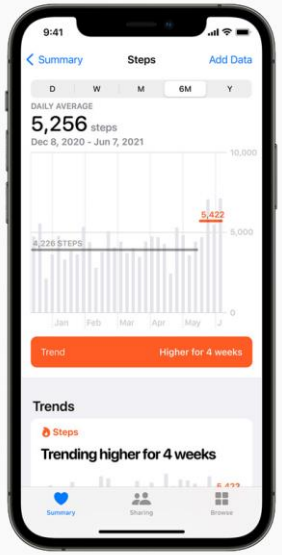
Health impacts of the digital era

Perspectives on consumer wearables from a physical activity researcher



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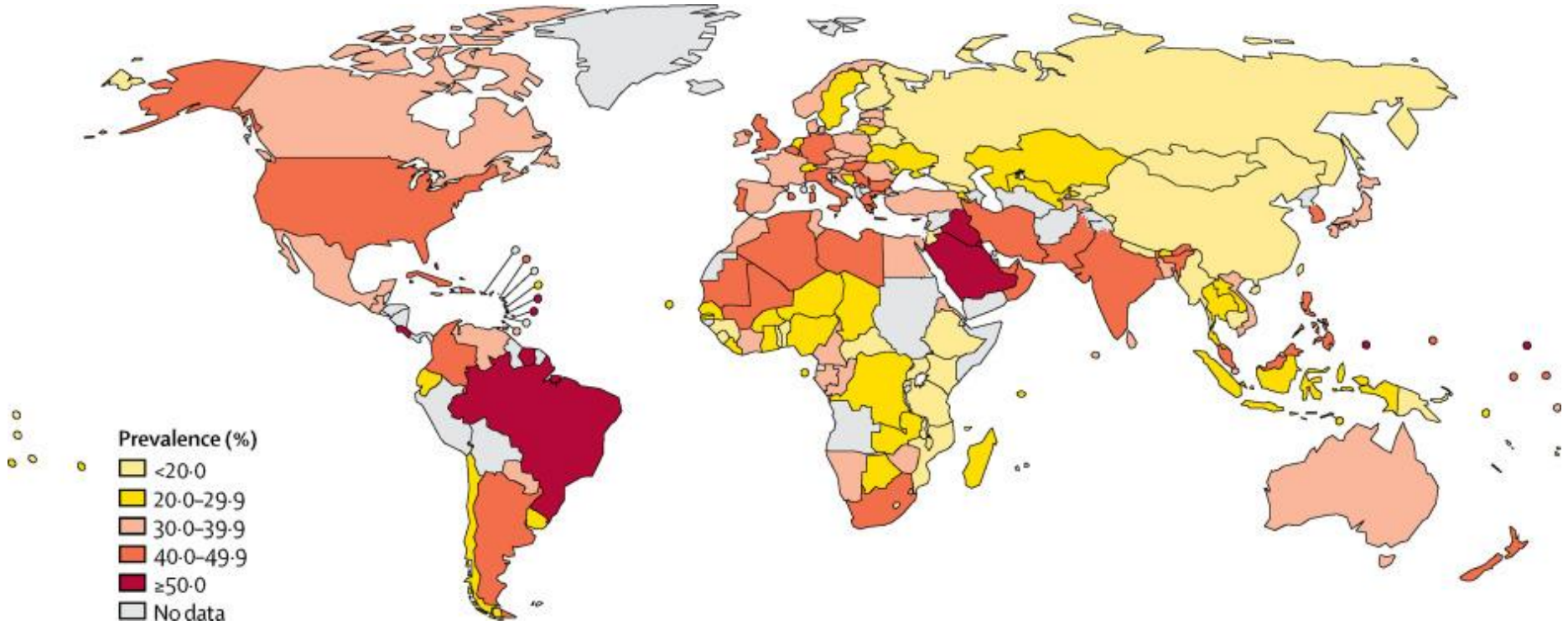
Outline

- Global levels of inactivity and trends over time
- What has happened during COVID?
- What influences physical activity levels?
- Who uses consumer wearables to track activity levels?
- Can activity trackers change behaviour?
- Can ‘we’ use activity trackers to monitor behaviour?

