Questionnaire. This adjustment factor was determined by exploring differences in prevalence between the International Physical Activity Questionnaire and other, similar survey questionnaires, such as the Global Physical Activity Questionnaire, in countries that have used both.

Third, we adjusted data from surveys that had only urban samples. Of the 358 surveys used, 27 reported data for urban populations only. For these surveys, we estimated the prevalence in rural areas using information from surveys reporting both urban and rural prevalence.

	All countries (n=231)	Region									Income group		
		Central Asia, Middle East, north Africa (n=28)	Central and eastern Europe (n=20)	East and southeast Asia (n=16)	High-income Asia Pacific (n=3)	High-income Western countries (n=36)	Latin American and Caribbean (n=47)	Oceania (n=22)	South Asia (n=6)	Sub-Saharan Africa (n=53)	Low-income (n=31)	Middle-income (n=109)	High-income (n=75)
Countries with data (%)	168 (72·7%)	23 (82·1%)	17 (85·0%)	13 (81·3%)	3 (100·0%)	24 (66·7%)	25 (53·2%)	17 (77·3%)	5 (83·3%)	41 (77·4%)	24 (77·4%)	89 (81·7%)	54 (72·0%)
Percentage of population covered with data	95·8%	90·4%	98·3%	97·3%	100·0%	99·0%	87·6%	94·3%	98·5%	89·6%	81·9%	96·9%	96·3%
Number with trend data* (%)	65 (28·1%)	8 (28·6%)	11 (55·0%)	7 (43·8%)	2 (66·7%)	20 (55·6%)	5 (10·6%)	7 (31·8%)	1 (16·7%)	4 (7·5%)	1 (3·2%)	27 (24·8%)	36 (48·0%)

*Defined as having used the same instrument and coverage at more than one point in time.

Table 1: **Distribution of data across income groups and regions**

	Overall percentage of insufficient physical activity (95% UI)	Percentage of men with insufficient physical activity (95% UI)	Percentage of women with insufficient physical activity (95% UI)	Country with the minimum prevalence		Country with the maximum prevalence	
				Country	Prevalence (95% CI)	Country	Prevalence (95% CI)
All countries	27·5% (25·0–32·2)	23·4% (21·1–30·7)	31·7% (28·6–39·0)	Uganda	5·5% (4·0–7·6)	Kuwait	67·0% (58·6–74·3)
Central Asia, Middle East, and north Africa	32·8% (31·0–35·2)	25·9% (23·7–28·7)	39·9% (37·9–42·7)	Jordan	11·9% (8·4–16·4)	Kuwait	67·0% (58·6–74·3)
Central and eastern Europe	23·4% (20·9–28·0)	22·0% (18·6–28·8)	24·7% (21·7–33·9)	Moldova	11·5% (8·1–16·0)	Serbia	39·5% (30·8–48·8)
East and southeast Asia	17·3% (15·8–22·1)	17·6% (15·7–23·9)	16·9% (14·9–25·7)	Cambodia	10·5% (6·9–15·7)	Philippines	39·7% (31·3–48·6)
High-income Asia Pacific	35·7% (34·4–37·0)	33·0% (29·4–33·6)	38·3% (37·4–42·6)	South Korea	35·4% (20·9–52·9)	Singapore	36·5% (21·7–54·3)
High-income Western countries	36·8% (34·6–38·4)	31·2% (28·5–32·6)	42·3% (39·1–45·4)	Finland	16·6% (12·9–21·0)	Cyprus	44·4% (36·8–52·1)
Latin America and Caribbean	39·1% (37·8–40·6)	34·3% (32·5–35·5)	43·7% (42·9–46·5)	Dominica	21·6% (16·3–28·0)	Brazil	47·0% (38·9–55·3)
Oceania	16·3% (14·3–20·7)	12·3% (11·2–17·7)	20·3% (18·8–28·7)	Niue	6·9% (4·8–9·9)	American Samoa	53·4% (41·4–65·0)
South Asia	33·0% (23·0–51·7)	23·5% (14·4–54·3)	43·0% (29·6–74·9)	Nepal	13·4% (11·2–15·6)	India	34·0% (22·3–47·7)
Sub-Saharan Africa	21·4% (19·1–23·3)	17·9% (15·1–20·5)	24·8% (21·8–27·2)	Uganda	5·5% (4·0–7·6)	Mauritania	41·3% (33·4–49·2)
Low-income	16·2% (14·2–17·9)	13·4% (11·3–15·6)	18·8% (15·9–21·4)	Uganda	5·5% (4·0–7·6)	Mali	40·4% (33·6–47·3)
Middle-income	26·0% (22·6–31·8)	21·9% (18·9–31·3)	30·1% (26·0–39·5)	Lesotho	6·3% (4·5–8·6)	American Samoa	53·4% (41·4–65·0)
High-income	36·8% (35·0–38·0)	32·0% (29·8–33·1)	41·6% (39·1–43·9)	Finland	16·6% (12·9–21·0)	Kuwait	67·0% (58·6–74·3)

