How much could 15% more physical activity reduce premature mortality in the EU?

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Muhlis ANA, Mahrouseh N, Andrade CAS, et al. Potential impact of increasing physical activity on NCD mortality in the EU: pathways to SDG 3.4.1 by 2030. BMJ Glob Health 2026;11:e022998. doi:10.1136/bmjgh-2025-022998

What if...?

1. If you were a policy maker, would you invest in getting people more physically active?

2. What if Europeans increased physical activity by 15%?

3. Would that reduce premature mortality alone by one third by 2030?

What if we already had a model that...

NON-COMMUNICABLE DISEASES DOMINATE EU MORTALITY, AND PHYSICAL INACTIVITY IS A MAJOR CONTRIBUTOR

91%

of all EU deaths
are from NCDs
(CVD, cancer, respiratory,
diabetes/kidney disease)[1]

36.2%

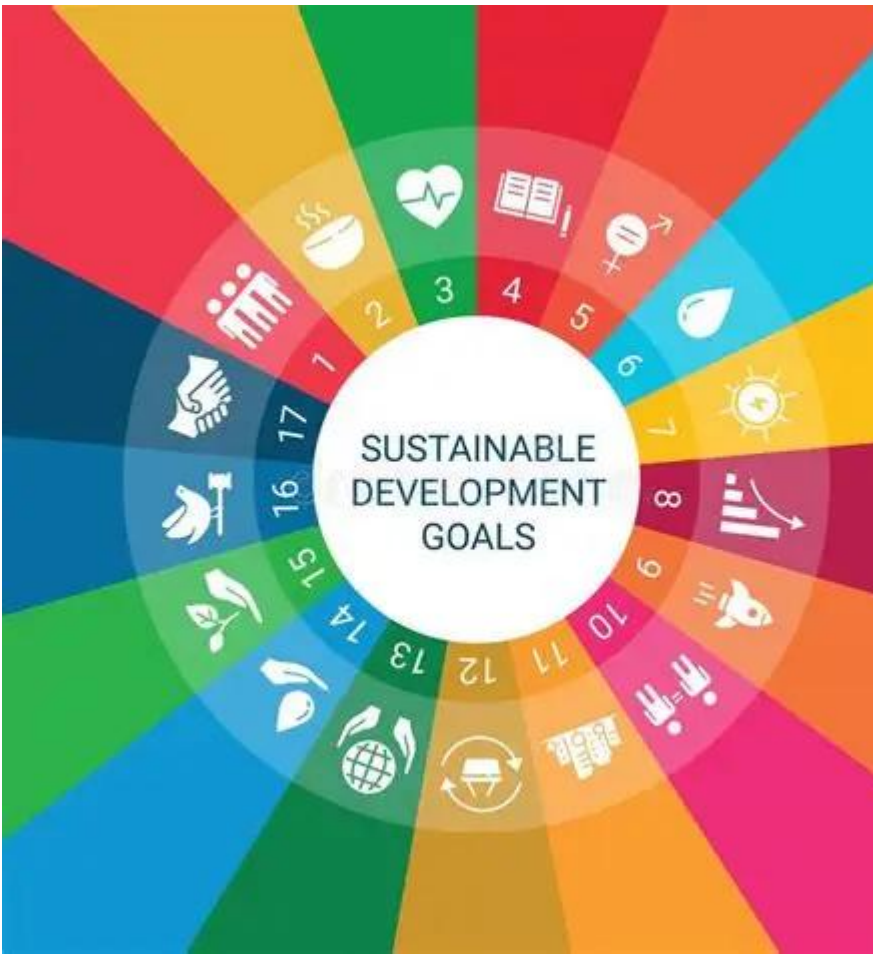
of EU adults are
physically inactive
45% report never exercising
or playing sport [2]

US$47.6 B/year

estimated global annual health-care cost
of physical inactivity
globally [3]

1.European Commission. EU burden from non-communicable diseases and key risk factors.Available:https://knowledge4policy. ec.europa.eu/health-promotion-knowledge-gateway/eu-burden- non-communicable-diseases-key-risk-factors_en#:~:text=factors% 20EU%202019-,Physical%20inactivity,421)%20(GBD%20Results) [Accessed 24 Sep 2025].
2. Nikitara K, Odani S, Demenagas N, et al. Prevalence and correlates of physical inactivity in adults across 28 European countries. Eur J Public Health 2021;31:840–5.
3. Santos AC, Willumsen J, Meheus F, et al. The cost of inaction on physical inactivity to public health- care systems: a population- attributable fraction analysis. Lancet Glob Health 2023;11:e32–9.

THE POLICY TARGET





SDG 3.4.1 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being [4]

Physical activity can contribute to this goal, but it is only one component within a wider prevention strategy that also includes tobacco, alcohol, diet, obesity, hypertension and other determinants.

4. World Health Organization. Dying between the exact ages 30 and 70 years from cardiovascular diseases, cancer, diabetes, or chronic respiratory diseases, probability (SDG 3.4.1) [online database]. Geneva: World Health Organization; 2024. Available: SDG Target 3.4 | Noncommunicable diseases and mental health: By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being

THE POLICY TARGET

Physical activity and the sustainable development goals 2030



THE GLOBAL ACTION PLAN ON PHYSICAL ACTIVITY 2018–2030

Target

A 15% relative reduction in the global prevalence of physical inactivity in adults and in adolescents by 2030.[5]

It does not mean that every individual must exercise exactly 15% more, but that countries should reduce the proportion of people who are insufficiently active and increase overall activity levels.

5. World Health Organization. Global action plan on physical activity 2018–2030: more active people for a healthier world. World Health Organization; 2018. Available: https://iris.who.int/handle/10665/272722

If the EU hits its physical-activity target

how close does that get us to SDG 3.4.1?