Global levels of inactivity amongst adults



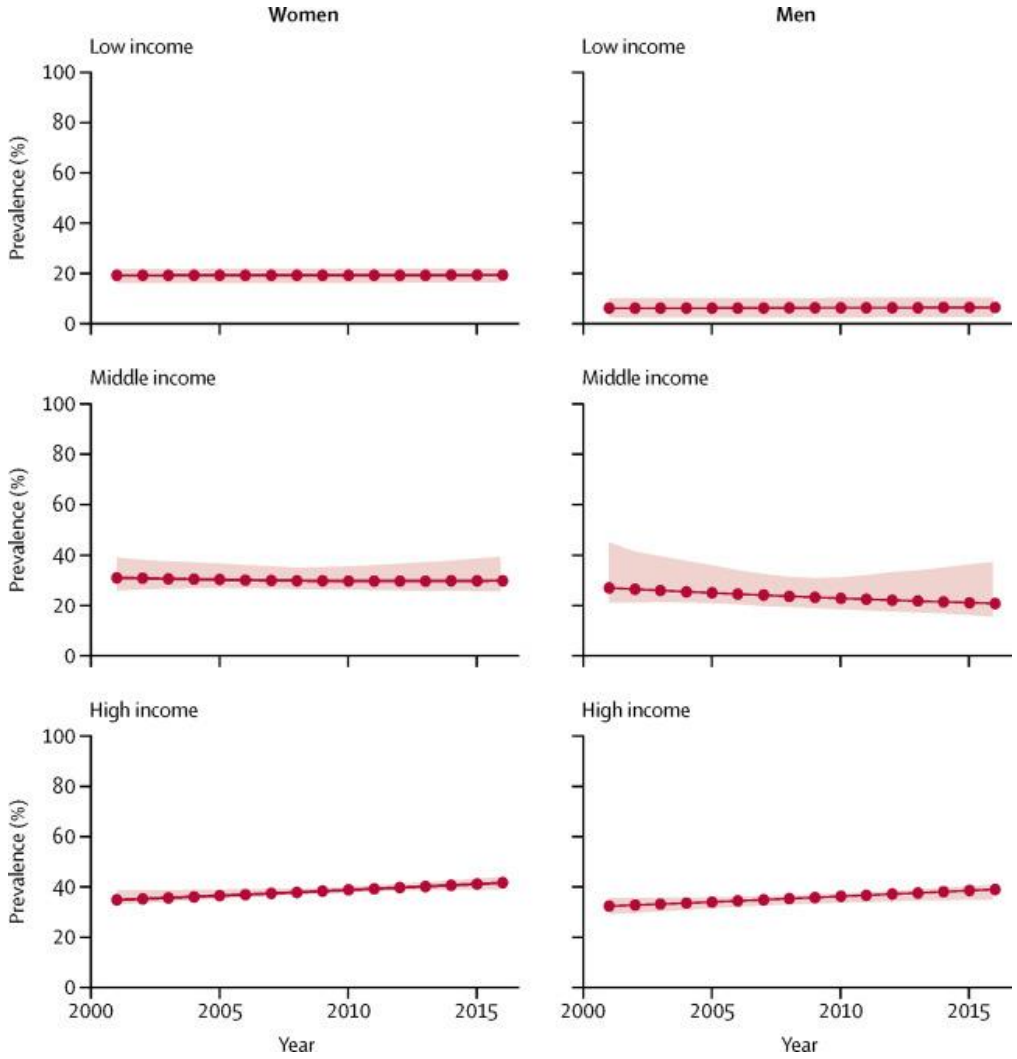
27.5% of the global population do not meet the recommended levels of activity

23.4% of men

31.7% of women

For women. Source: Guthold et al. (2018) doi.org/10.1016/S2214-109X(18)30357-7

Global trends



Insufficient activity is increasing in high income countries.

In high income Western countries

2001: 30.9%

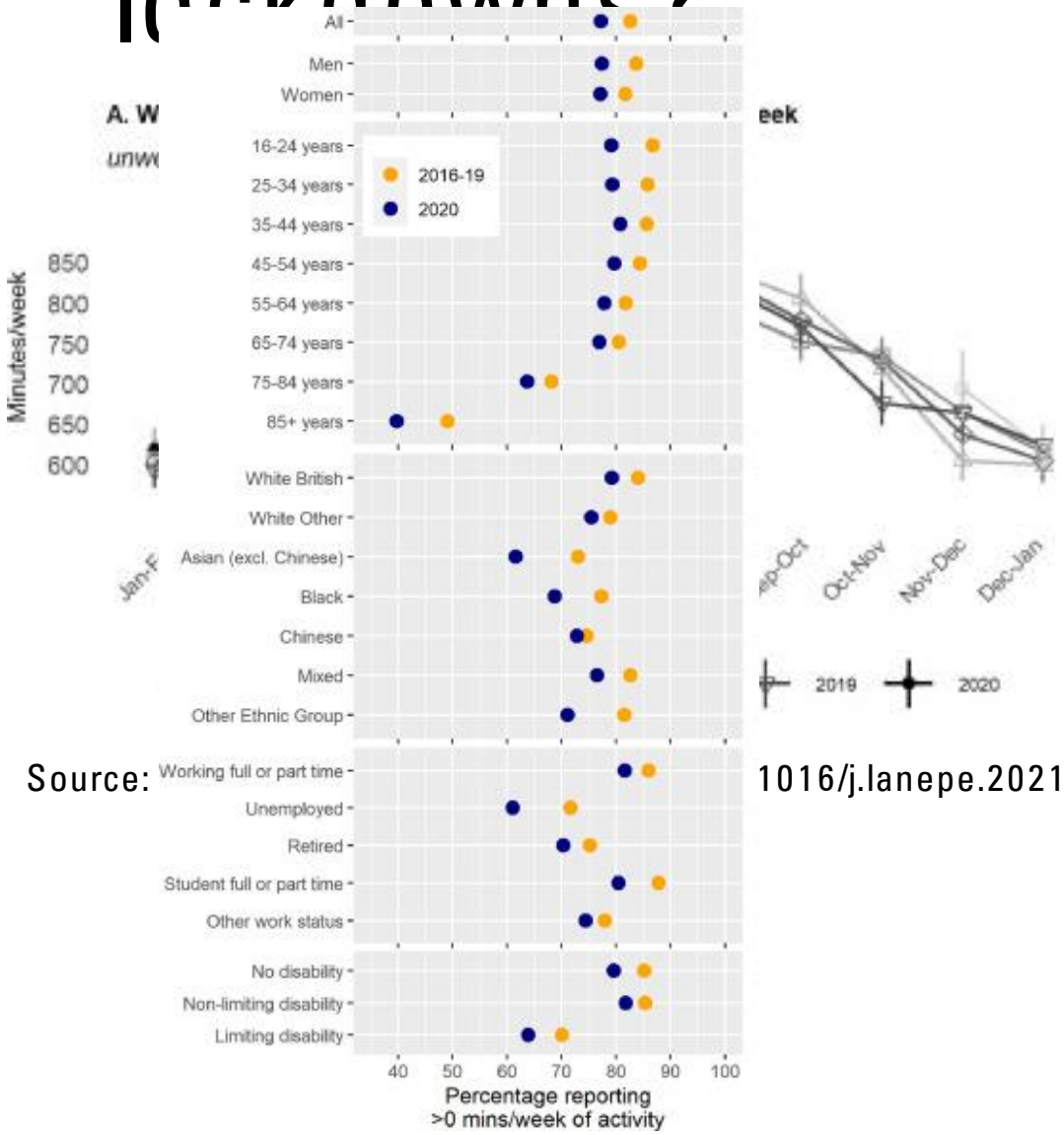
2016: 36.8%

Note: few data points

Average change across all 65 countries with trend data was <0.01%

Source: Guthold et al. (2018) doi.org/10.1016/S2214-109X(18)30357-7

What happened during COVID lockdowns?