Table 2: **Prevalence of insufficient physical activity in 2016**

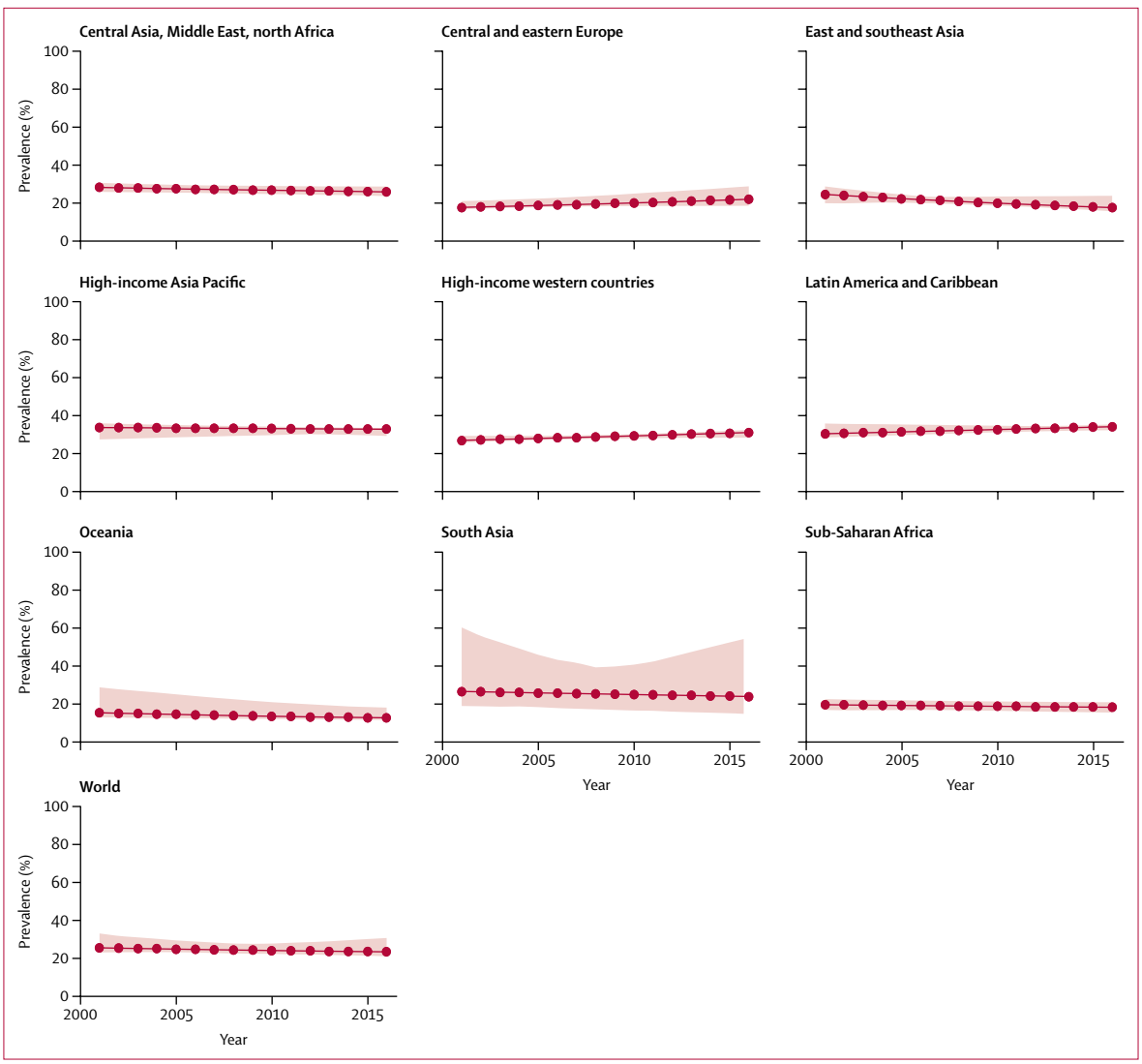

Figure 1: **Trends in insufficient physical activity in men from 2001 to 2016**
The shaded areas show 95% uncertainty intervals.

We calculated a national estimate combining the two by applying estimates of population by area of residence for the respective survey year.[27]

Fourth, for surveys that did not report data for all ages older than 18 years, we estimated the data for the missing age groups using information from surveys that reported age-specific values for the entire age range.

The methods used to generate final estimates of insufficient physical activity prevalence by country, year, sex, and age differed depending on the availability of data on trends over time.

Of the 168 countries included, 65 had done at least two comparable surveys from different years using the same questionnaire (appendix p 16). For these countries, we estimated the prevalence of insufficient physical activity for each year from 2001, to 2016, using a multilevel mixed-effects linear regression model. To allow estimates to be informed by data from the same country, from other countries in the region, and other variables, this model included a random slope on year, a random intercept for each country, and fixed effects for country urbanisation, education, and location within nine previously defined regions that have been used in similar analysis for other non-communicable disease risk factors.[19,20] For 76 countries, only one survey was available. We assumed no change over time in these countries, based on the fact that the average change in prevalence per year across the 65 countries with at least two comparable surveys was less than 0·01%.

27 countries had done several surveys with different survey coverage, or with different questionnaires, limiting comparability of these survey data. Although we adjusted for over-reporting in the International Physical Activity Questionnaire, we considered the comparison of

