

Sex and health across gendered contexts: A focus on generational differences

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Sex, health & gendered mechanisms

- There are well-known sex differences in physical and mental health outcomes.
- These health differences can be due to both biological sex (e.g. chromosomal and hormonal factors), as well as gendered social experiences.
- Gendered exposure to socioeconomic disadvantage, psychosocial stressors, and their embodiment.
- Disentangling these different causes and mechanisms is challenging, yet critical to understanding the impact of social mechanisms and the role of policy.



Terminologies: Sex / gender

Throughout this presentation, “sex” refers to biological distinctions based on chromosomal, hormonal, and anatomical “female” or “male” characteristics, conceptualised as female or male sex as assigned at birth.

- How sex is recorded in available research data.
- Focus on exposure to binary gender norms and gendered life course patterns associated with a person’s perceived/assigned sex at birth.

Accordingly, the use of the terms “gendered mechanisms/pathways” and “gender” in this presentation refers to the downstream lived experience and biosocial exposures of individuals with female or male assigned sex at birth.

Sex and gender - Conceptual and methodological complexities

- Gender definition and measurement – variable and multi-dimensional
- Causal inference assumptions pose challenges:
 - **Consistency:** Gender is not a clearly defined, manipulable "treatment."
 - **Positivity:** One cannot experience the gendered environment associated with another sex assignment at birth.
 - Triangulation of methods: **heterogeneity analyses** & causal mediation analyses



Gender (equality) norms & health

Heterogeneity analyses to compare the causal effect of sex on health across more or less gendered contexts.

- Generation as a proxy for different social/gendered contexts.
- Gender norms and gender role attitudes have become progressively more gender equal over time (mainly attributed to generational replacement).



Generation, sex and health (1)

- **Smoking, lung cancer morbidity & mortality, alcohol consumption** (male disadvantage): most consistent evidence
 - ↓ Narrowing sex differences: overall decline in smoking, but women's decline occurred later, leading to a delayed peak in their **lung cancer risk** in later cohorts [1-3].
 - ↓ Review: Narrowing sex differences in **heavy drinking** due to a more rapidly increasing drinking risk among women [4].
- **Healthy life expectancy, morbidity, and multimorbidity** (female disadvantage) in later life
 - ↑ Increasing sex differences in younger cohorts in Australia and Hong Kong [5,6].

Generation, sex and health (2)

- **Mental health:** inconsistent evidence

- ↓ Narrowing sex differences in depression and life satisfaction (female disadvantage) in younger cohorts across countries [7-9]
- ↑ Widening disparities in depressive symptoms among middle-aged and older adults in younger Chinese cohorts [10]
- ↑ Widening sex gap in suicide mortality (male disadvantage) in younger cohorts in Hong Kong [11]
- = Stability in psychological sex differences across cohorts [12,13]

Generation, sex and health (3)

- **Self-rated health:** inconsistent evidence
 - ↓ Narrowing [14,15] or even reversing of sex differences [16]
 - ↑ Small but insignificant increases [17] of sex differences in younger cohorts
 - ↕ First a widening and then narrowing of sex differences for late US Baby Boomers and subsequent cohorts [18]

Evidence gap:

- Inconsistent evidence across various country contexts, sample characteristics, and methodological approaches (age-period-cohort)
- No study assessed sex differences in health outcomes across generations/cohorts in the UK context

Aims, objectives and research questions

To examine sex differences in mental health, physical functioning and poor self-rated health, and effect modification by generation, within a large, longitudinal study representative of the UK population.

Research questions:

1. How is sex at birth associated with mental health, physical functioning and poor self-rated health?
2. Does the association between sex and health outcomes vary by different social/ gendered contexts, i.e., across generations?