We built a counterfactual scenario using NCDprime tool across 24 EU countries to find it out by estimating the number of total and premature NCD deaths that could be prevented or postponed

METHODS

Tool

The WHO NCDPRIME tool[6] is a comparative risk-assessment tool to estimate NCD mortality attributable to modifiable risk factors under alternative exposure or counterfactual scenarios.

Data

Physical activity and BMI inputs came from European Health Interview Survey (EHIS), waves 2 (2015) and 3 (2019)[7,8] and cause-specific mortality from the Global Burden of Disease 2019 study across 24 EU countries [9]. These data were also used to project NCD mortality and physical activity in 2030.

Scenario

+15% increase in moderate-to-vigorous activity (MET-hours/week) and 15% relative decrease in physical inactivity based on the WHO GAPPA 2030 target, applied equally across age and sex.

Output

Modelled for 2015, 2019 and 2030, with 5,000 Monte Carlo iterations to generate uncertainty intervals.

6. World Health Organization Regional Office for Europe. Modelling the impact of national policies on noncommunicable disease mortality using prime. Available: https://www.who.int/europe/ tools-and-toolkits/modelling-the-impact-of-national-policies-on- noncommunicable-disease-mortality-using-prime [Accessed 27 Jan 2026].
7. European Commission, Eurostat. European health interview survey (EHIS wave 2)—methodological manual. Luxembourg Publications Office of the European Union; 2013. Available: https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-ra-13-018
8. European Commission, Eurostat. European health interview survey (EHIS wave 3)—methodological manual. Luxembourg Publications Office of the European Union; 2018. Available: https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-02-18- 240
9. Institute for Health Metrics and Evaluation (IHME). GBD results tool. IHME. Available: https://vizhub.healthdata.org/gbd-results [Accessed 15 Jan 2025].

METHODS

How physical activity was measured

Self-reported activity from the EHIS, converted into a single common unit: MET-hours per week.

What is a MET?

1 MET = energy expended at rest. Higher values mean more intense activity. [10]

Moderate intensity

3–5.9 MET (mean 4.5) [11]

Vigorous intensity

≥6 MET [11]

EHIS respondents reported weekly **frequency** and **duration** of aerobic activities performed for at least 10 continuous minutes in a typical week, including transport walking/cycling and sport or recreational activities causing at least a slight increase in breathing or heart rate.

MET-hours/week = frequency × duration × MET value

Standard MET values applied (2024 Compendium of Physical Activities):

4.08	6.86	6.32
MET	MET	MET
Walking	**Cycling**	**Sports**

10. OECD, World Health Organization. Step up! Tackling the Burden of Insufficient Physical Activity in Europe. OECD, 2023. Available: https://www.oecd.org/en/publications/step-up-tackling-the-burden- of-insufficient-physical-activity-in-europe_500a9601-en.html
11. Herrmann SD, Willis EA, Ainsworth BE, et al. 2024 Adult Compendium of Physical Activities: A third update of the energy costs of human activities. J Sport Health Sci 2024;13:6–12.

METHODS

Classifying activity levels

WHO recommends ≥150 min/week moderate or ≥75 min/week vigorous activity for adults — equivalent to 600 MET-min/week. [12]

Insufficiently active

<600 MET-min/wk

(<10 MET-hours/wk)

= physically inactive

Moderately active

600–3,000 MET-min/wk

(10–50 MET-hours/wk)

meets WHO minimum recommendation

Highly active

>3,000 MET-min/wk

(>50 MET-hours/wk)

12. Nikitara K, Odani S, Demenagas N, et al. Prevalence and correlates of physical inactivity in adults across 28 European countries. Eur J Public Health 2021;31:840–5.

METHODS

What PRIME actually models

PRIME estimates mortality effects through two pathways: a direct effect of physical activity on disease risk and an indirect effect mediated by BMI.
The model is stratified by sex and five-year age groups and includes cardiovascular disease, selected cancers, diabetes and chronic renal failure.
It is therefore a scenario model focused on mortality, not a comprehensive model of all health benefits of physical activity.

Cause-specific NCD mortality:

Cardiovascular disease

- Ischaemic heart disease
- Hypertensive disease
- Cerebrovascular disease

Cancers

- Colorectal
- Lung
- Kidney
- Pancreatic
- Endometrial
- Gallbladder)
- Breast
- Stomach