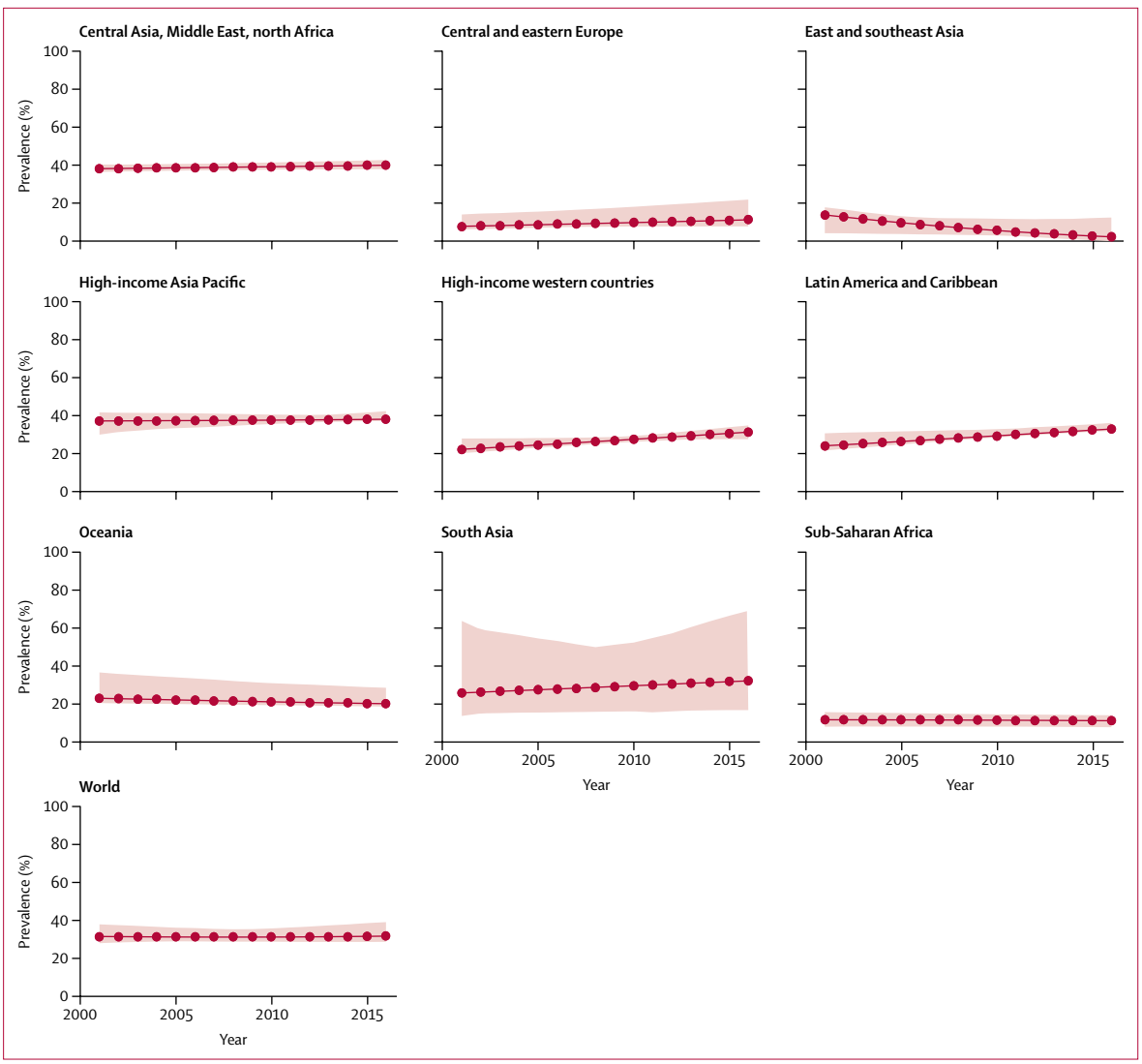

Figure 2: **Trends in insufficient physical activity in women from 2001 to 2016**
The shaded areas show 95% uncertainty intervals.

adjusted data from the International Physical Activity Questionnaire to data from other questionnaires to be insufficient to inform country trends. Therefore, for these 27 countries, we also assumed a flat trend, whereby the trend line was based on the average prevalences across surveys for each country.

To derive final estimates for the entire age range, we age-standardised resulting sex-specific and age-specific prevalence estimates using the WHO Standard Population.[28] To produce global and regional estimates, and estimates for World Bank income groups,[18] we created population-weighted sex-specific and age-specific estimates for each subgroup and year,[29] and then age-standardised these estimates.[28] Using the bootstrap method, we drew 1000 samples, each containing 80% of all survey data, to produce uncertainty intervals [UI] for these estimates, representing the 2·5th and 97·5th percentile of the 1000 draws. We calculated trends as the difference in prevalence between 2001, and 2016, and considered a change in prevalence over time to be statistically significant if fewer than 2·5% of draws showed changing trend (appendix pp 17–27).[30]

Role of the funding source

There was no funding source for this study. The corresponding author had full access to all the data and had final responsibility for the decision to submit for publication.

Results

Our analysis included 358 population-based surveys done between 2001 and 2016, with 1·9 million participants from 168 countries (appendix p 1), representing 96% of