Data & Measures

Data: BHPS & UKHLS (BHPS 01-18, UKHLS 01-14; 1991-2024)

Exposure: Sex at birth

Effect modifier: Generation

- Silent Generation/Baby Boomers (<1965)
- Generation X (1965-1980)
- Generation Y/Z (>1980)

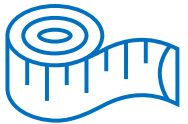


Outcome	Measure	Waves
Mental health	GHQ-12	All waves BHPS & UKHLS
	SF-12 MCS*	UKHLS 01-14
Physical functioning	SF-12 PCS*	UKHLS 01-14
Self-rated health	SF-12 item: Poor/fair vs excellent/very good/good	UKHLS 02-14
*z-standardised to account for potential mode effects		

Sample definition



16-65 years old



Non-missing outcome (at baseline and at least two follow-ups)



Missing/inconsistent reports of sex

Analyses

- Growth curve models in Stata
 - Cubic age trajectories
 - Random intercepts and random slopes for age
 - Clustering at PSU level
- UKHLS baseline survey weights
- Marginal effects to estimate the average effects of sex

Moderation analyses: Age-period-cohort (APC) identification problem

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$$\textit{Period} = \textit{Cohort} + \textit{Age}$$

Moderation analyses: Age-period-cohort (APC) identification problem

- Age-period-cohort (APC) identification issue also applies to the product sex*generation:

$$Period*SEX = Cohort*SEX + Age*SEX$$

- No solution, however, we can make some (untestable) assumptions.
- 2-factor models (e.g., omitting period/wave) may suffer from omitted variable bias
- 3-factor models make use of the fact that the APC identification problem only applies to linear effects, i.e., non-linear effects of period/wave can be included

Analyses – moderation analyses

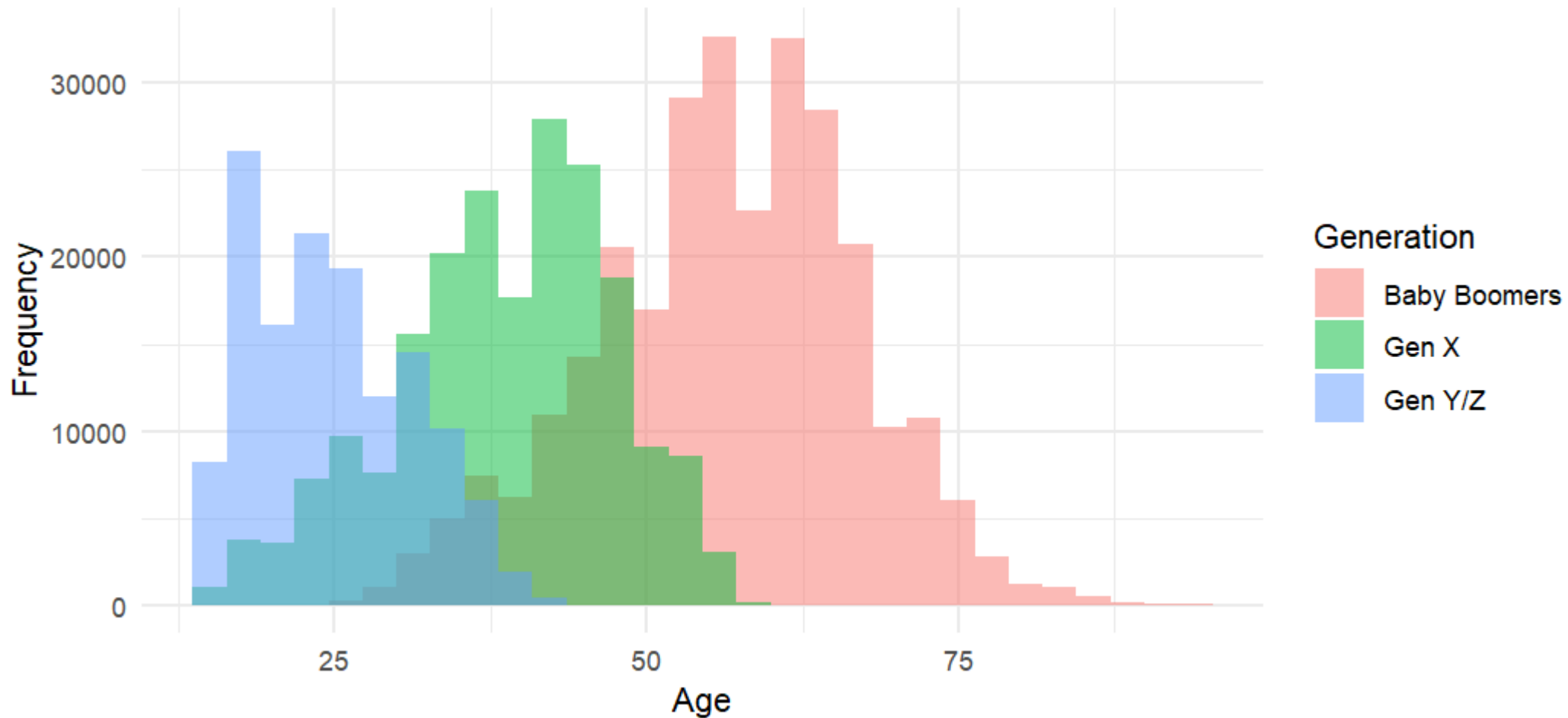
- Moderation analyses conducted using the following models
 - 2-factor model (sex*generation*age growth curve models; wave omitted)
 - 3-factor model (incl non-linear effects for wave & interactions)
- Estimations of marginal effects of sex by generation using overlapping age ranges
- Sensitivity analyses: second-best-fitting/alternative model specification