Source: 1016/j.lanepe.2021.100265

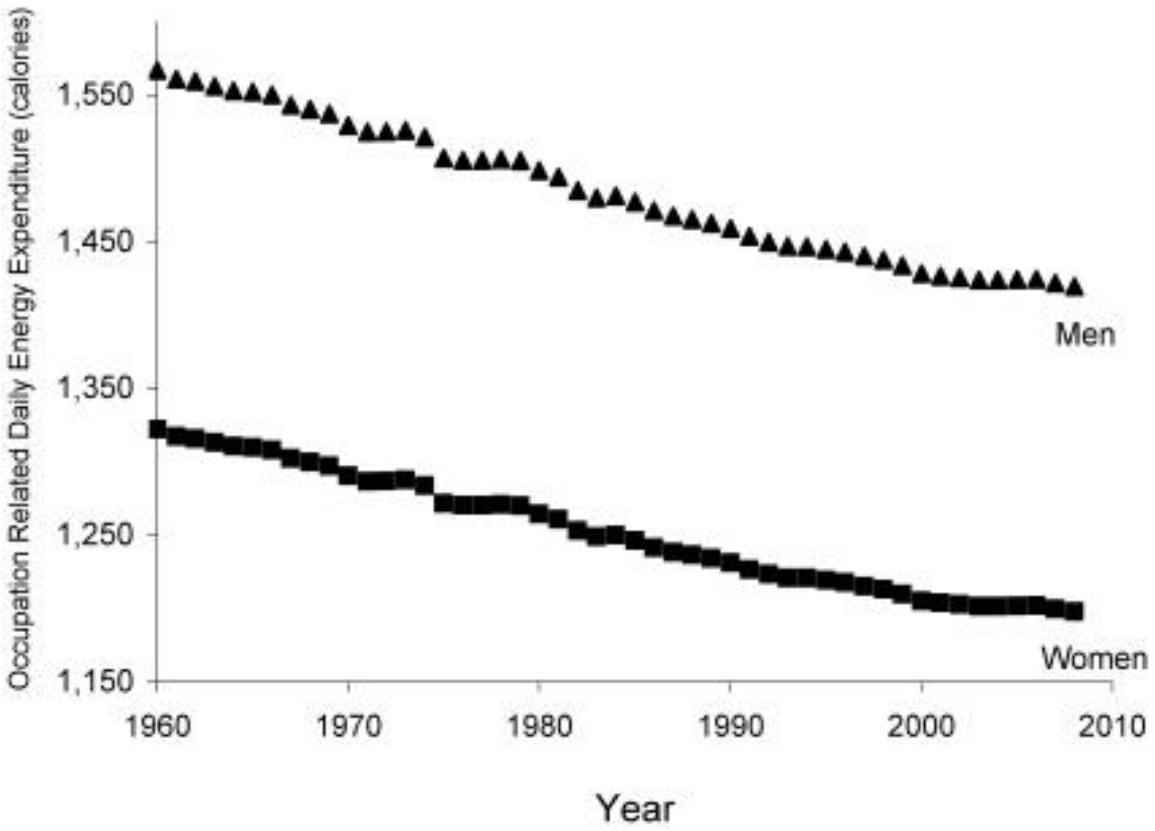
Lockdowns caused a decreased in physical activity.

This did not occur equally.

'Rebound' has not been equal.

May have severe knock-on consequences e.g. falls.

What is behind changes in activity levels?



