

Physical Activity and COVID: Health Effects and Behavioral Changes

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Agenda

Physical Activity and COVID Severity

- **Early:** Obesity and Lifestyle Risk Factors
- **Middle:** PA Evidence Builds
- **Late:** Meta-analysis, CDC Lit Review

PA Participation During the Pandemic

- My take on the current literature
 - Domains
 - Timing
 - Consensus?

Physical Activity and COVID Severity

Early suggestions

- Obesity was flagged as a risk factor by spring, 2020

Factors associated with hospital admission and critical illness among 5279 people with coronavirus disease 2019 in New York City: prospective cohort study

Christopher M Petrilli,^{1,2} Simon A Jones,^{3,4} Jie Yang,⁴ Harish Rajagopalan,² Luke O'Donnell,¹ Yelena Chernyak,² Katie A Tobin,² Robert J Cerfolio,^{2,5} Fritz Francois,^{2,6} Leora I Horwitz^{1,3,4}

- As was smoking

Smoking Is Associated With COVID-19 Progression: A Meta-analysis

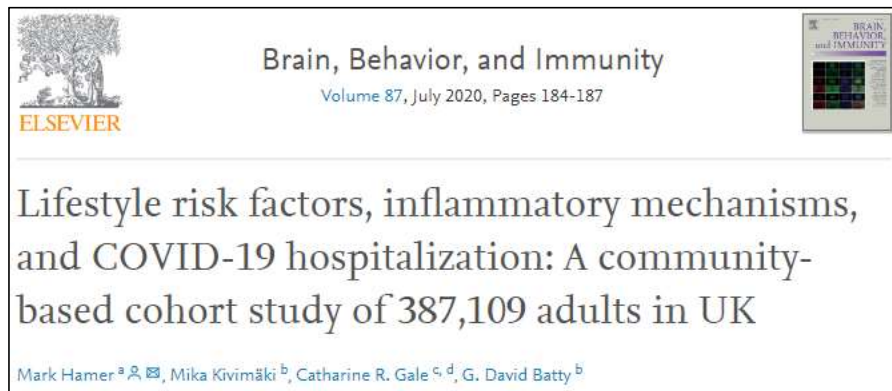
Roengrudee Patanavanich MD, LLM, PhD^{1,2}, Stanton A. Glantz PhD^{1,6}

What do they have in common?

Why were they identified so early as risk factors?

Standard Clinical Assessment

Building Physical Activity Evidence



- N=307,189 in UK Biobank
- Baseline lifestyle factors 2006-2010
 - IPAQ
- Outcome: COVID-19 hospitalization
- Compared to meeting the aerobic PAG:
 - 38% - 51% higher risk of hospitalization due to COVID among inactive
 - No increased risk among insufficiently active

Building Physical Activity Evidence

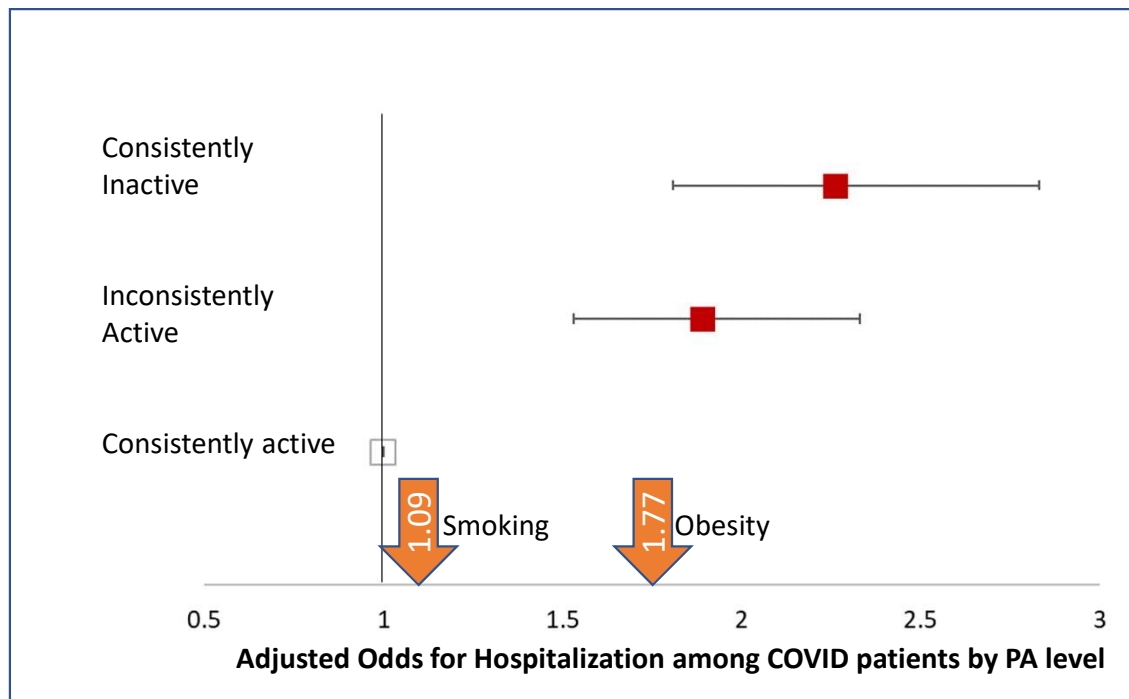
Physical inactivity is associated with a higher risk for severe COVID-19 outcomes: a study in 48 440 adult patients

Robert Sallis ¹, Deborah Rohm Young,² Sara Y Tartof,² James F Sallis,³ Jeevan Sall,¹ Qiaowu Li,² Gary N Smith,⁴ Deborah A Cohen²

April 2021, BJSM

- Kaiser Permanente of Southern CA
- Predominantly Female, Hispanic, <60y
- All had a +COVID Dx
- Outcomes
 - Hospitalization
 - ICU Admission
 - Death
- At least 3 visits with a PA Vital Sign:
 - On average, how many days per week do you engage in moderate to strenuous exercise (like a brisk walk)?
 - On average, how many minutes do you engage in exercise at this level?