Other conditions

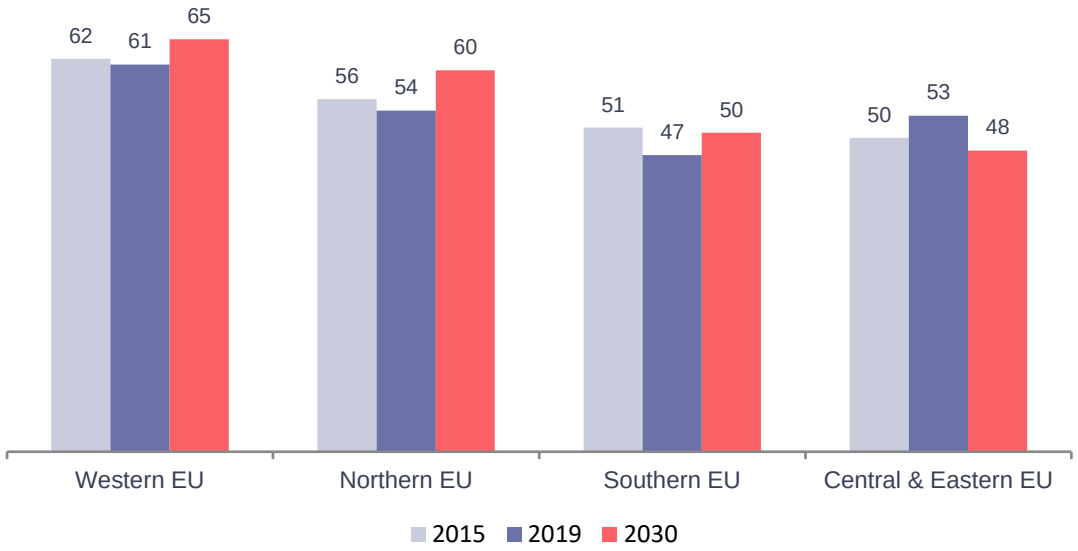
- Diabetes
- Chronic renal failure

RESULT

Baseline physical activity across the EU

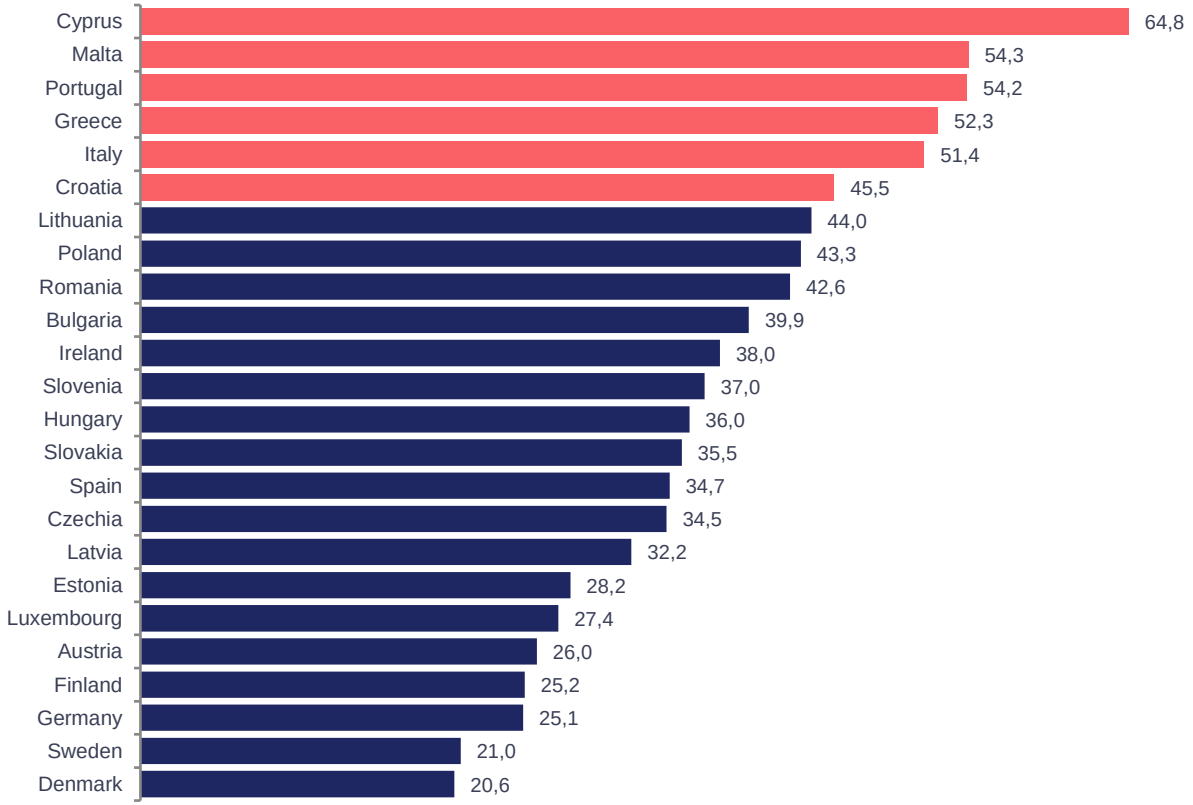
before the +15% activity scenario is applied.

Mean of MET-hours/week among active adults, by region



Western & Northern Europe have the highest physical activity
Central & Eastern and Southern Europe may show declining physical activity by 2030.
These differences matter because the same relative increase in activity can generate different absolute mortality benefits depending on baseline mortality, population size and age structure.