Descriptives

Sample, N(%)

	Total	Silent Gen./ Baby Boomers	Generation X	Generation Y/Z
GHQ-12	56,679 (100)	21,438 (37.8)	17,992 (31.7)	17,249 (30.4)
Of which female	30,933 (54.6)	11,610 (54.2)	9,820 (54.6)	9,503 (55.1)
SF-12	44,147 (100)	14,176 (32.1)	14,441 (32.7)	15,530 (35.2)
Of which female	24,466 (55.4)	7,770 (54.8)	8,090 (56.0)	8,606 (55.4)
SRH	42,564 (100)	13,224 (31.1)	13,975 (32.8)	15,365 (36.1)
Of which female	23,605 (55.5)	7,243 (54.8)	7,823 (56.0)	8,539 (55.6)

Age distribution by generation



Descriptives: age (26-42) standardised proportions/means

	Baby Boomers	Gen X	Gen Y/Z
Gender role attitudes, M (SE)			
Women	12.7 (0.04)	13.1 (0.02)	13.7 (0.05)
Men	11.8 (0.04)	12.6 (0.02)	13.1 (0.06)
In paid work, %			
Women	71.2%	75.3%	79.2%
Men	88.9%	91.2%	89.7%
Gender gap (pp)	17.7%	15.9%	10.5%
In full-time work %			
Women	43.5%	48.2%	53.0%
Men	88.0%	86.1%	82.8%
Gender gap (pp)	44.5%	37.9%	29.8%
Personal income, M (SE)			
Women	£514 (8.3)	£1,124 (6.2)	£1,576 (9.2)
Men	£1,376 (12.2)	£2,132 (9.4)	£2,381 (13.4)
Gender ratio	37.4%	52.7%	66.2%

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Descriptives: age (26-42) standardised proportions/means

	Baby Boomers	Gen X	Gen Y/Z
Weekly hrs of housework, M (SE)			
Women	18.8 (0.13)	14.2 (0.06)	11.8 (0.09)
Men	5.4 (0.06)	5.7 (0.03)	6.3 (0.06)
Gender gap (hrs)	13.4 hrs	8.5 hrs	5.5 hrs
Main child carer, %			
Women	69.2%	64.9%	60.1%
Men	2.7%	3.2%	2.8%
Gender gap (pp)	66.5%	61.7%	57.3%
Caring >= 20 hrs, %			
Women	3.0%	3.8%	4.8%
Men	1.4%	1.9%	2.5%
Gender gap (pp)	1.6%	1.9%	2.3%