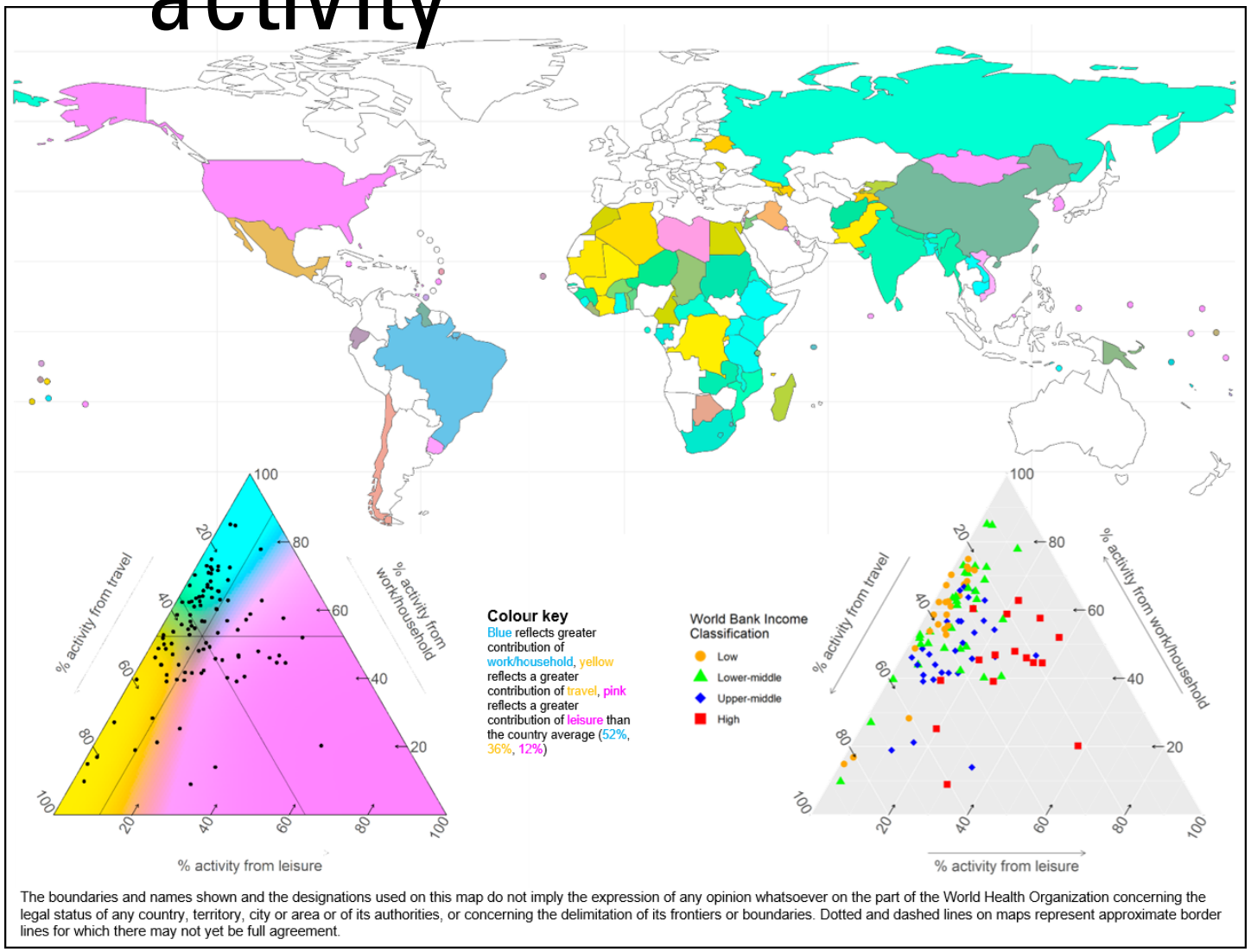
Source: Church et al. (2011) 10.1371/journal.pone.0019657

Energy expenditure at work is likely decreasing.

Daily occupation-related energy expenditure decreased by 100 calories over 50 years in the US.

Unclear if increases in leisure time activity can compensate.

The global perspective on occupational activity

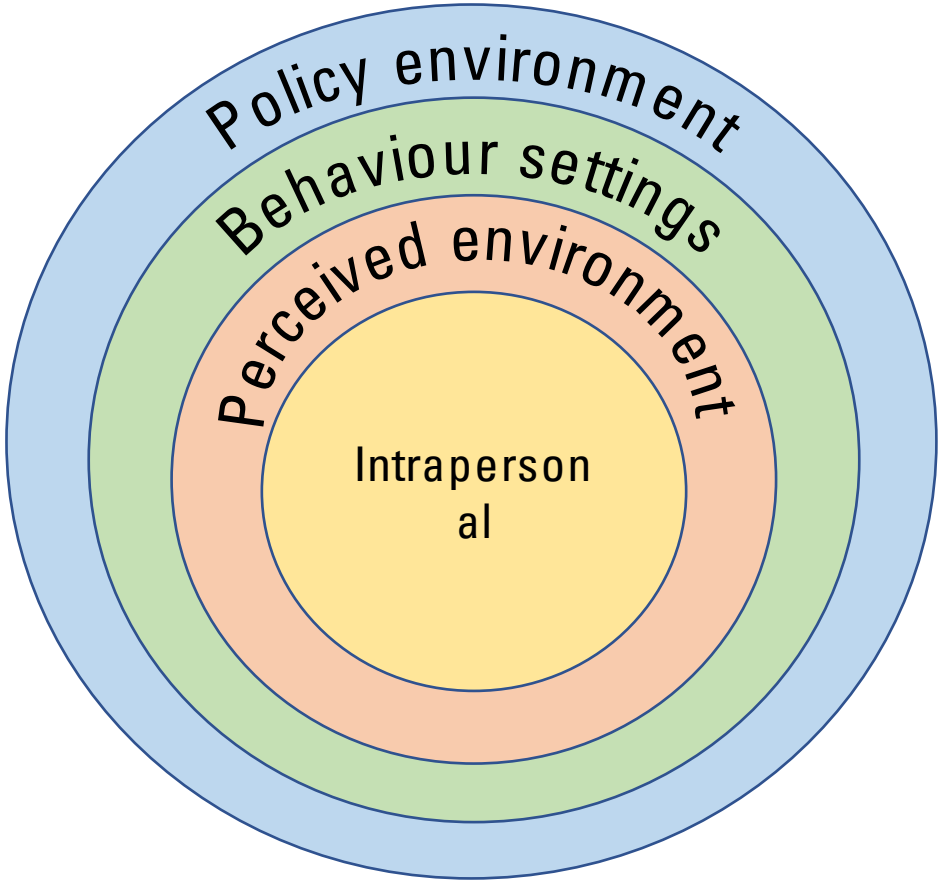


Above average contribution of:

- Pink: leisure time activity
- Yellow: travel activity
- Blue: work/household activity

Source: Strain et al. (2020) https://bjsm.bmj.com/content/54/24/1488

What influences physical activity levels?