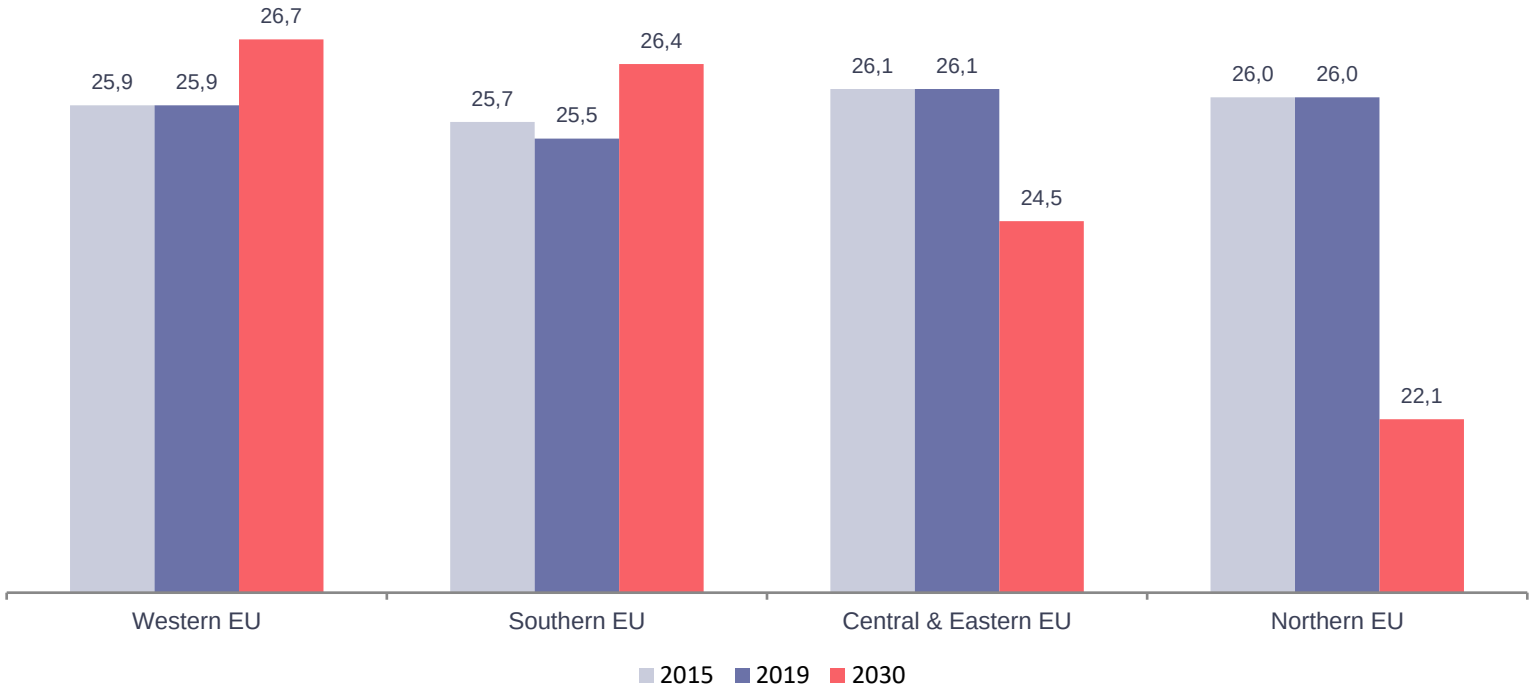
Proportion of Physically inactive adults by country, 2030 (%)



RESULT

Baseline BMI across the EU

Mean body mass index (kg/m²) in 2015, 2019 and 2030.



RESULT

We modelled a counterfactual scenario of

↑15%

15% increase in moderate-to-vigorous physical activity among active adults and a 15% relative reduction in the proportion of adults who were insufficiently active

RESULT

What could change by 2030

107,108

total NCD deaths averted across all ages by 2030
95% UI: 102,479 – 111,737 · a 4.7% reduction in total NCD mortality

24,178

premature (<75y) deaths averted
95% UI: 23,253–25,103 · 3.3% of premature NCD deaths

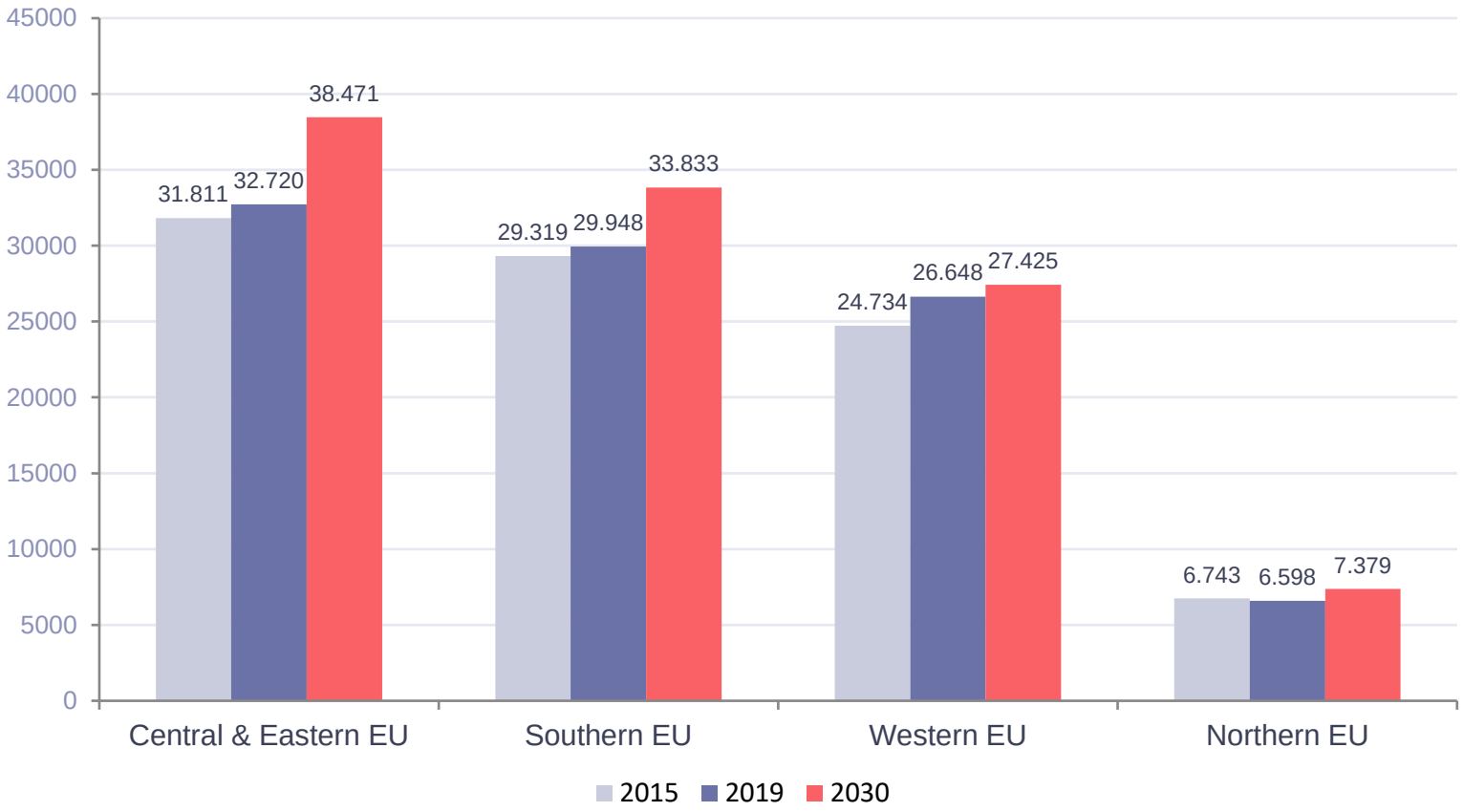
2015 → 2030

Under the same counterfactual scenario, the estimated number of deaths that could be averted was 92,607 in 2015 and 107,108 in 2030.