Building Physical Activity Evidence



Adjusted for: demographics, underlying medical conditions associated with severe COVID-19 – including BMI, clinical utilization

Consensus: CDC Literature Review

- 25 studies: 15 cohort, 5 x-sectional, 4 ecological, 1 case-control
- “The data indicate an association between increased mortality and hospitalization due to COVID-19 infection and physical inactivity, and a possible association between increased ventilation due to COVID-19 infection and physical inactivity”
- The data suggest an increased risk of mortality and hospitalization due to COVID-19 infection with decreased duration or frequency of physical activity.

Consensus: CDC Literature Review

The screenshot shows the top portion of the CDC website. At the top left is the CDC logo and the text 'Centers for Disease Control and Prevention' with the tagline 'CDC 24/7: Saving Lives. Protecting People™'. To the right is a search bar with the text 'Search COVID-19' and a magnifying glass icon. Below this is a dark teal header with 'COVID-19' in white. Underneath is a navigation bar with several tabs: 'Your Health' (which is highlighted), 'Vaccines', 'Cases & Data', 'Specific Settings', 'Healthcare Workers', 'Health Depts', 'Science', and 'More'. Below the navigation bar, the page title 'People with Certain Medical Conditions' is displayed. To the left of the title is a breadcrumb trail: 'Your Health'. Below the title are several links: 'About COVID-19', a plus sign, 'Updated Sept. 2, 2022', 'Español | Other Languages', and 'Print'.

Physical inactivity


People who do little or no physical activity are more likely to get very sick from COVID-19 than those who are physically active. Being physically active is important to being healthy. Get more information on physical activity and health, physical activity recommendations, how to become more active, and how to create activity-friendly communities:

- [Physical Activity](#)
- [Physical Activity Guidelines for Americans, 2nd edition](#) 
- [Move Your Way®](#) 
- [Active People, Healthy NationSM: Strategies to Increase Physical Activity](#)
- [National Center on Health, Physical Activity and Disability – Building Healthy Inclusive Communities](#) 

Consensus: Meta Analysis

2022 Meta-
Analysis in
BJSM

Physical activity and risk of infection, severity and mortality of COVID-19: a systematic review and non-linear dose–response meta-analysis of data from 1 853 610 adults

Yasmin Ezzatvar  ¹, Robinson Ramírez-Vélez  ^{2,3}, Mikel Izquierdo  ^{2,3},
Antonio Garcia-Hermoso  ²

Let's take a look at the overall conclusions...

Hospitalisation

Brandenburg et al. 2021 [34]

de Souza et al. 2021 [38]

Hamdan et al. 2021 [35]

Hamer et al. 2020 [20]

Latorre-Román et al. 2021 [29]

Li & Hua et al. 2021 [40]

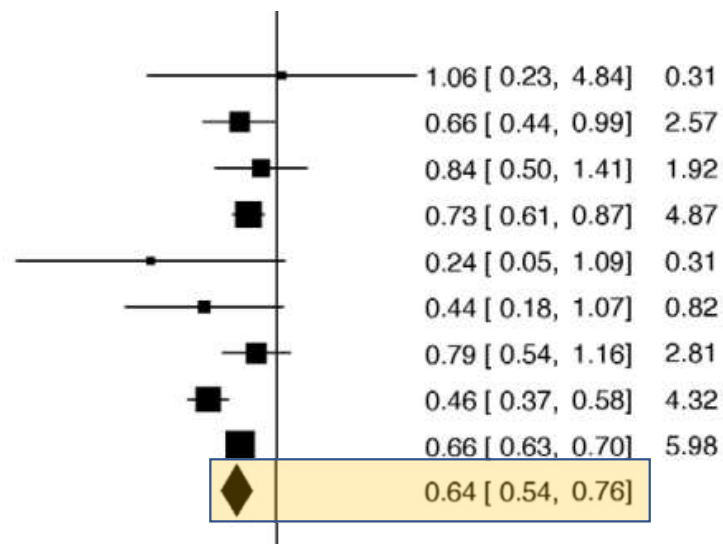
Maltagliati et al. 2021 [30]

Sallis et al. 2021 [21]