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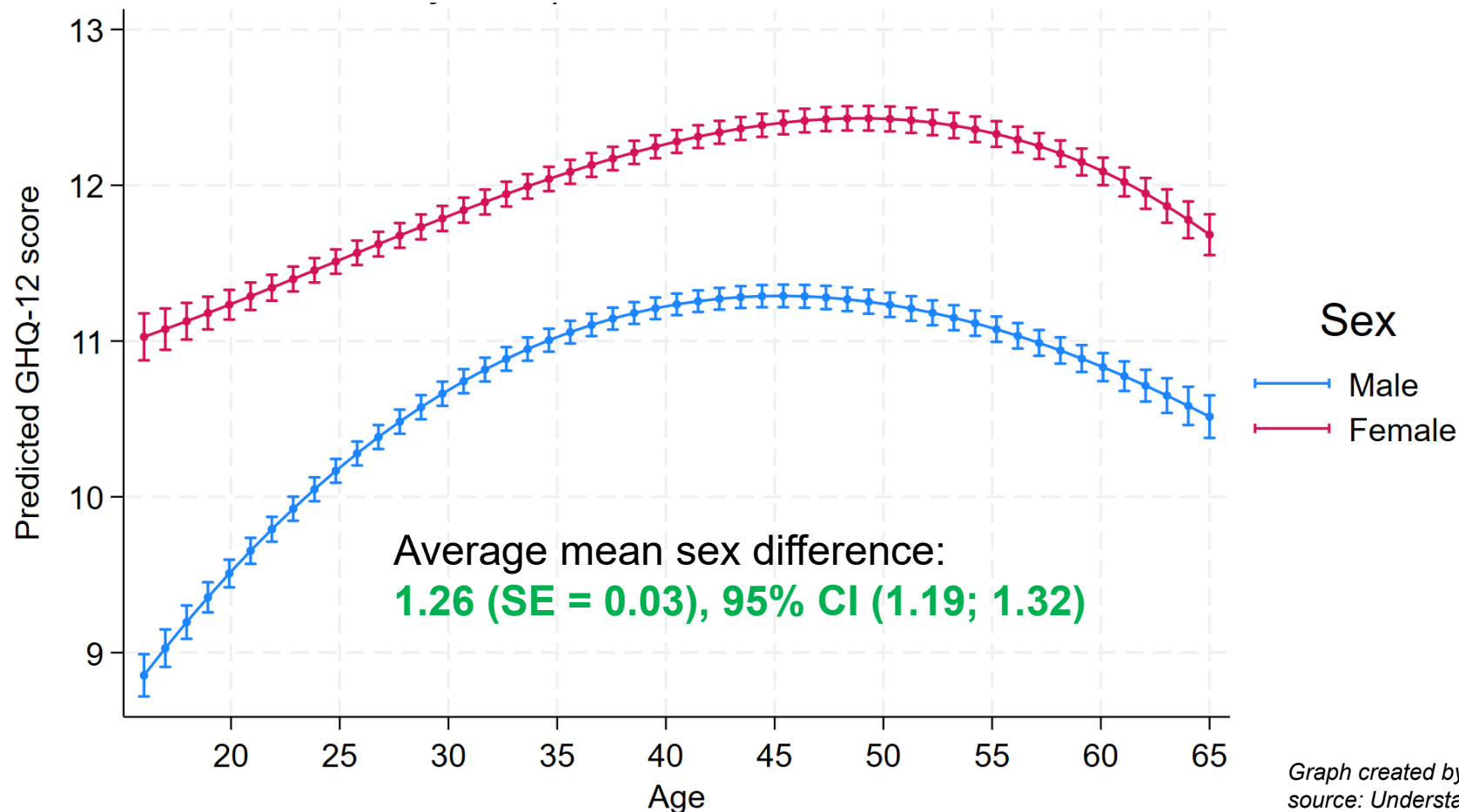
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