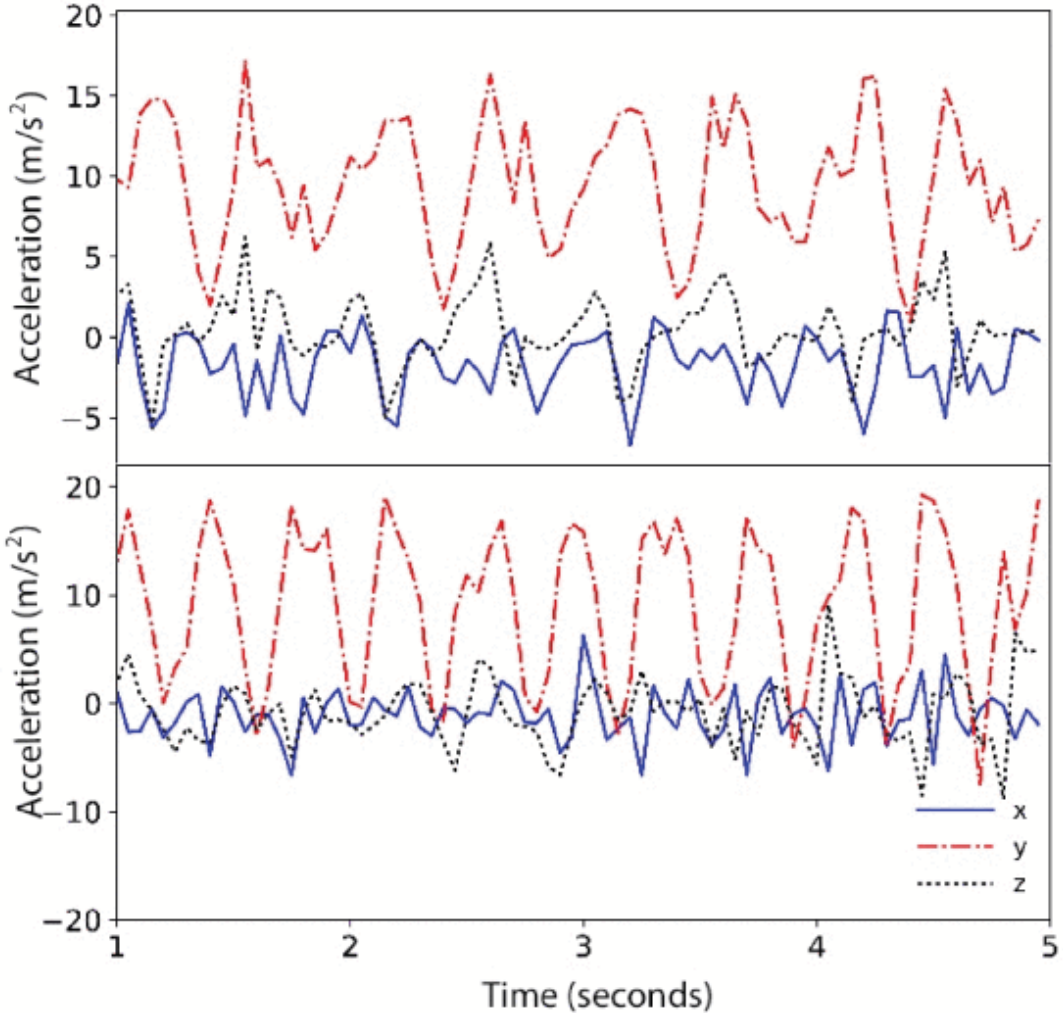


Many factors determine whether someone is regularly active.

Individual motivation is an important factor, but not the only factor. It is also rarely enough for it to be the single factor.

Source: adapted from Sallis et al. (2006) doi.org/10.1146/annurev.publhealth.27.021405.102100