RESULT

Total deaths averted in the EU and its regions

Total NCD deaths averted across all ages by EU region in 2015, 2019 and 2030



107,108

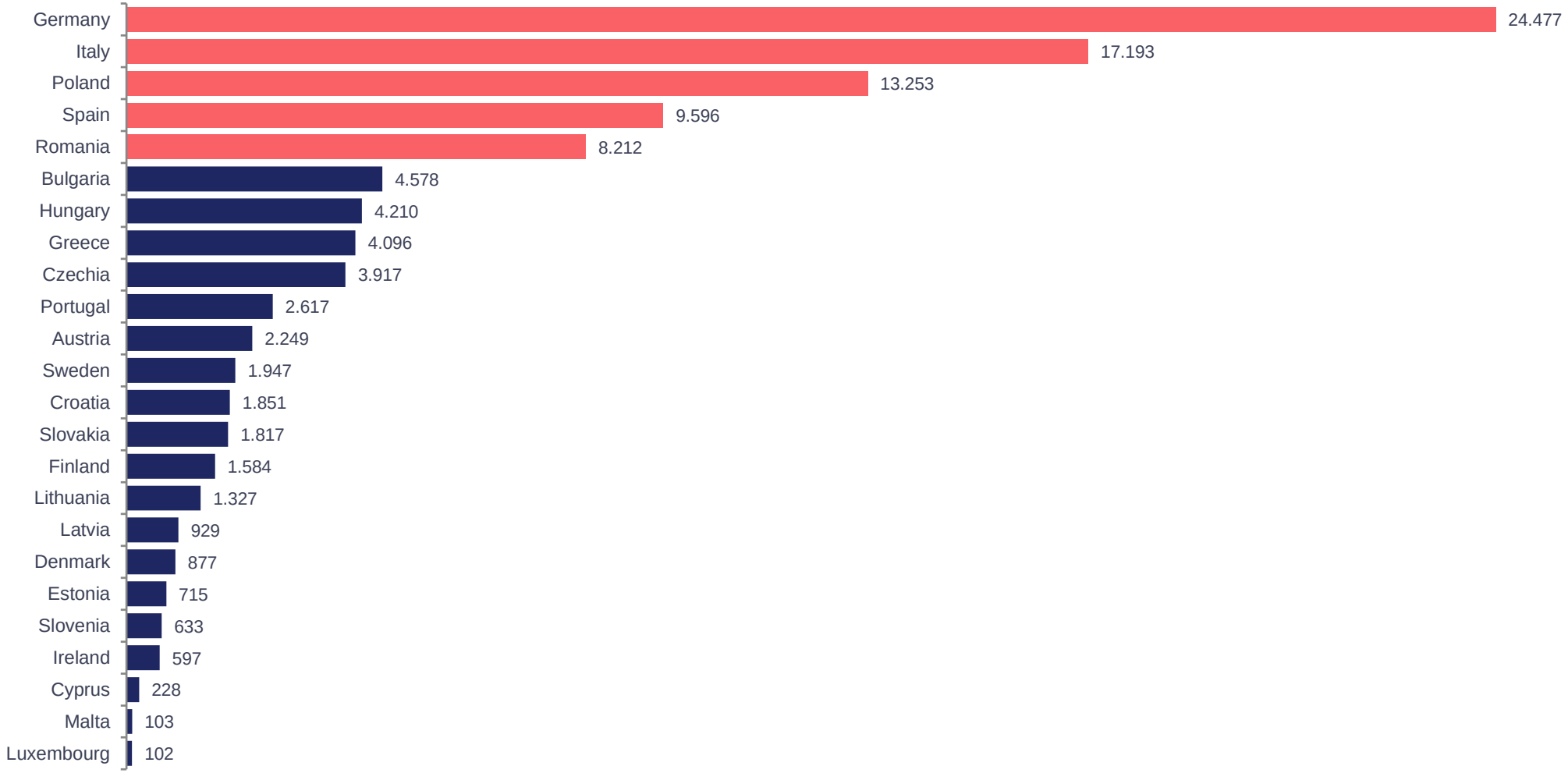
total EU deaths averted by 2030

Central & Eastern and Southern Europe together account for over two thirds of all deaths averted in the EU.
This reflects higher baseline NCD mortality, population size, age structure and lower activity levels in several countries