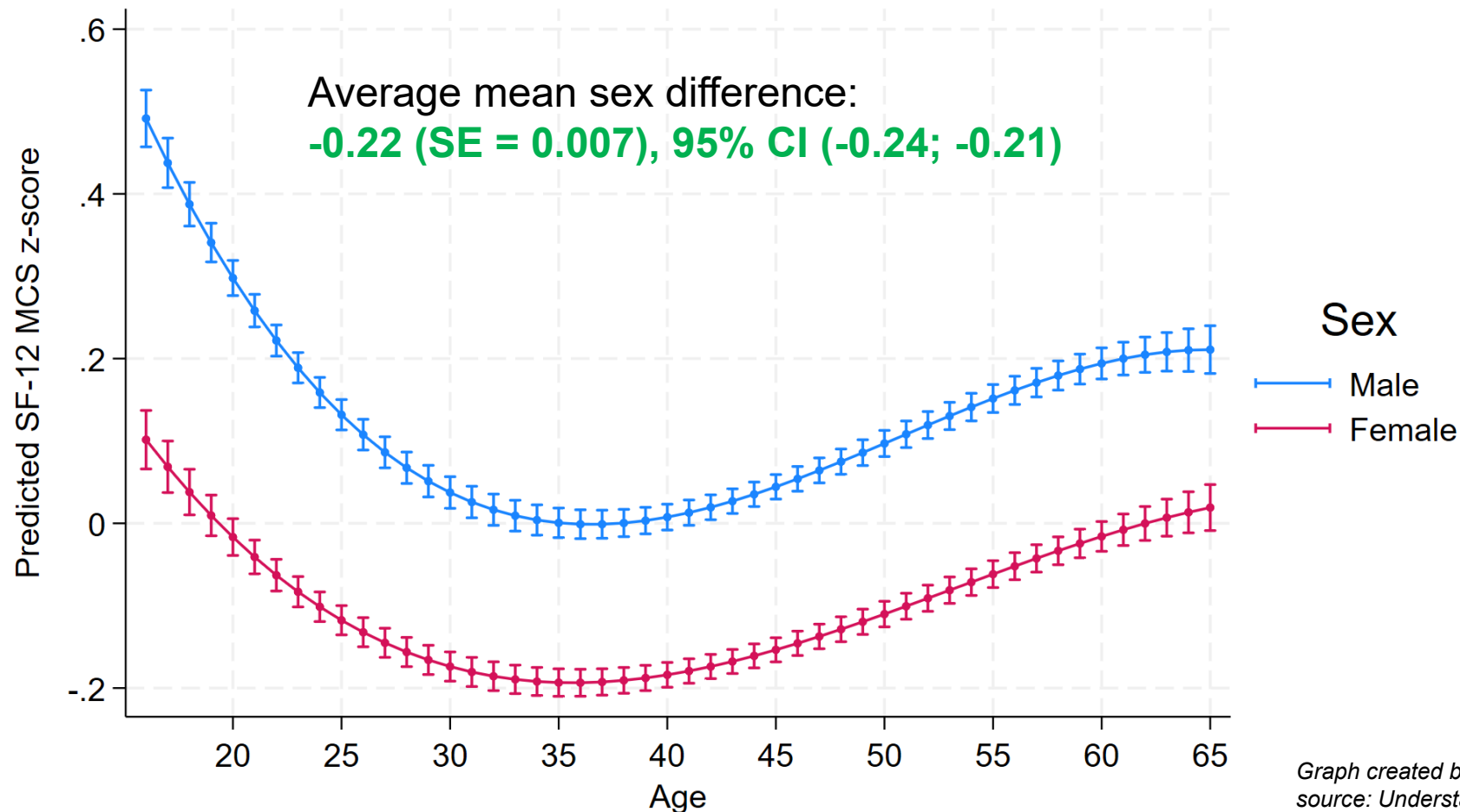
**RQ1: How is sex at birth associated
with health outcomes?**

