

# How do physical activity, diet quality and their changes over time relate to mortality?

## Introduction

- **What is already known on this topic:** both physical activity (PA) and following a Mediterranean-type diet have been shown to lower the risk of mortality.
- **Knowledge gap:** less is known about the combined impact of these behaviours on mortality, especially with consideration of their changes over time during adulthood.
- **Objectives:** to examine the separate and combined associations of PA, diet quality and their changes over time with total mortality and mortality from different causes (such as heart diseases and cancer).

## Methods

- **Design:** population-based prospective cohort study
- **Participants:** 9,349 adults aged 40 to 79 years from EPIC-Norfolk cohort, with repeated measurements of PA and diet and subsequent follow-up over decades.
- **Main exposures:** self-reported questionnaires were used to derive physical activity energy expenditure (PAEE) as a proxy of total PA, and adherence to the Mediterranean Diet Score (MDS, range 0-15 points) as an indicator of overall diet quality.
- Within-person changes in PAEE and MDS were computed from repeated measures in 1993-2004.
- Combined trajectories of PA and diet quality were also constructed.

## Results

### Risk of death according to different trajectories of physical activity and diet quality over time

Baseline assessment 1993 to 1997		Exposure assessment	Repeated assessment 1998 to 2004		Follow-up	End of follow-up 2022
Physical activity	Diet quality		Physical activity	Diet quality		Risk of death
Low	Low		Low	Low		Reference
Low	Low		High	High		Lowered by 40%
High	Low		High	Low		Lowered by 17%
Low	High		Low	High		Lowered by 13%
High	High		High	High		Lowered by 22%

Compared with those who had both lower physical activity and lower diet quality at baseline and sustained this over time, we found that other groups had a reduced risk of premature mortality. For example:

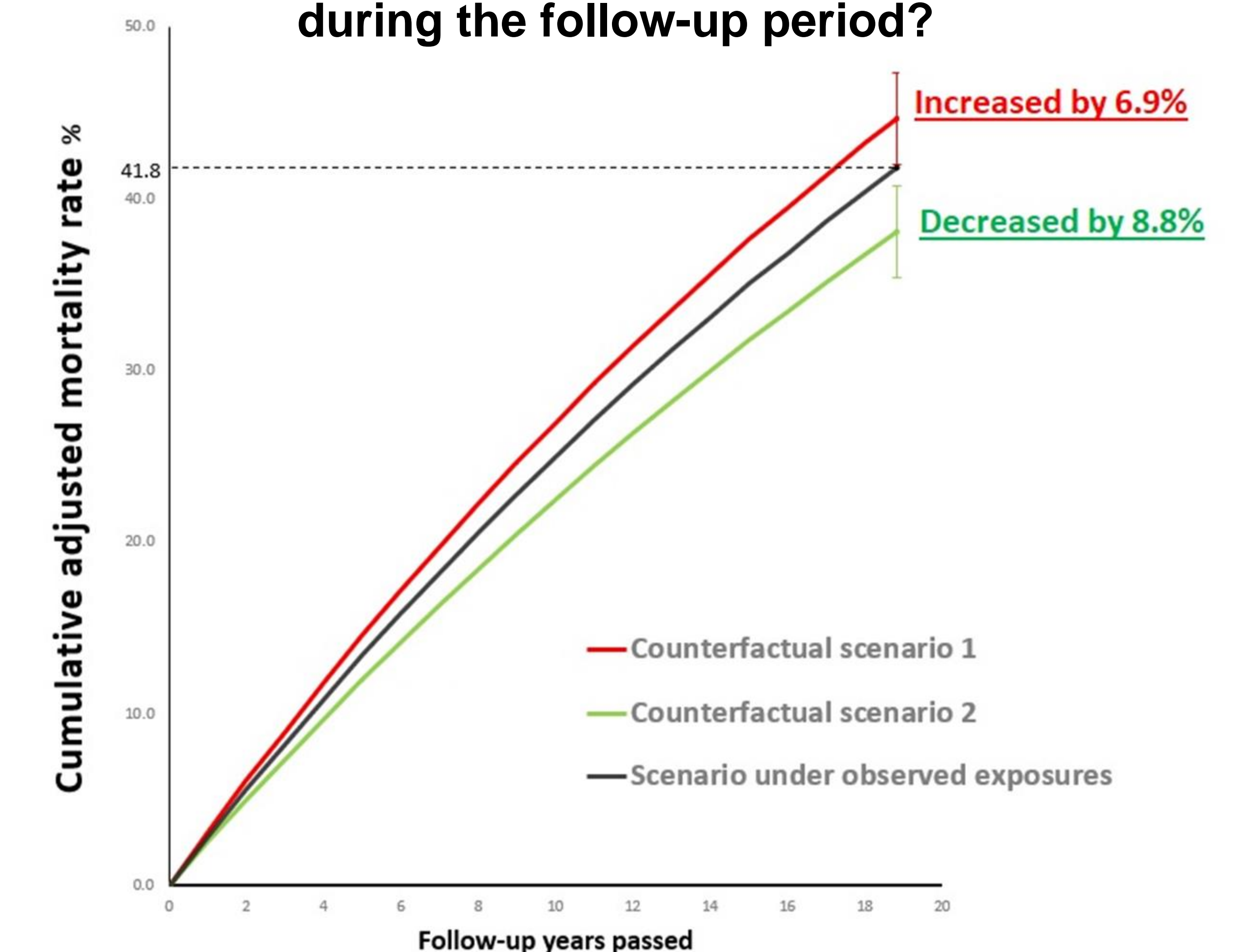
- In those who sustained only high diet quality over time, the risk of death was lower by 13%.
- In those who sustained only high physical activity over time, the risk of death was lower by 17%.
- In those who sustained high levels of both behaviours over time, risk of death was lower by 22%.
- In those who improved both behaviours over time, the risk of death was lower by 40%.

### Risk of death from any cause, per standardised increase in each health behaviour

Variable	Lowering the risk by
Baseline physical activity	10%
Change in physical activity	11%
Baseline diet quality	5%
Change in diet quality	7%

- Similar associations were found for death from heart diseases and death from cancer.
- Associations were similar by different age groups, male or female, smoker or non-smoker and by obesity status (measured by the body mass index).

### What could have been the difference in the mortality rate during the follow-up period?



- If all participants had maintained low levels of physical activity and diet quality consistently, total number of deaths in the cohort would have been increased by 6.9%.
- If all participants had maintained high levels of physical activity and diet quality consistently, total number of deaths in the cohort would have been decreased by 8.8%.

## Conclusion

- Higher baseline physical activity and diet quality as well as improvements in these behaviours over time were all associated with lower mortality, independent of each other.
- These findings support the advocacy of active living and healthy eating, and highlight that it is never too late to improve these health behaviours.

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