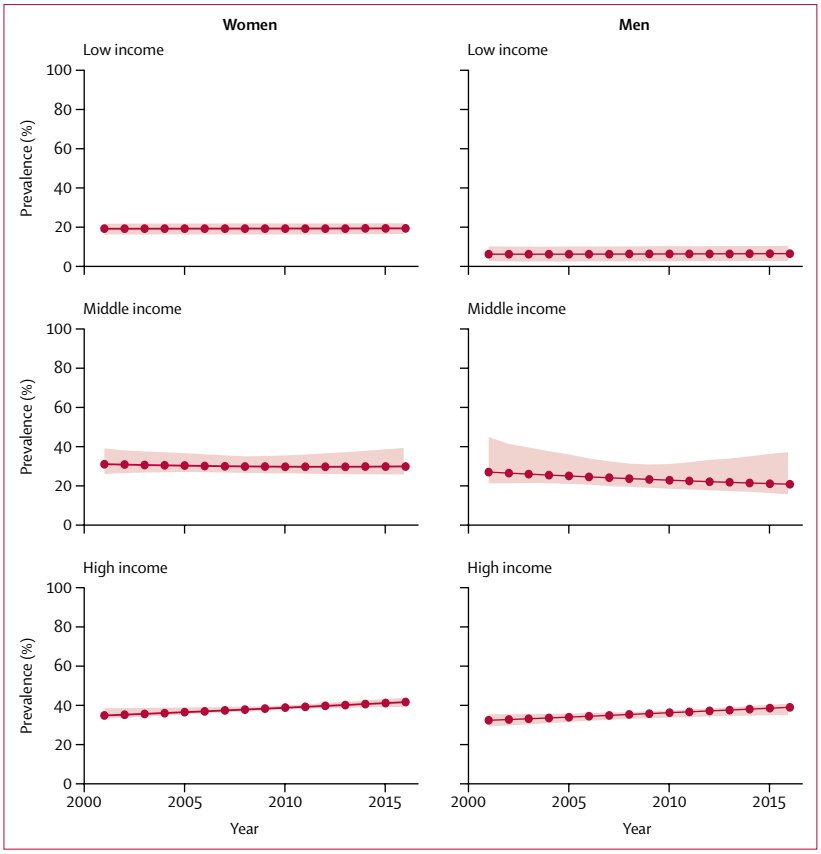

Figure 3: **Trends in insufficient physical activity for three income groups from 2001 to 2016**
The shaded areas show 95% uncertainty intervals.

the world's population. The availability of data across income groups and regions was spread fairly evenly, with the exception of Latin American and Caribbean countries where just more than half of countries had data (table 1). Of the 358 surveys included, 301 were nationally representative, and 150 of 168 countries had at least one national survey (appendix pp 2–15).

65 of 168 countries had at least two surveys using the same questionnaire and survey coverage (table 1, appendix p 16). Availability of data meeting these two criteria was skewed towards higher-income countries, with only 3·2% of low-income countries and 48·0% of high-income countries having trend data (table 1).

Globally, more than a quarter of adults (27·5%, 95% UI 25·0–32·2) were insufficiently physically active in 2016 (table 2). Between 2001 and 2016, levels of insufficient physical activity have decreased only marginally and insignificantly, with a global prevalence of 28·5% (23·9–33·9) in 2001. Women were less active than men, with a prevalence difference of 6 percentage points between sexes in 2001 (25·5%, 95% UI 23·1–33·0 for men, and 31·5%, 95% UI 27·9–37·8 for women), and of more than 8 percentage points in 2016 (23·4%, 21·1–30·7, for men, and 31·7%, 28·6–39·0, for women; figures 1 and 2).

Prevalence of insufficient physical activity ranged from 16·3% (95% UI 14·3–20·7) in Oceania to 39·1% (37·8–40·6) in Latin America and the Caribbean in 2016 (table 2). Between 2001 and 2016, the prevalence of physical inactivity increased by more than 5 percentage points in high-income Western countries (from 30·9%, 26·4–38·1 in 2001, to 36·8%, 34·6–38·4, in 2016) and in Latin America and Caribbean (from 33·4%, 29·1–38·6, in 2001, to 39·1%, 37·8–40·6, in 2016), whereas east and southeast Asia had a decrease of more than 5 percentage points (from 25·7%, 20·6–29·4, in 2001, to 17·3%, 15·8–22·1, in 2016).

Across all regions, with the exception of east and southeast Asia, women were less active than men in 2016 (table 2). There was a difference between sexes of more than 10 percentage points in central Asia, Middle East and north Africa; high-income Western countries; and south Asia (table 2). The highest levels of insufficient activity (>40%) among women in 2016 were in Latin America and the Caribbean, south Asia, and high-income Western countries (table 2). The lowest levels of physical activity in men (<20%) in 2016 were in Oceania, east and southeast Asia, and sub-Saharan Africa (table 2).

The prevalence of insufficient physical activity in high-income countries was more than double the prevalence in low-income countries in 2016 (table 2). The prevalence increased over time in high-income countries, from 31·6% (27·1–37·2) in 2001, to 36·8% (35·0–38·0) in 2016, whereas it was stable in low-income countries, at 16·0% (12·0–19·6) in 2001, and 16·2% (14·2–17·9) in 2016 (table 2, figure 3).