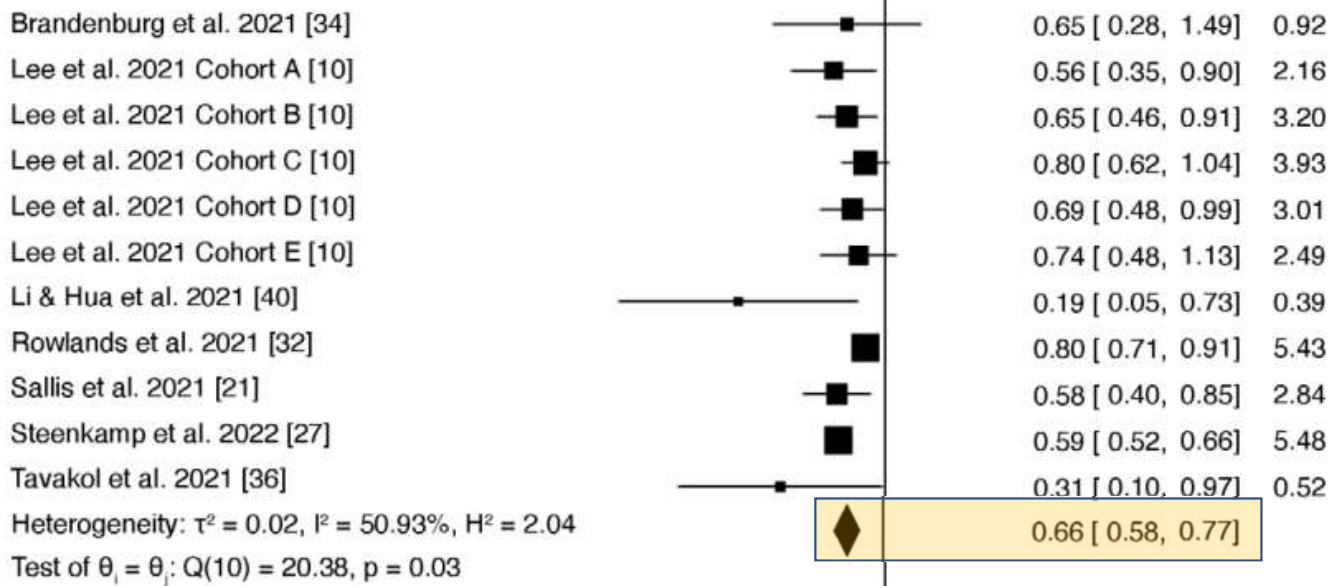
Steenkamp et al. 2022 [27]

Heterogeneity: $\tau^2 = 0.02$, $I^2 = 48.01\%$, $H^2 = 1.92$

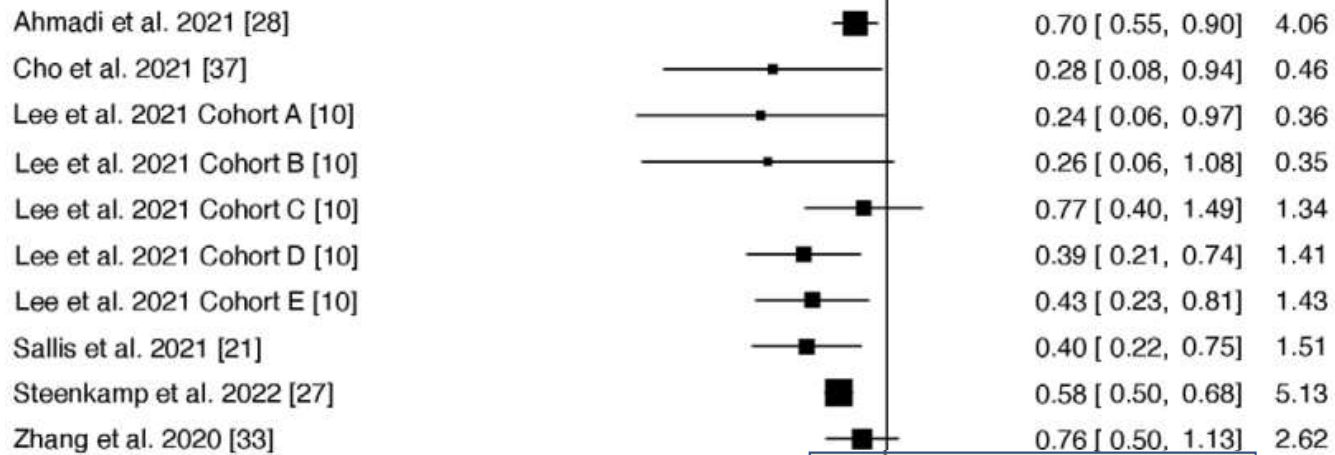
Test of $\theta_1 = \theta_j$: $Q(8) = 15.39$, $p = 0.05$



Severe COVID-19 illness (e.g., ICU, ventilation)



Mortality



Heterogeneity: $\tau^2 = 0.02$, $I^2 = 26.63\%$, $H^2 = 1.36$

Test of $\theta_1 = \theta_j$: $Q(9) = 12.27$, $p = 0.20$

0.57 [0.46, 0.71]