RESULT

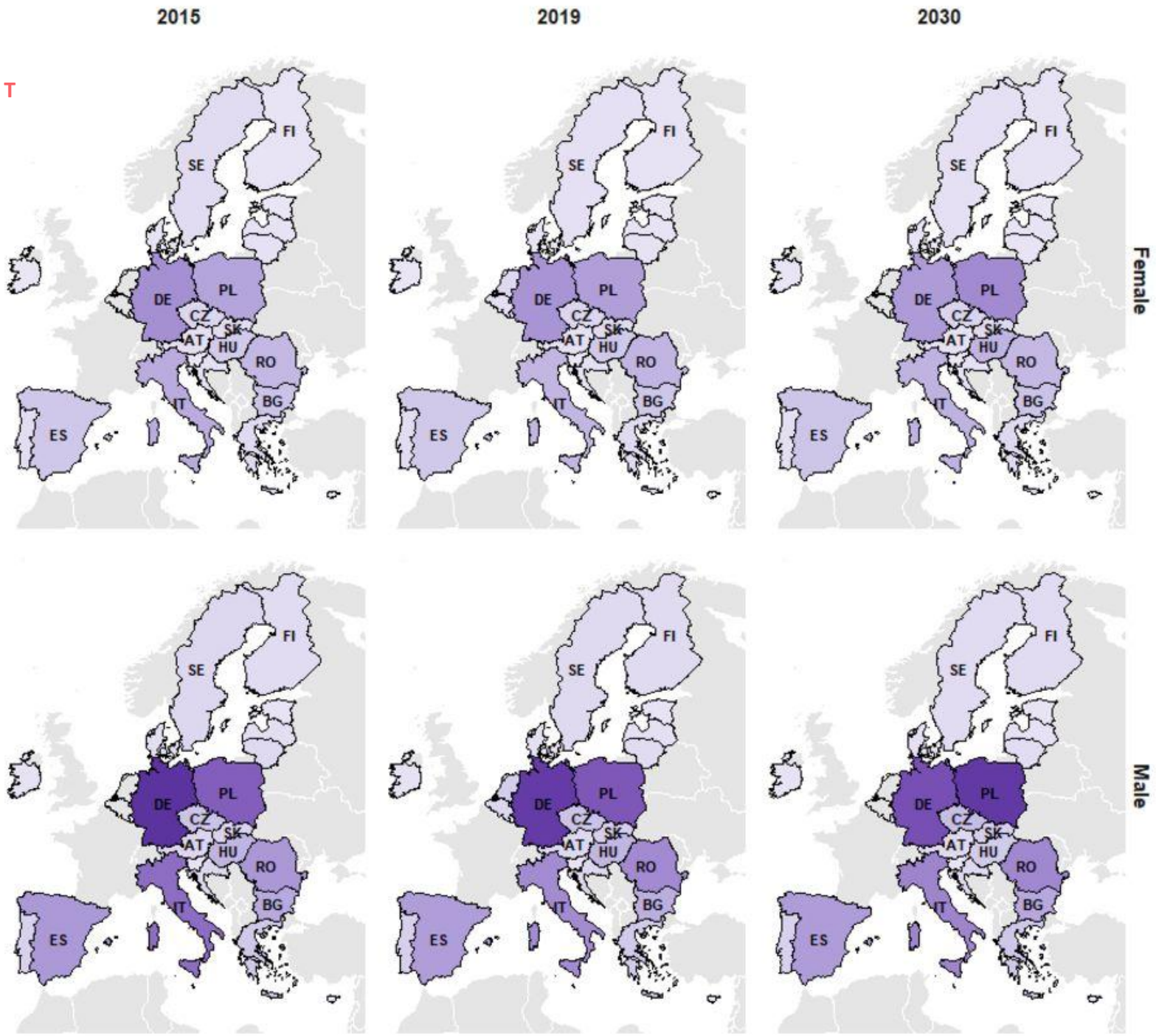
Total deaths averted by EU member states

Total NCD deaths averted across all ages by 2030 (24 countries)



RESULT

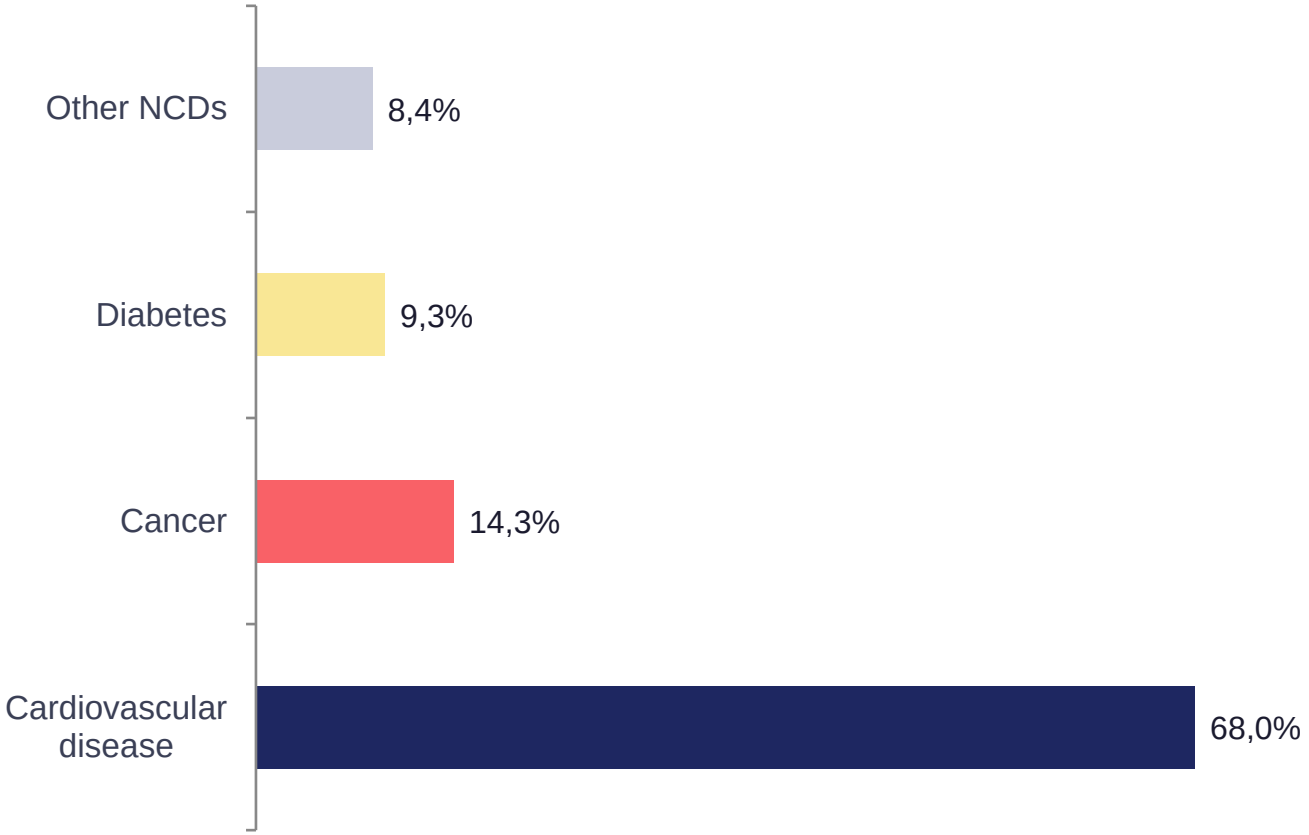
Maps showing estimated premature deaths averted by sex across EU countries for 2015, 2019 and 2030