Country-specific, age-standardised prevalence of insufficient physical activity in 2016 ranged from 5·5% (4·0–7·6) in Uganda to 67·0% (58·6–74·3) in Kuwait (appendix pp 28–31). In four countries, the prevalence of insufficient physical activity was more than 50% (Kuwait, American Samoa, Saudi Arabia, and Iraq), whereas the prevalence was lower than 10% in seven countries (Uganda, Mozambique, Lesotho, Tanzania, Niue, Vanuatu, and Togo). In 55 (32·7%) of 168 countries, more than a third of the population was insufficiently physically active.

In 159 of 168 countries, prevalence of insufficient physical activity was lower in men than in women, with a difference of at least 10 percentage points in 65 countries, and a difference of more than 20 percentage points in nine countries: Barbados, Bahamas, Saint Lucia, Palau, Iraq, Bangladesh, Trinidad and Tobago, Iran, and Saudi Arabia. Figures 4 and 5 show country prevalence for men and women.

Of the 65 countries with data for trends over time, 28 had decreasing levels of insufficient activity, whereas levels were increasing in 37 countries. The largest decreases (>15%) have occurred in Cook Islands, Jordan, Tokelau, Samoa, Myanmar, Solomon Islands, and Tonga, while the largest increases (>15%) occurred in Brazil, Bulgaria, Germany, Philippines, and Singapore. The average change across all of 65 countries was less than 0·01%.

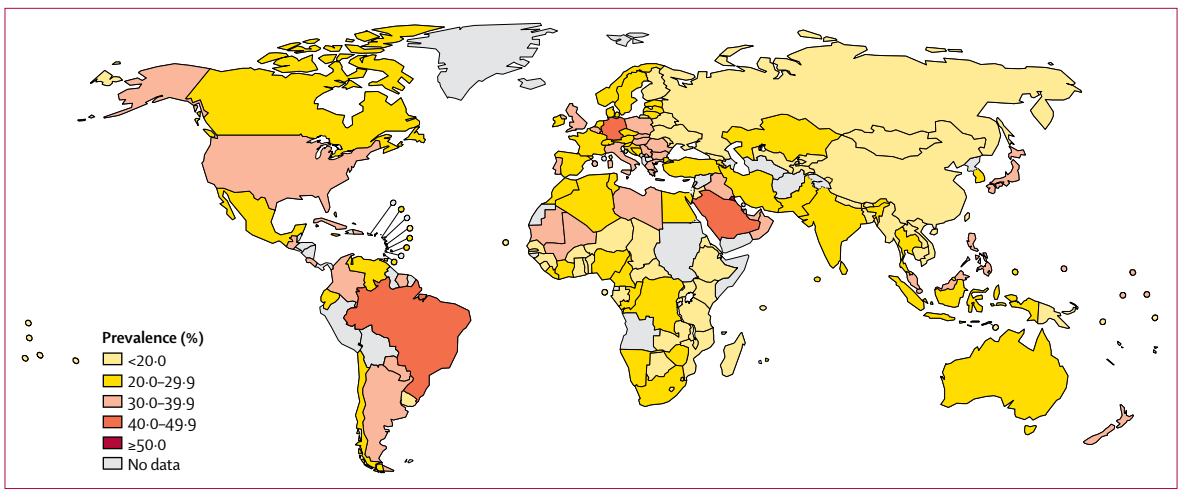

Figure 4: **Country prevalence of insufficient physical activity in men in 2016**