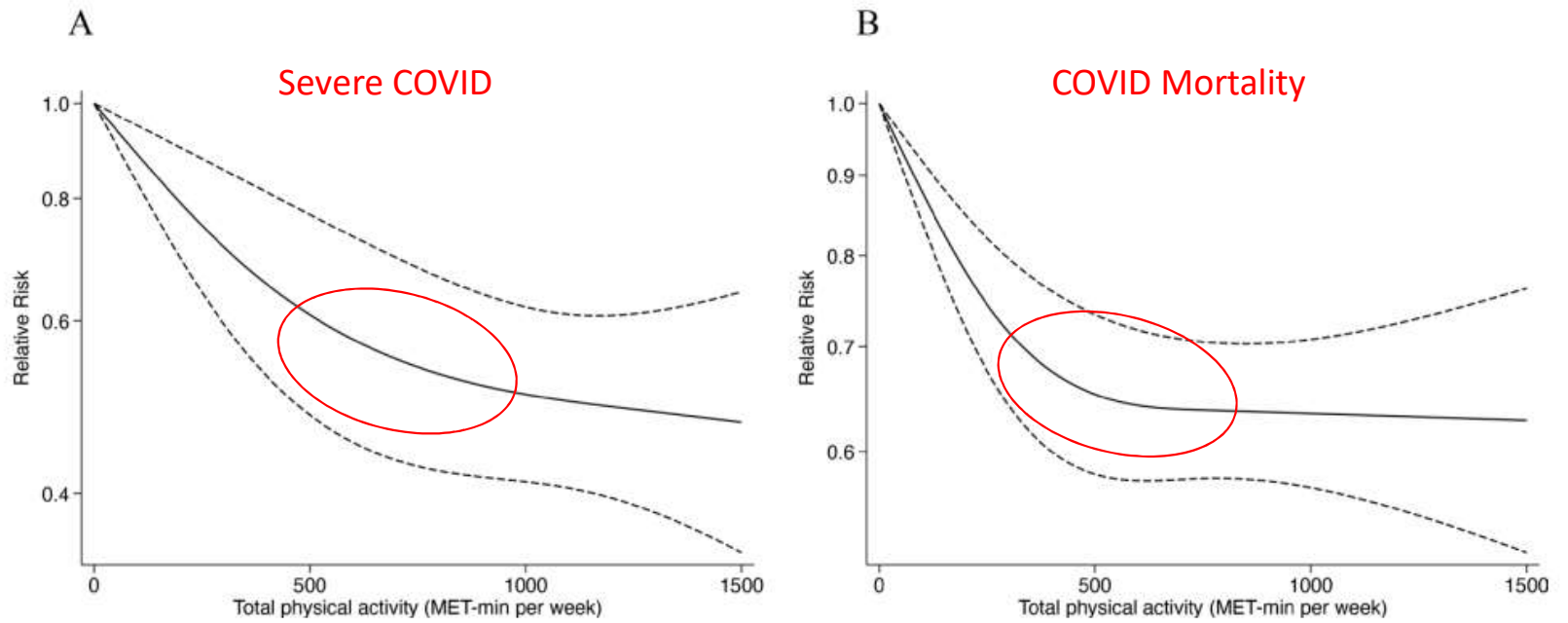
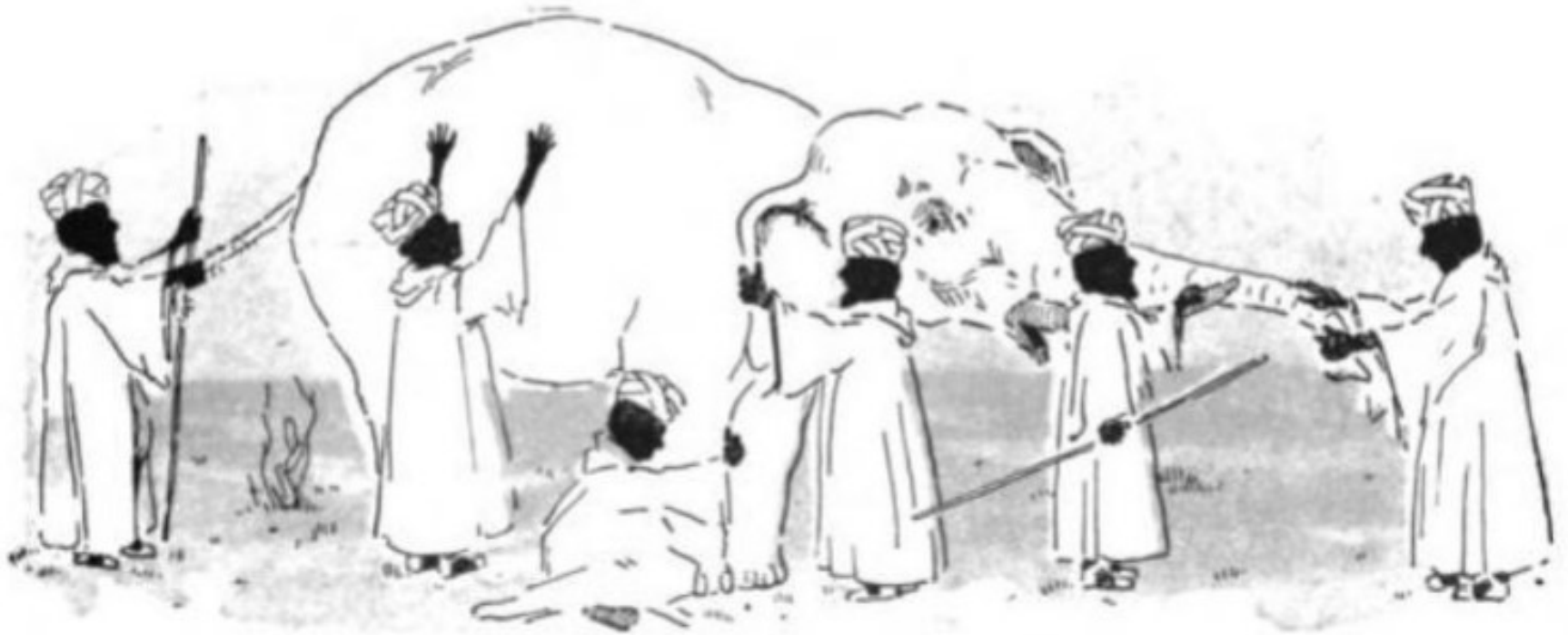


Figure 3 Non-linear relationship between physical activity and severe COVID-19 illness (A) and death due to COVID-19 (B).

What is next?