Women experience higher distress across waves/ages



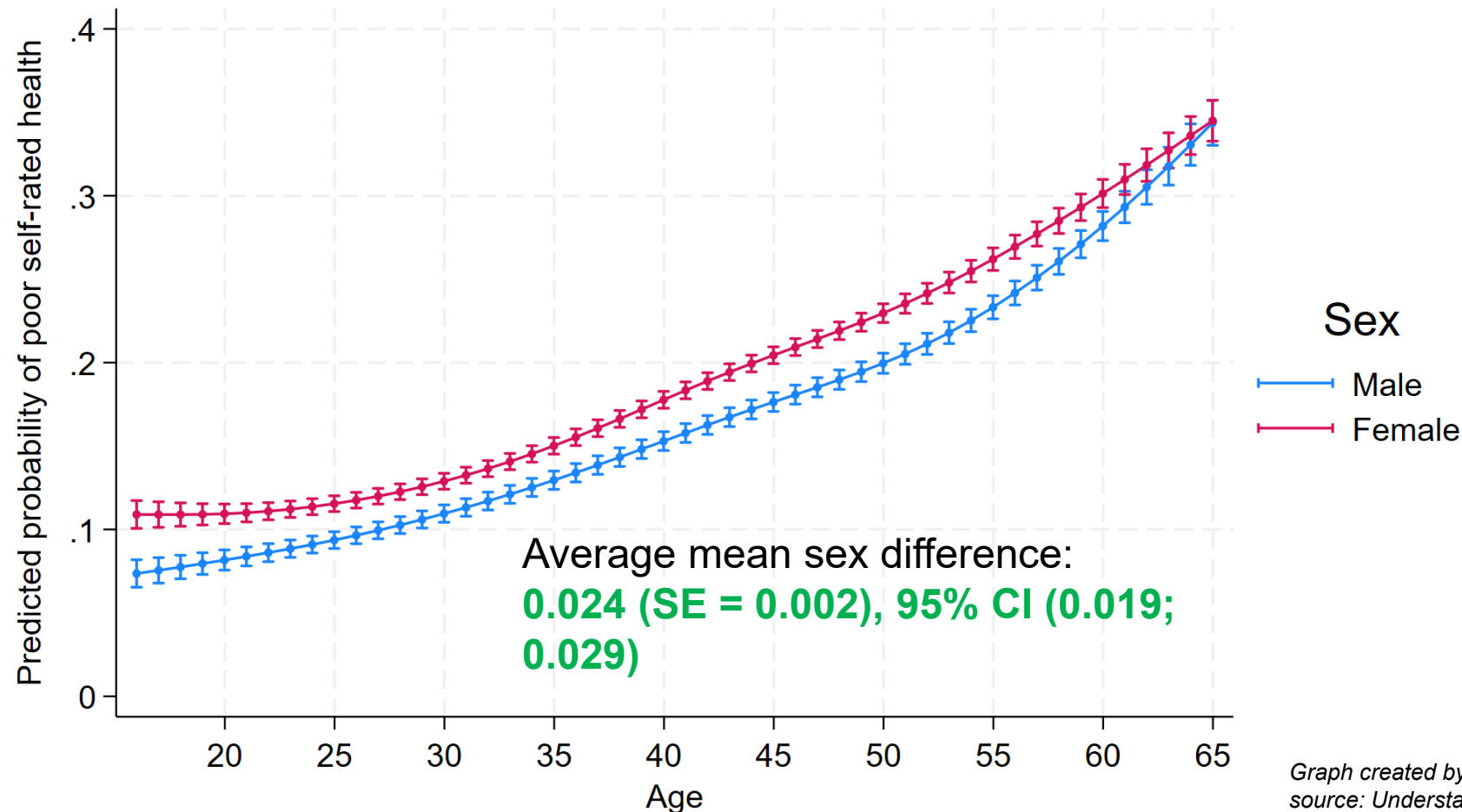
Graph created by Verena Schneider using Stata. Data source: Understanding Society: Waves 1-15, 2009-2024 and Harmonised BHPS: Waves 1-18, 1991-2009