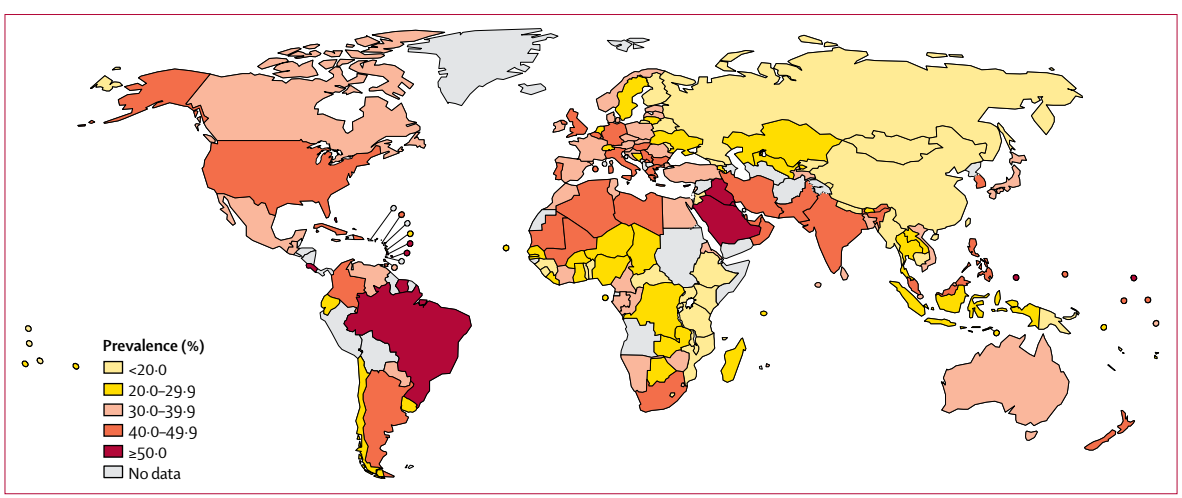

Figure 5: **Country prevalence of insufficient physical activity in women in 2016**

Discussion

Our analysis, including data from nearly 2 million participants (representing 96% of the global population), shows that globally, in 2016, more than a quarter of all adults was not getting enough physical activity. This puts more than 1·4 billion adults at risk of developing or exacerbating diseases linked to inactivity, and needs to be urgently addressed. Previous estimates[4] showed a global prevalence of insufficient physical activity of 23·3% in 2010. This difference from our results is due to our inclusion of nearly twice as many surveys (358 *vs* 195), and our ability to produce estimates for an additional 22 countries. Our estimates will be made available in the WHO Global Health Observatory,[17] where they can be downloaded for use in projects such as burden of disease calculations.[16]

Prevalence of insufficient physical activity varied greatly across regions and income groups in 2016. We found the highest levels in Latin America and the Caribbean, high-income Western countries, and high-income Asia Pacific, and prevalence was more than double in high-income countries than in low-income countries in 2016. In wealthier countries, the transition towards more sedentary occupations and personal motorised transportation probably explains the higher levels of inactivity. Conversely, in lower-income countries, more activity is undertaken at work and for transport; however, these behaviours are changing rapidly.[31] National policy needs to be implemented to encourage non-motorised modes of transportation, such as walking and cycling, and to promote participation in active recreation and sports in leisure time. Such policies are particularly important in countries with rapid urbanisation, such as Argentina, Brazil, and Colombia,[27] which contribute to the high levels of insufficient activity in Latin America and the Caribbean. Effective policies include improved provision of cycling and walking infrastructure, improving road safety, and creating more opportunities for physical activity in public open spaces and parks, in workplaces, and in other local community settings.[5,32,33]

We also found a wide variation in country prevalence of insufficient activity both across and within regions. The prevalence of insufficient activity was lower than 10% in a few countries, and more than 50% in others. This inequality has also been confirmed by Althoff and colleagues,[34] who used movement sensors built into smartphones to assess physical activity. Despite the difference in measurement method (we used self-reported physical activity), and differences in sampling, the resulting patterns of activity are similar, with some of the least active countries located in central and south America and north Africa and the Middle East, and some of the most active countries in east Asia and eastern Europe. The fact that activity varies greatly across countries, even within regions, suggests that the factors that influence inactivity lie mostly at the national, subnational, or community level, which is where policies are needed to increase physical activity.[32]

Our study confirms findings[34–37] of lower activity in women than in men, with some of the biggest differences in south and central Asia and the Middle East and north Africa. One way to explain sex differences in activity is to assess male and female participation in different domains of activity (activity at work or in the household, for transport, and during leisure time), and at different intensities (moderate and vigorous). Previous research[36,38,39] indicates that women tend to do less leisure-time activity, and lower-intensity activity than do men. Offering more opportunities for safe and accessible leisure-time activity to women in order to increase their overall levels of activity would therefore help close the gender gap and achieve the 2025 global physical activity target.[38] Furthermore, cultural norms, traditional roles, or lack of social and community support might lead to reduced participation in physical activity among girls and women. Understanding and addressing these barriers is needed to plan and deliver culturally sensitive actions to support behaviour change.[40]