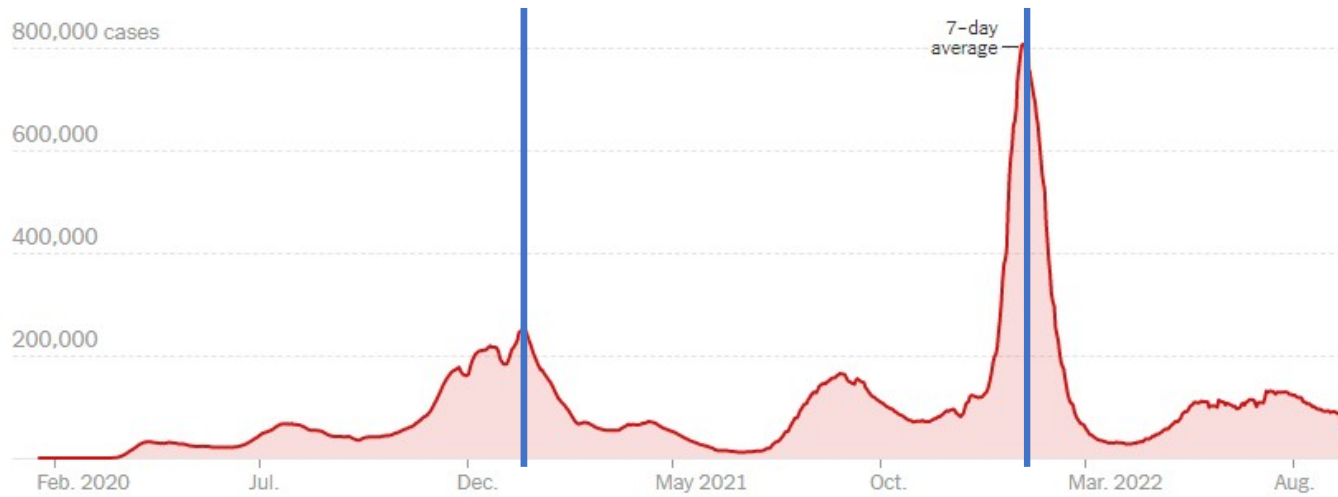
- PA and mortality due to influenza and pneumonia
- PAG 2028?
- Others? How do we “break in” to the infectious disease world?
 - Learn to play in a new sandbox

Physical Activity Behaviors During COVID

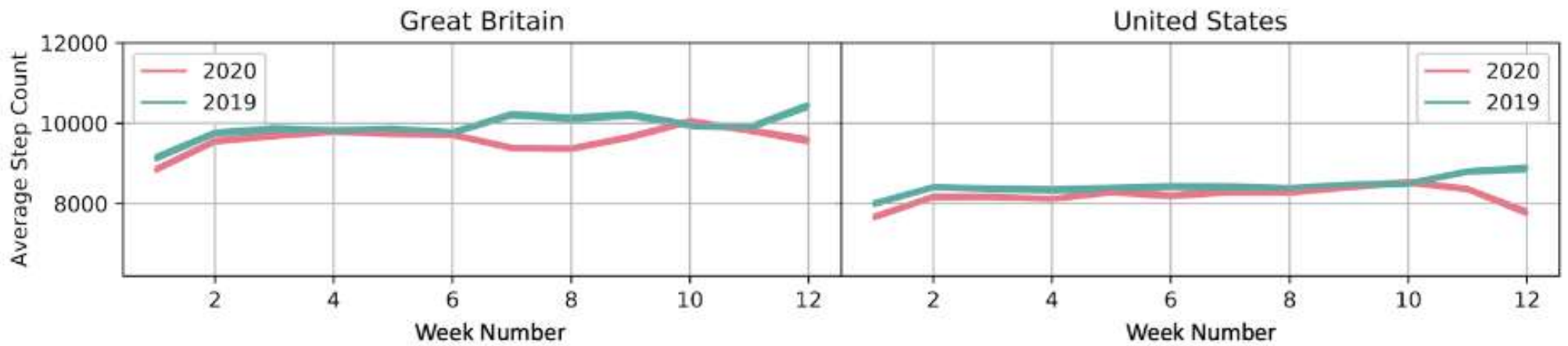


Wikipedia: Public Domain

	Leisure	Transport	Occupational	Household	TOTAL
Early ~2020					
Middle ~2021					
Late ~2022					