Activity tracking using consumer wearables



Source: Weiss et al. (2010)
doi.org/10.1109/ACCESS.2019.2940729

- Tracker (often wrist-worn)
- Smartphone app
- Hybrid system

Measures acceleration

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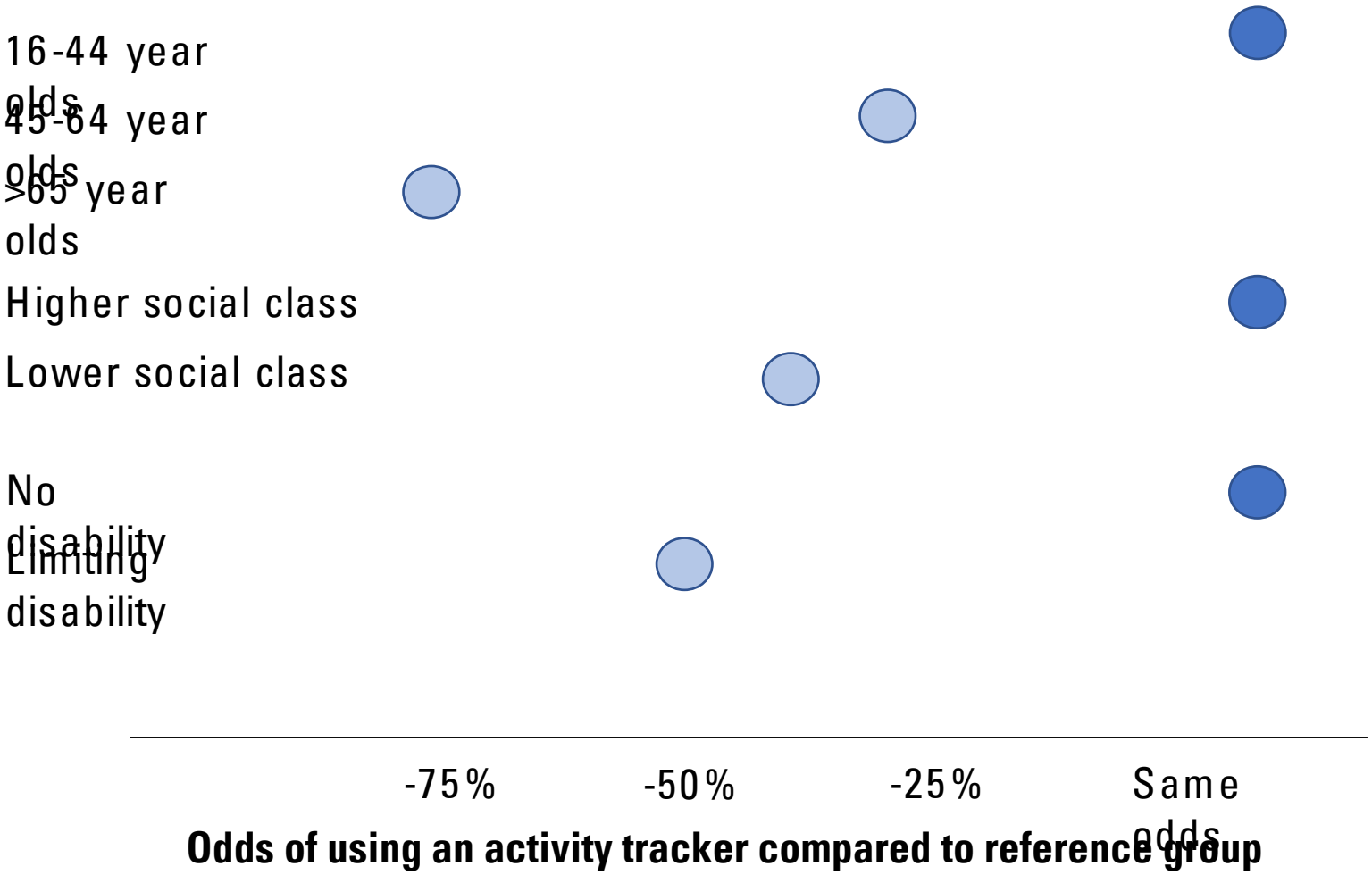
Black-box algorithms

Metrics e.g. steps, energy expenditure

Who uses activity trackers?



Those who use wearable activity trackers tend to be

- Younger
- More affluent
- Without a disability

They are also more likely to be active.

Source: adapted from Strain et al. (2019)
doi.org/10.2196/11898

Why do people use activity trackers?

36% want to monitor their activities

27% want to improve their fitness

18% want to improve their health

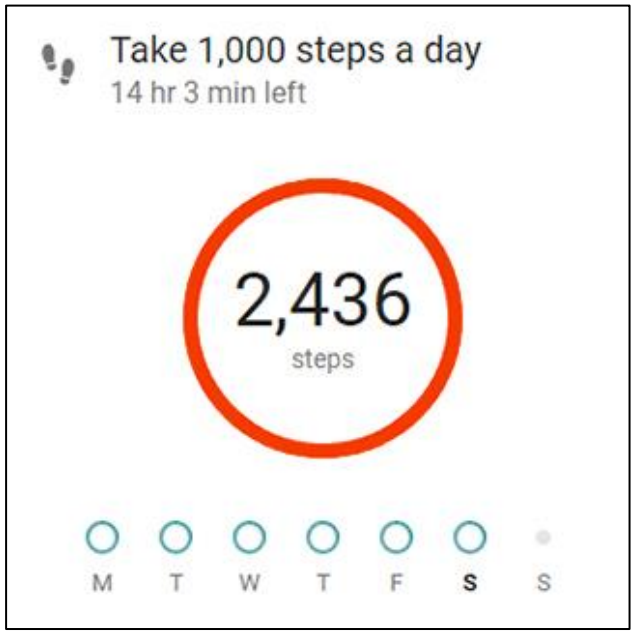
3% want to compete with family and friends

2% want to keep up with technology

(6% other)

Source: Maher et al. (2017) 10.1186/s12889-017-4888-1

Can activity trackers change behaviour?



They contain behaviour change techniques:

- Goal setting
- Feedback and rewards
- Prompts

Dükling et al. (2020)
https://doi.org/10.2196/20820

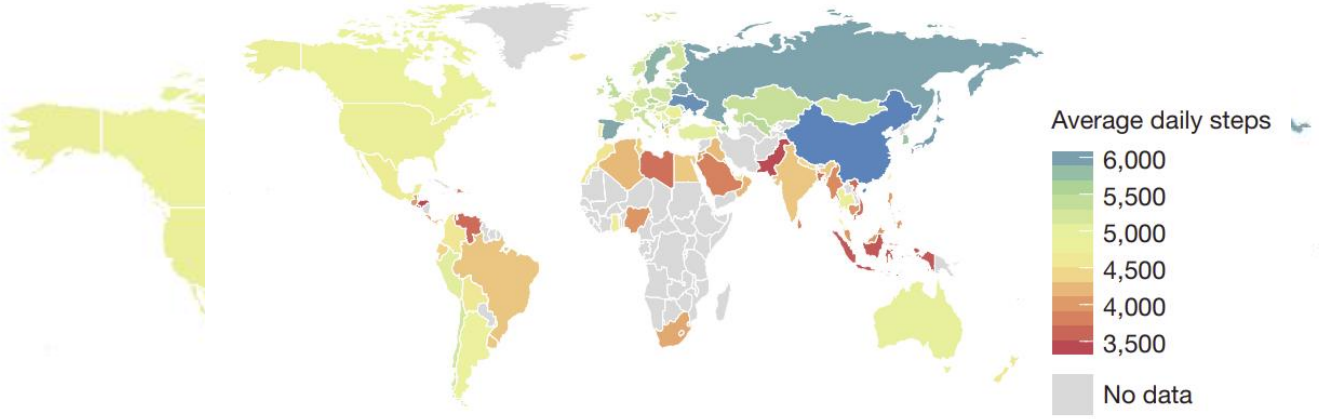
In a review of randomised trials:

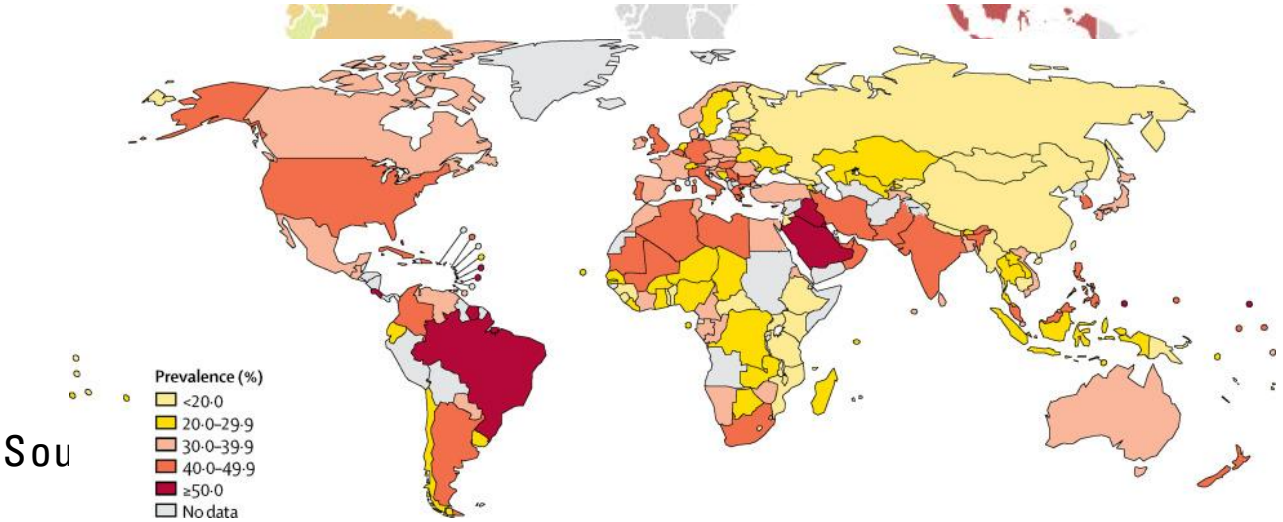
- Utilizing a consumer-based wearable activity tracker as either the primary component of an intervention or as part of a broader physical activity intervention had the potential to increase physical activity participation.
- The effects of physical activity interventions are often short term.

Brickwood et al. (2019)
https://doi.org/10.2196/11819

Can we use activity trackers to monitor behaviour?

Things to be aware of: (1) comparisons between populations





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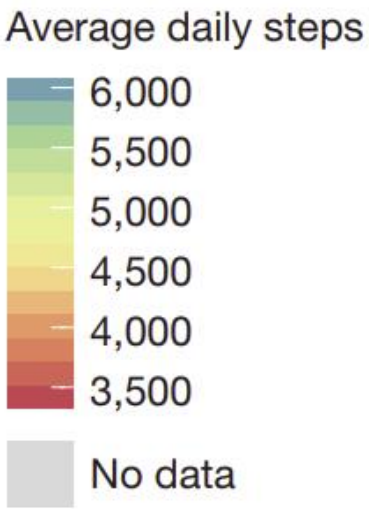
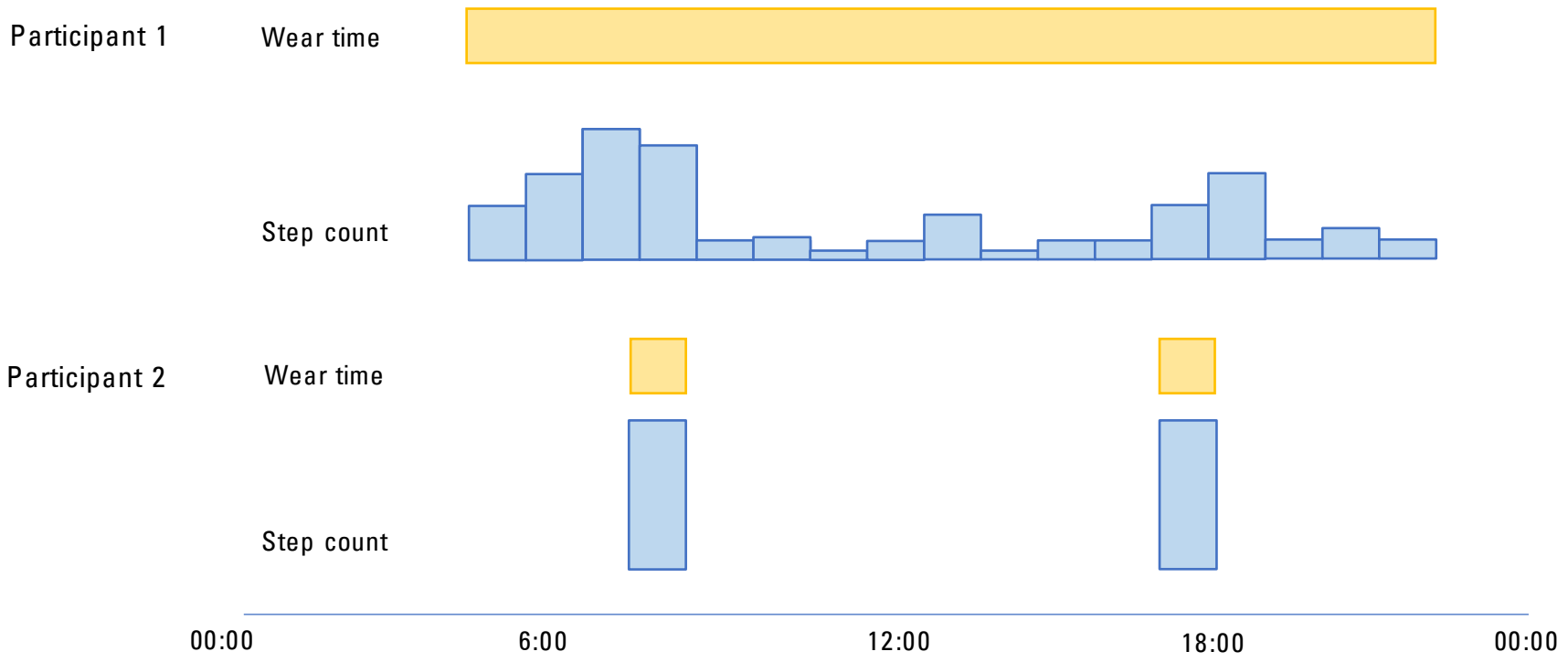