Women experience higher distress/ lower mental functioning at all ages



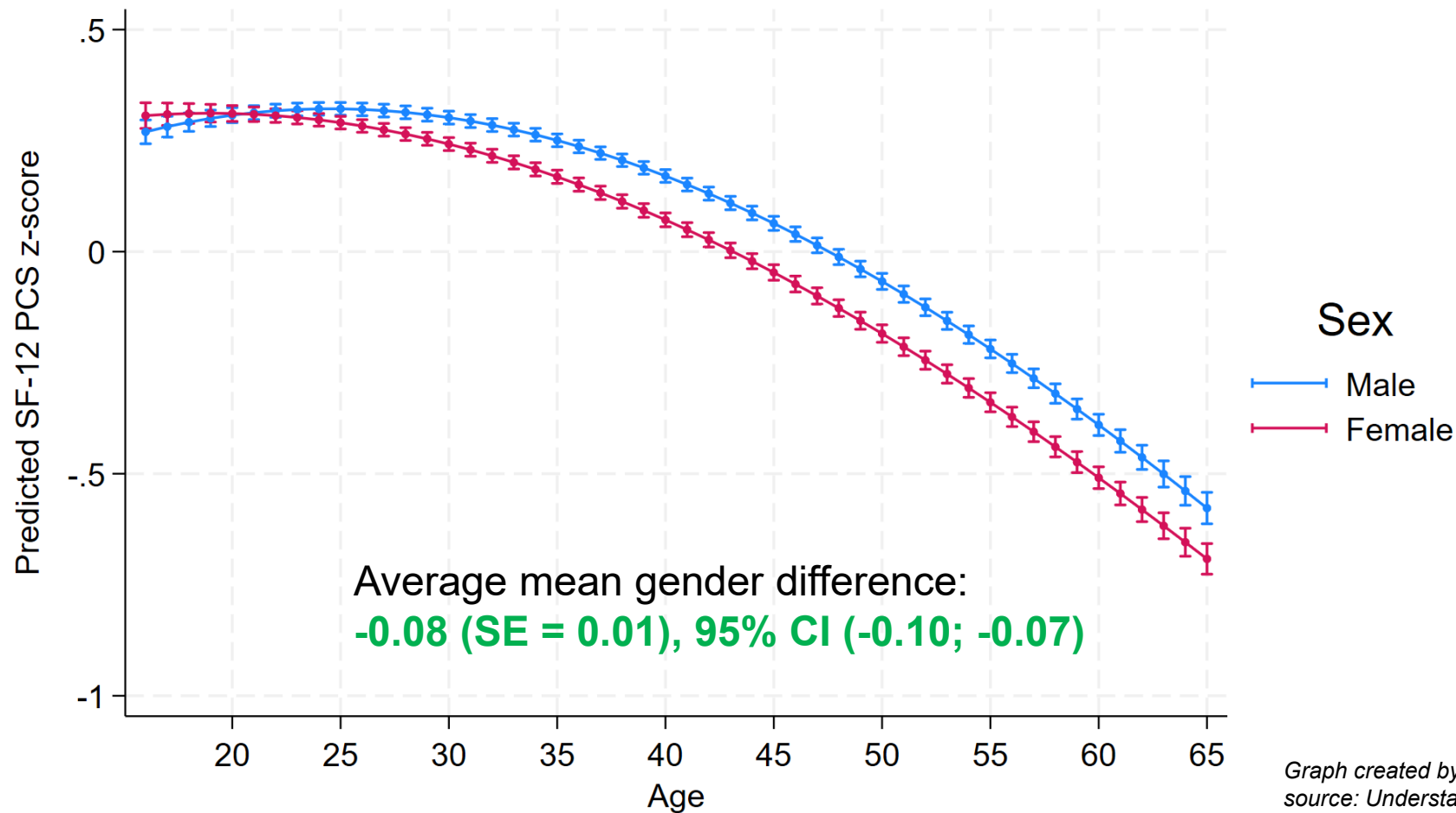
Graph created by Verena Schneider using Stata. Data source: Understanding Society: Waves 1-15, 2009-2024 and Harmonised BHPS: Waves 1-18, 1991-2009

Women have a higher probability to report poor self-rated health across waves/ages



Graph created by Verena Schneider using Stata. Data source: Understanding Society: Waves 1-15, 2009-2024 and Harmonised BHPS: Waves 1-18, 1991-2009