FitBit – 30+ Million Users

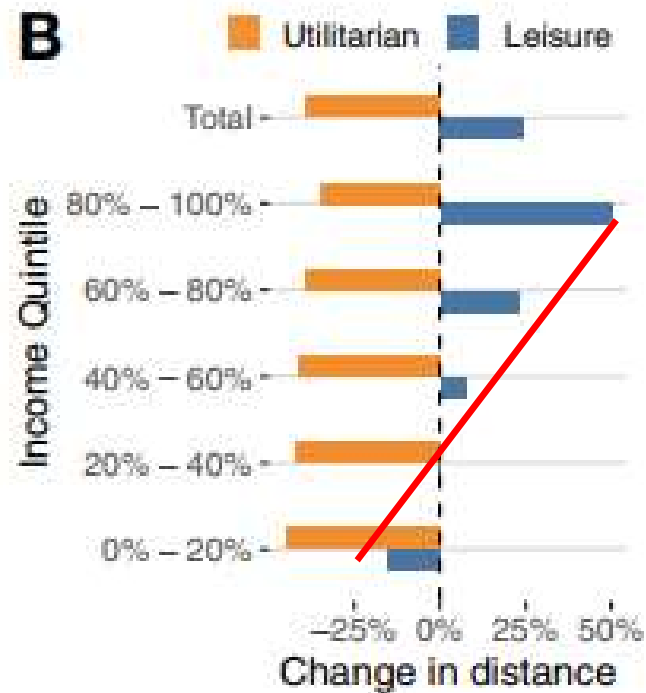


March 23, 2020

Fitbit.com

Hunter, et al., Nature Communications, June
2021

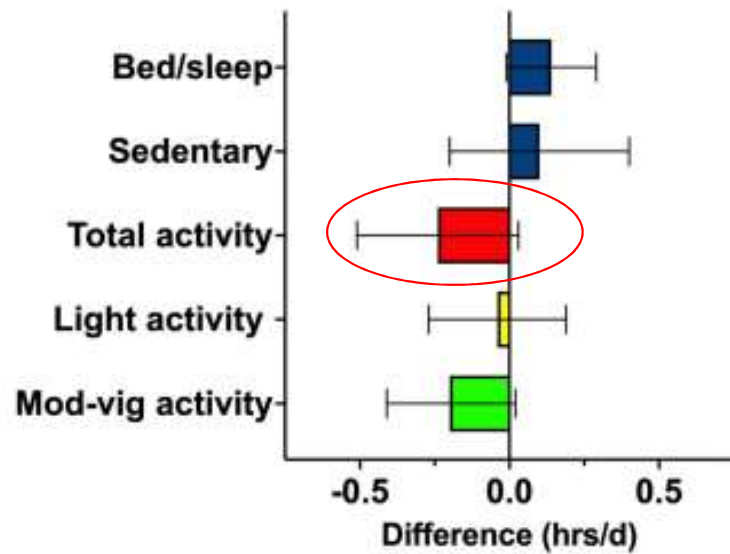
Hunter, et al., Nature Communications, June 2021



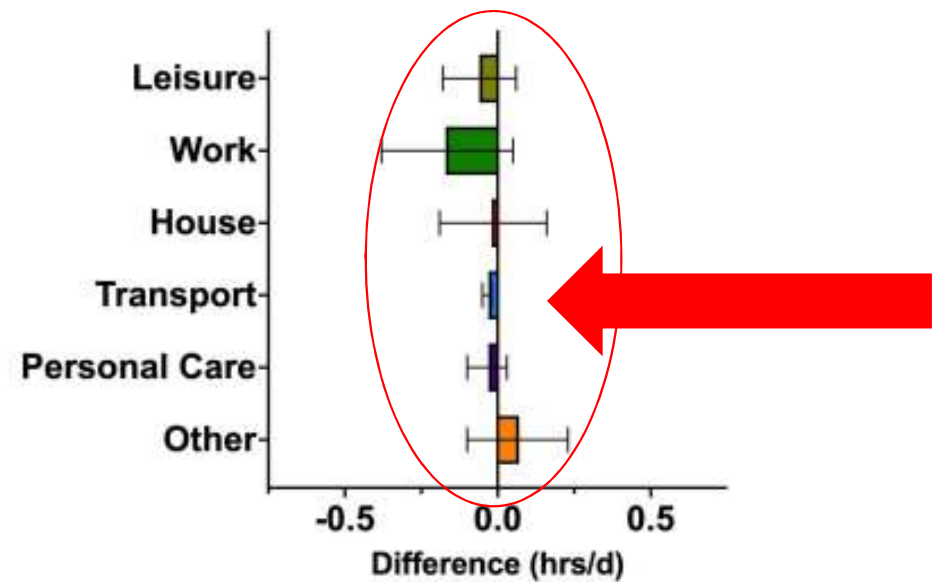
Matthews, et al., PLoS One, Sept 2022

(Fall 2019 to Fall 2020)