Sample:

Apple iPhone users of the Azumio Argus app.

Can we use activity trackers to monitor behaviour?

Things to be aware of: (2) comparisons between individuals



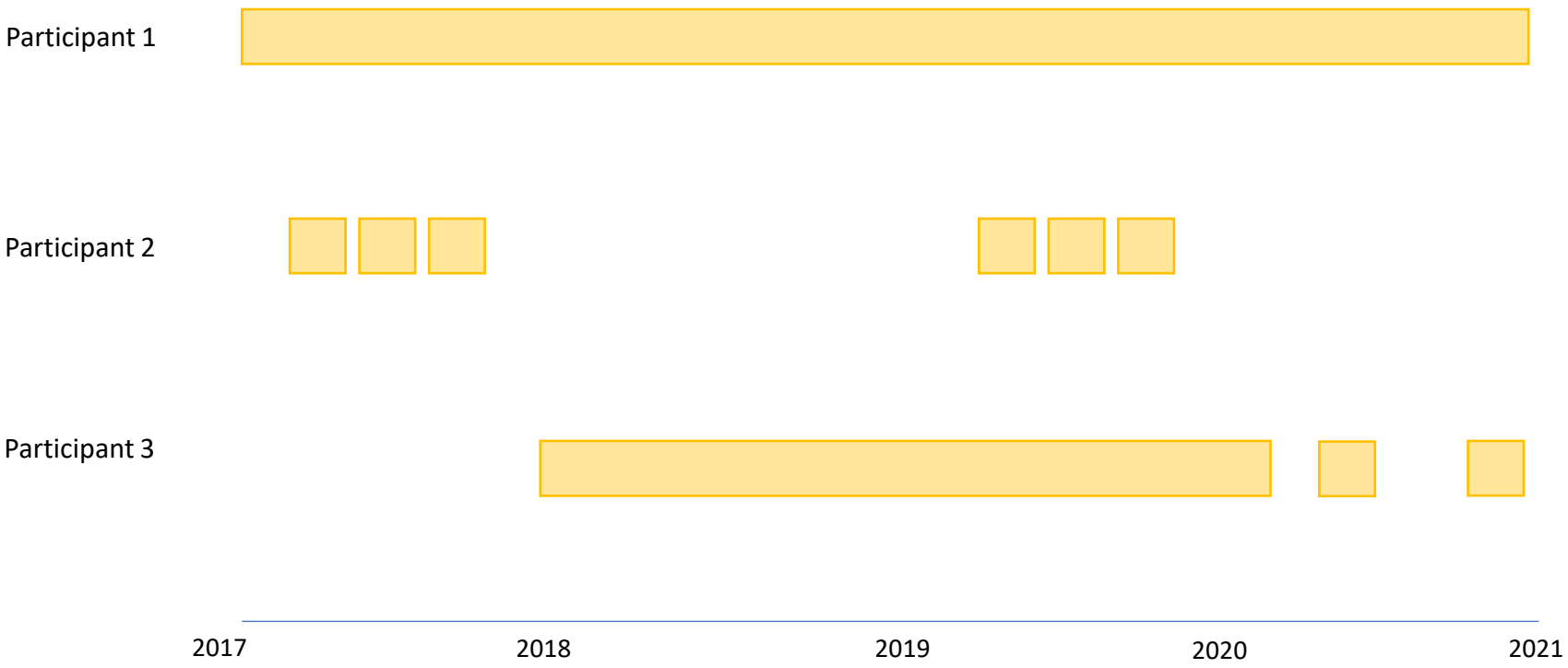
People have very different wear patterns for their tracker.

Depends on purpose of use, wear position, other factors…

Adapted from Strain et al. (2021) https://doi.org/10.1123/jmpb.2021-0046

Can we use activity trackers to monitor behaviour?

Things to be aware of: (3) comparisons within individuals



People may change their wear patterns.

This may depend on activity levels, external factors, etc

Adapted from Strain et al. (2021) https://doi.org/10.1123/jmpb.2021-0046

Concluding thoughts

- Physical activity levels are not increasing globally
- Increasing physical activity levels sustainably is complex
- Activity trackers offer an interesting opportunity for behaviour change
  - But activity tracker owners are not representative of the wider population
  - Comparing activity levels *between* individuals may be difficult
  - Comparing activity levels *within* individuals may be difficult
- Some groups of individuals may still need more support than just an activity tracker in order to change behaviour
  - That support might need to focus on wider factors influencing activity than just individual attributes

Thank you

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Disclaimer: The views presented here are my own and do not represent my employers or any funders. My research funding has primarily come from the Medical Research Council; please see papers for details.