The effect is consistently larger among men than among women, roughly twice as many premature deaths averted among men. This partly reflects sex differences in baseline NCD mortality and exposure patterns. The geographical pattern also reinforces that potential gains are concentrated where baseline mortality and inactivity are higher.

RESULT

Cause-specific NCD deaths averted in the EU in 2030 under the counterfactual scenario



36.6%

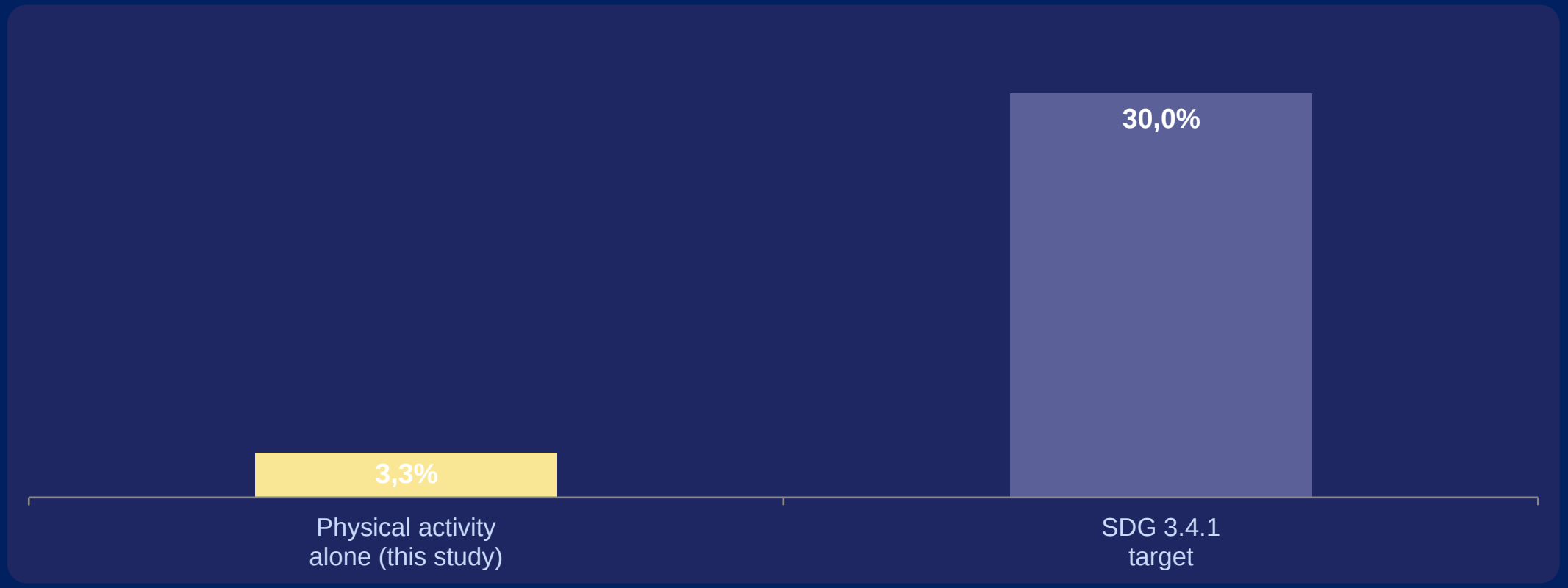
of CVD deaths prevented come from ischaemic heart disease alone

Most of the mortality benefit comes from cardiovascular disease. In 2030, cardiovascular disease accounts for about 68% of all averted NCD deaths, while cancer, diabetes and other NCDs account for smaller shares.

TRANSLATION INTO REAL LIFE:

Physical Activity won't close the gap alone

Reduction in premature NCD mortality in the EU, by 2030



A 3.3% reduction in premature NCD mortality is important, especially because it represents more than 24,000 premature deaths. However, the SDG 3.4.1 target is around a one-third reduction. Physical activity alone therefore cannot close the gap. The message is not that physical activity is unimportant, but that single-risk-factor strategies are insufficient.

Physical activity alone is unlikely to achieve the SDG 3.4.1 target of reducing premature NCD deaths by 2030.

Combining physical activity with complementary measures (improved diet and reduced tobacco and alcohol use) could make this target attainable across the EU.

Thank you

Original research

BMJ Global Health

Potential impact of increasing physical activity on NCD mortality in the EU: pathways to SDG 3.4.1 by 2030

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To cite: Muhlis ANA, Mahrouseh N, Andrade CAS, *et al*. Potential impact of increasing physical activity on NCD mortality in the EU: pathways to SDG 3.4.1 by 2030. *BMJ Glob Health* 2026;**11**:e022998. doi:10.1136/bmjgh-2025-022998

Handling editor Seema Biswas

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/bmjgh-2025-022998).