A. Daily behaviors



D. Physical Activity

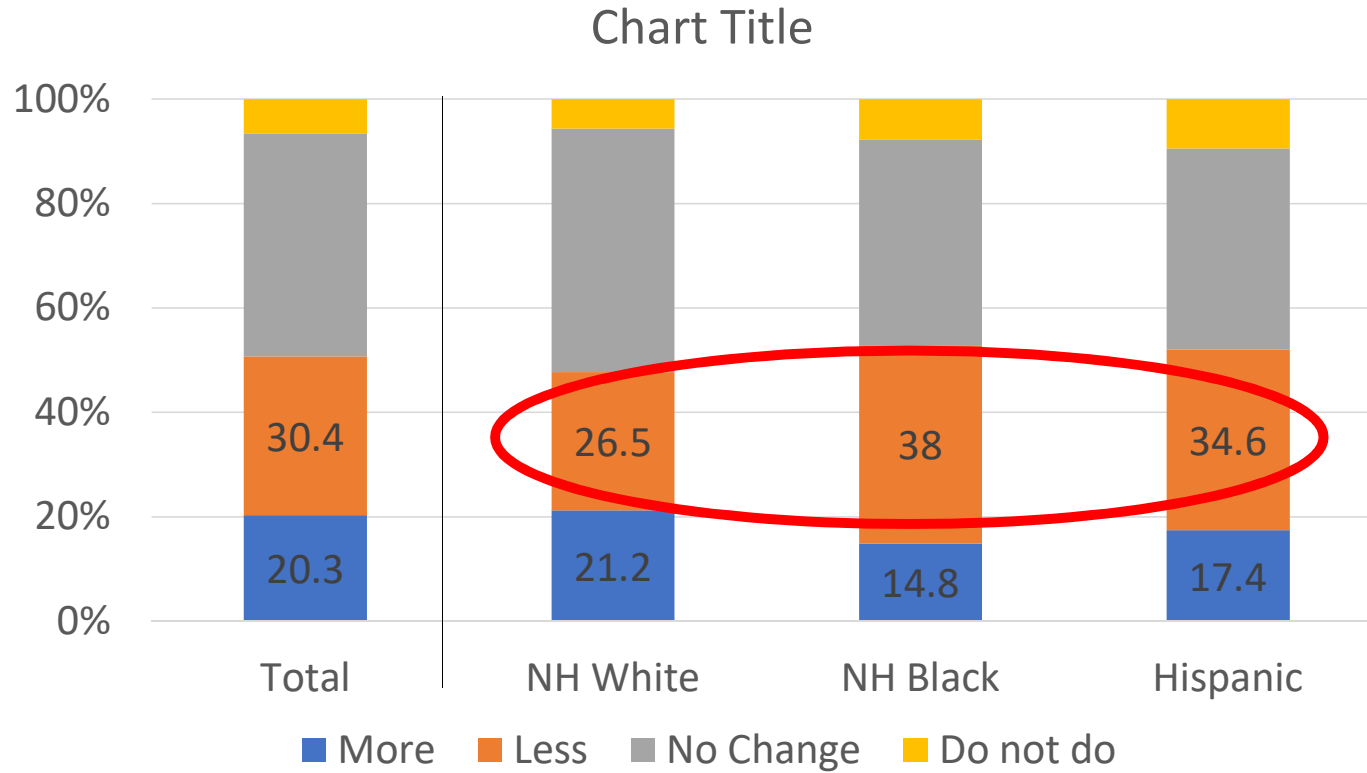


Reduction in total PA was significant only among women





Matthews, et al., PLoS One, Sept 2022

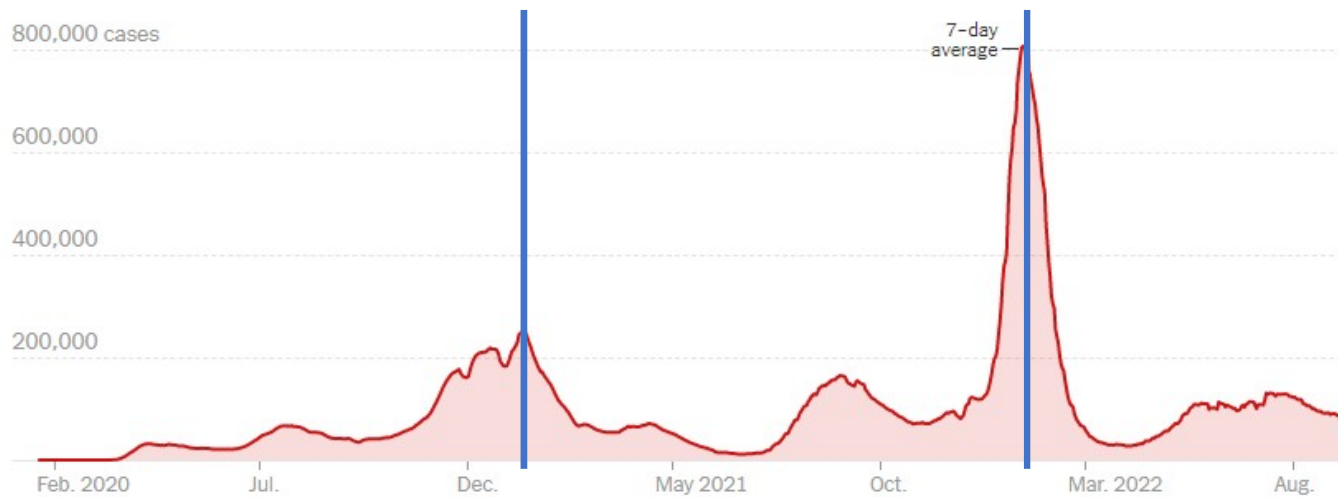
- Significant decreases in physical activity:
 - **Transport PA:** Overall, Men, Women, 20-39 years, teleworkers
 - **Leisure PA:** Women
 - **Occupational PA:** 20-39 years