Our analysis was the first to assess trends in physical inactivity over time. The global prevalence of physical inactivity was stable between 2001 and 2016, suggesting no progress in reducing global levels to reach the 2025 global physical activity target.[6] However, we found a wide variation in trends in inactivity across regions, income groups, and countries. The largest increases in insufficient physical activity have occurred in high-income countries, whereas the largest decreases have occurred in east and southeast Asia. These decreases are largely explained by increased participation in physical activity in China, the most populous country in the region (data not shown). Leisure-time physical activity in China has increased,[41] which might be explained by increased park use and physical activity among China's rapidly growing elderly population.[42] The lack of progress in other regions might be explained by the fact that, although more than 70% of countries have an operational physical activity policy, the scale and reach of its implementation is yet to have a national impact.[4,32]

Our study is affected by several limitations. First, similar to all global analyses, data were not available for every country and year, and availability varied across countries and regions. Latin America and the Caribbean, high-income Western countries, Oceania, and sub-Saharan Africa had the lowest proportion of countries with data. However, within these regions, the most populous countries were more likely to have data, so that the proportion of the population with data in these regions was still high. Countries with a population of more than 10 million with no data were Bolivia, Haiti, and Peru in Latin America and the Caribbean; Angola, Burundi, Somalia, South Sudan, and Sudan in sub-Saharan Africa; Afghanistan in south Asia; Syria and Yemen in central Asia, Middle East, and North Africa; and North Korea in east and southeast Asia. Some of these countries are also classified as low-income countries, which had the lowest data availability of the income groups. The availability of data for trends in physical inactivity was clearly skewed towards high-income countries, with 48·0% of countries being covered, compared with 3·2% of low-income countries. In fact, our trend estimations for low-income countries were based on one country only, Benin, which limits the representativeness for other low-income countries. Data coverage for trends was low in sub-Saharan Africa, Latin American and the Caribbean, and south Asia, indicating that trend estimates for these regions should be interpreted with caution.

Second, data quality also varied across countries and over time. 131 (37%) of the 358 surveys included data that were collected through the WHO Stepwise Approach to NCD Risk Factor Surveillance, using the Global Physical Activity Questionnaire.[9,10,14] The WHO Stepwise Approach was started in 2001, and the earlier surveys tended to be less representative with sometimes only subnational coverage.[14] Nonetheless, we included these data in our analysis because they help to provide global coverage for the earlier years.

Third, we had to rely on self-reported data in our analysis despite their limitations.[43] Nationally representative data for physical activity that are collected objectively, using accelerometers, for example, are mostly only available for high-income countries, and results are not comparable across countries because of variations in data collection methods, data processing, and scoring.[4,44] In the next few years we expect that more objective physical activity data will become available at a larger scale, and for the next update of our comparable estimates we will reconsider inclusion of these data in some way.

Finally, in some cases, our estimates are different to prevalence estimates produced by countries. There are several reasons for this difference. We adjusted our estimates for several factors when necessary. We also standardised our estimates to an artificial age structure, the WHO Standard Population.[28] Furthermore, some countries tend to produce estimates for only leisure time physical activity, whereas we include four domains of

physical activity. In these cases, national estimates of physical inactivity prevalence will be higher than our comparable estimates.

Our data show that progress towards the global target set by WHO member states to reduce physical inactivity by 10% by 2025 has been too slow and is not on track. Levels of insufficient physical activity are particularly high and still rising in high-income countries, and worldwide, women are less active than are men. A significant increase in national action is urgently needed in most countries to scale-up implementation of effective policies. The Global Action Plan on Physical Activity 2018–2030,[32] is a new catalyst for global action, and provides a selection of 20 specific policies targeting different settings and populations that can be adapted and tailored to local contexts in all countries. However, implementation will require bold leadership and full engagement across sectors to change the current approach. Collaboration across sectors could generate significant returns, because policies that support increasing physical activity can provide other benefits to health, local economies, community wellbeing, and environmental sustainability, and contribute towards achieving many of the 2030 Sustainable Development Goals.[5]

Contributors

RG analysed the data and wrote the first draft of the report. GAS and RG developed the methodological approach, with inputs from all other authors. All authors designed the study, and revised and approved the final report.

Declaration of interests

All authors are staff members of WHO. The authors alone are responsible for the views expressed in this publication and they do not necessarily represent the decisions, policy, or views of WHO.

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