Received 5 December 2025
Accepted 13 April 2026

ABSTRACT

Background Physical inactivity affects 36.2% of adults in the European Union (EU), contributing substantially to the burden of non-communicable diseases (NCDs). The WHO's Global Action Plan on Physical Activity 2018–2030 targets a 15% relative reduction in physical inactivity by 2030, supporting Sustainable Development Goal (SDG) 3.4.1 to achieve over 30% reduction in premature NCD mortality. This study estimates the number of averted deaths, premature deaths and cause-specific NCD deaths averted if physical activity targets are achieved across EU countries.

Methods We applied the WHO Preventable Risk Integrated ModEl using baseline physical activity and body mass index from waves 2 and 3 of the European Health Interview Survey. The counterfactual scenario modelled a 15% increase in metabolic equivalent of task hours/week of moderate-to-vigorous physical activity and a 15% relative reduction in the proportion of adults who are physically inactive across the EU.

Findings Increased physical activity is associated with an estimated 24 178 premature deaths averted by 2030 (95% uncertainty interval (UI): 23 253–25 103), equivalent to 3.3%

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Physical inactivity is a major contributor to premature non-communicable disease (NCD) mortality.

⇒ A PubMed search (1 September 2015–31 August 2025) using the MeSH terms "Sustainable Development"[MeSH Terms] AND "mortality, premature"[MeSH Terms] AND ("Exercise"[MeSH Terms] OR "Sedentary Behavior"[MeSH Terms]) found no population-based studies quantifying the potential impact of achieving Sustainable Development Goal (SDG)-aligned physical activity targets on NCD deaths across the European Union (EU).

WHAT THIS STUDY ADDS

⇒ This EU-wide scenario analysis is the first to estimate the impact of increased physical activity on NCD mortality, allowing for consistent comparisons across countries through 2030.

⇒ The study provides a comprehensive, region-specific estimate of how an increase in physical activity af-

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1.European Commission. EU burden from non-communicable diseases and key risk factors.Available:https://knowledge4policy. ec.europa.eu/health-promotion-knowledge-gateway/eu-burden- non-communicable-diseases-key-risk-factors_en#:~:text=factors% 20EU%202019-,Physical%20inactivity,421)%20(GBD%20Results) [Accessed 24 Sep 2025].
2. Nikitara K, Odani S, Demenagas N, et al. Prevalence and correlates of physical inactivity in adults across 28 European countries. Eur J Public Health 2021;31:840–5.
3. Santos AC, Willumsen J, Meheus F, et al. The cost of inaction on physical inactivity to public health- care systems: a population- attributable fraction analysis. Lancet Glob Health 2023;11:e32–9.
4. World Health Organization. Dying between the exact ages 30 and 70 years from cardiovascular diseases, cancer, diabetes, or chronic respiratory diseases, probability (SDG 3.4.1) [online database]. Geneva: World Health Organization; 2024. Available: SDG Target 3.4 | Noncommunicable diseases and mental health: By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being
5. World Health Organization. Global action plan on physical activity 2018–2030: more active people for a healthier world. World Health Organization; 2018. Available: https://iris.who.int/handle/10665/ 272722
6. World Health Organization Regional Office for Europe. Modelling the impact of national policies on noncommunicable disease mortality using prime. Available: https://www.who.int/europe/ tools-and-toolkits/modelling-the-impact-of-national-policies-on- noncommunicable-disease-mortality-using-prime [Accessed 27 Jan 2026].
7. European Commission, Eurostat. European health interview survey (EHIS wave 2)—methodological manual. Luxembourg Publications Office of the European Union; 2013. Available: https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-ra-13-018
8. European Commission, Eurostat. European health interview survey (EHIS wave 3)—methodological manual. Luxembourg Publications Office of the European Union; 2018. Available: https://ec.europa. eu/eurostat/web/products-manuals-and-guidelines/-/ks-02-18- 240
9. Institute for Health Metrics and Evaluation (IHME). GBD results tool. IHME. Available: https://vizhub.healthdata.org/gbd-results [Accessed 15 Jan 2025].
10. OECD, World Health Organization. Step up! Tackling the Burden of Insufficient Physical Activity in Europe. OECD, 2023. Available: https://www.oecd.org/en/publications/step-up-tackling-the-burden- of-insufficient-physical-activity-in-europe_500a9601-en.html
11. Herrmann SD, Willis EA, Ainsworth BE, et al. 2024 Adult Compendium of Physical Activities: A third update of the energy costs of human activities. J Sport Health Sci 2024;13:6–12.
12. Nikitara K, Odani S, Demenagas N, et al. Prevalence and correlates of physical inactivity in adults across 28 European countries. Eur J Public Health 2021;31:840–5.
13. Frieden TR, Cobb LK, Leidig RC, et al. Reducing Premature Mortality from Cardiovascular and Other Non- Communicable Diseases by One Third: Achieving Sustainable Development Goal Indicator 3.4.1. gh 2020;15:50.
14. World Health Organization. Health- enhancing physical activity in the European Union. 2024. Available: https://www.who.int/europe/ publications/i/item/WHO-EURO-2024-10606-50378-76030

- Our findings resonate with several ongoing EU policy frameworks that place physical activity and NCD prevention high on the agenda.
- Physical inactivity is a risk factor for premature NCD mortality, but physical activity alone does not achieve the 2030 SDG 3.4.1 goal. Combined with policies targeting other risk factors, however, the target becomes more attainable. Frieden et al. estimated that physical activity together with WHO “best-buy” interventions on diet, tobacco and alcohol could make the 30% reduction achievable.[13]
- Interventions should be tailored to regional and local contexts. The WHO report “Health-enhancing physical activity in the European Union, 2024”. shows that 28 EU countries report a formal policy to promote physical activity. However, implementation does not cover all sectors