Watson, et al., IJBNPA 2021

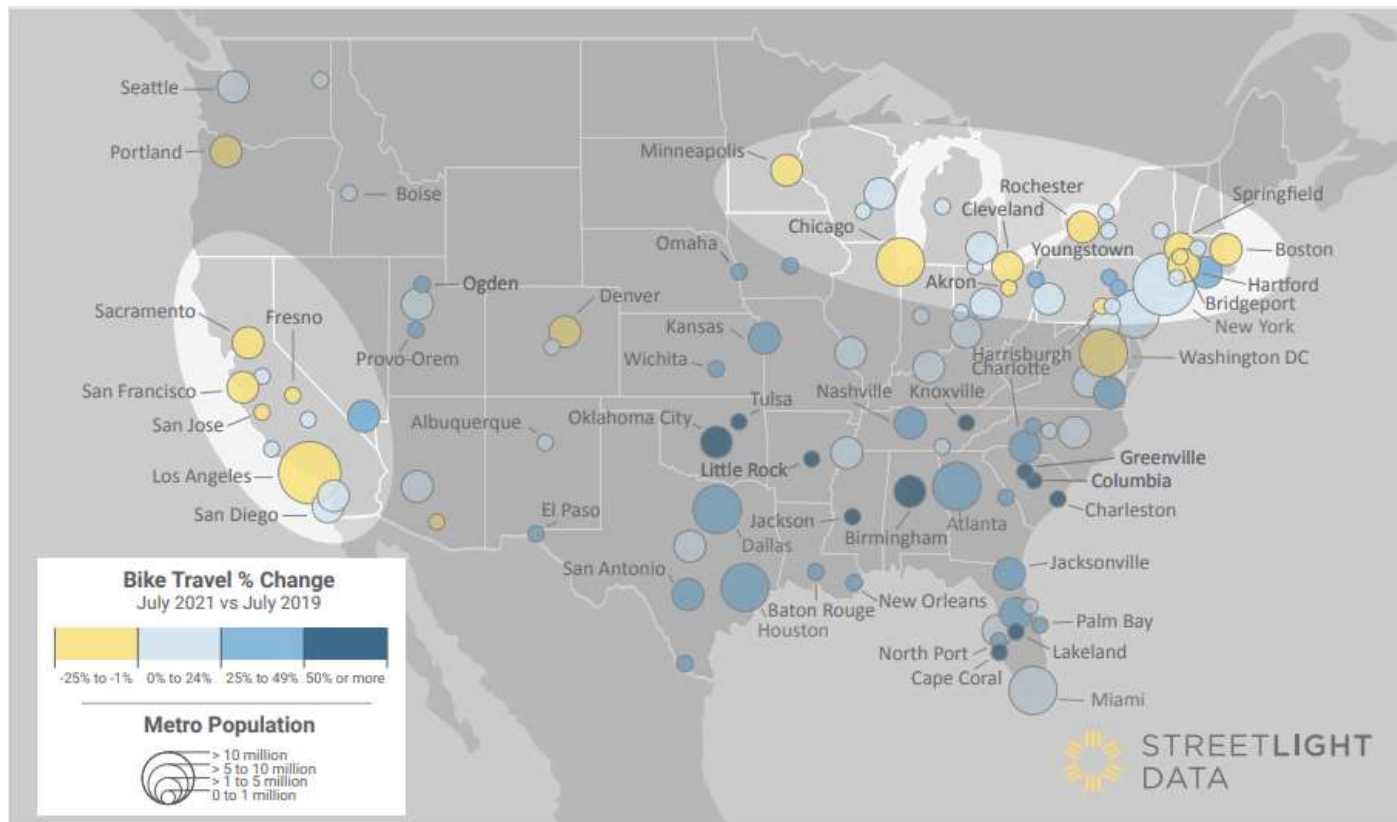


Data from the Styles Survey, June 2020

	Leisure	Transport	Occupational	Household	TOTAL
Early ~2020	↑ High SES Retirees ↓ Women?		 20-39yo	 Older adults	 Inconsistent across groups
Middle ~2021					
Late ~2022					

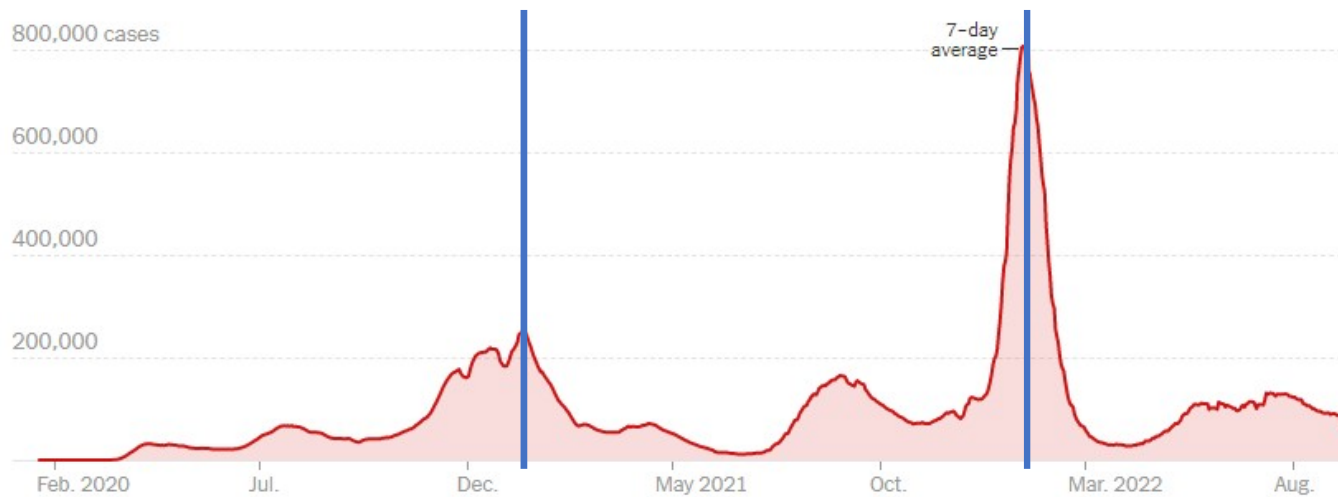


StreetLight, Inc: Bicycling in 2020 and 2021



Reproduced from material at [StreetLightData.com](https://www.streetlightdata.com)

	Leisure	Transport	Occupational	Household	TOTAL
Early ~2020	↑ High SES Retirees ↓ Women?	↓	↓ 20-39yo	↓ Older adults	↓ Inconsistent across groups
Middle ~2021	Biking: up 10% in top 100 Metros				
Late ~2022	Waiting on NHANES, NHIS*, YRBS				



Thanks!