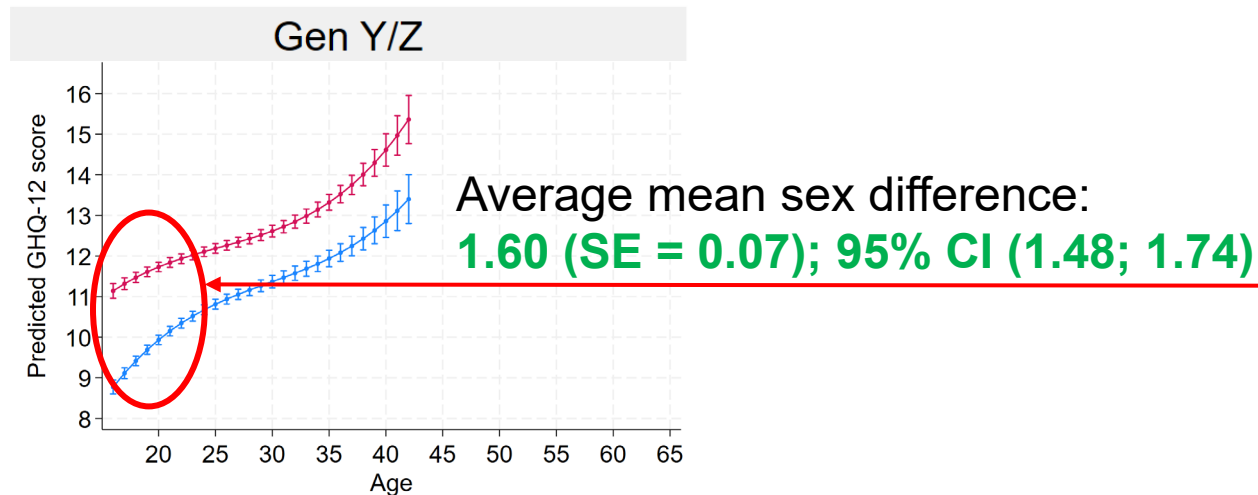
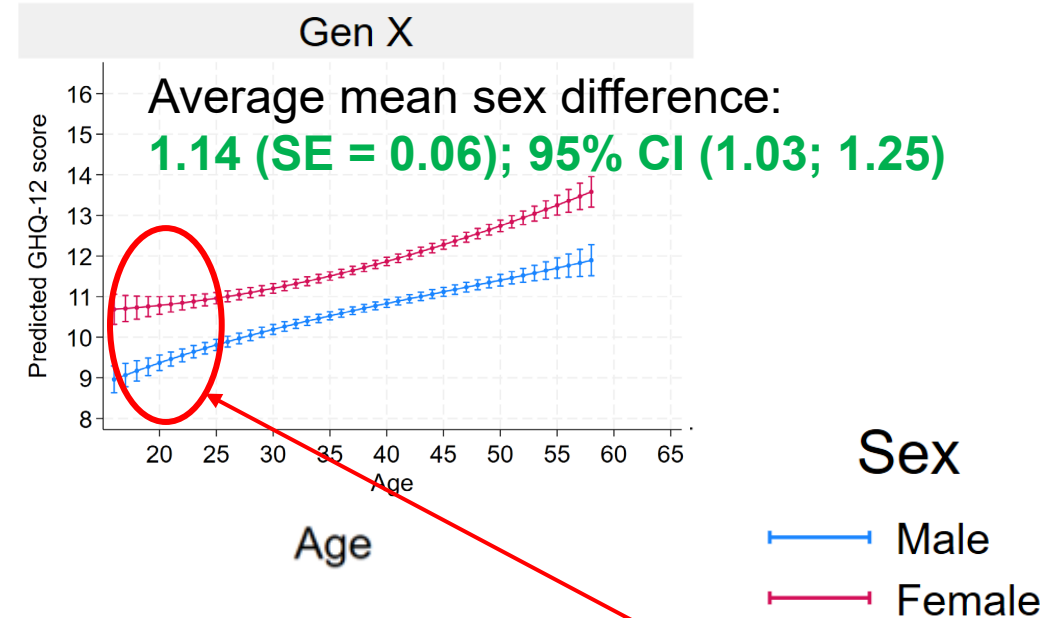
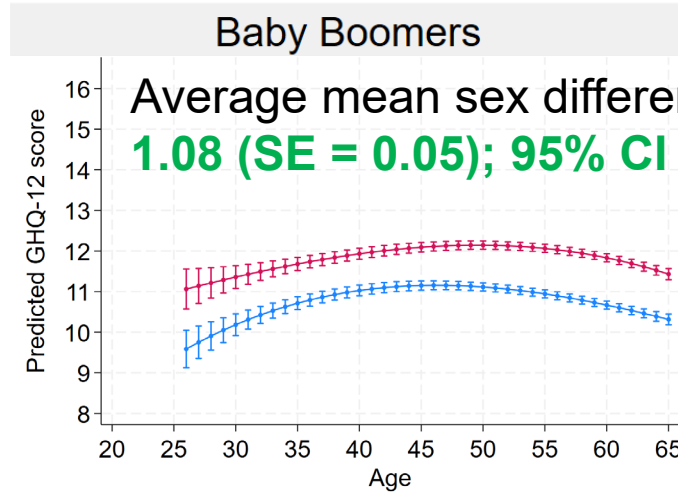
There is no meaningful gender gap in physical functioning



Graph created by Verena Schneider using Stata. Data source: Understanding Society: Waves 1-15, 2009-2024 and Harmonised BHPS: Waves 1-18, 1991-2009

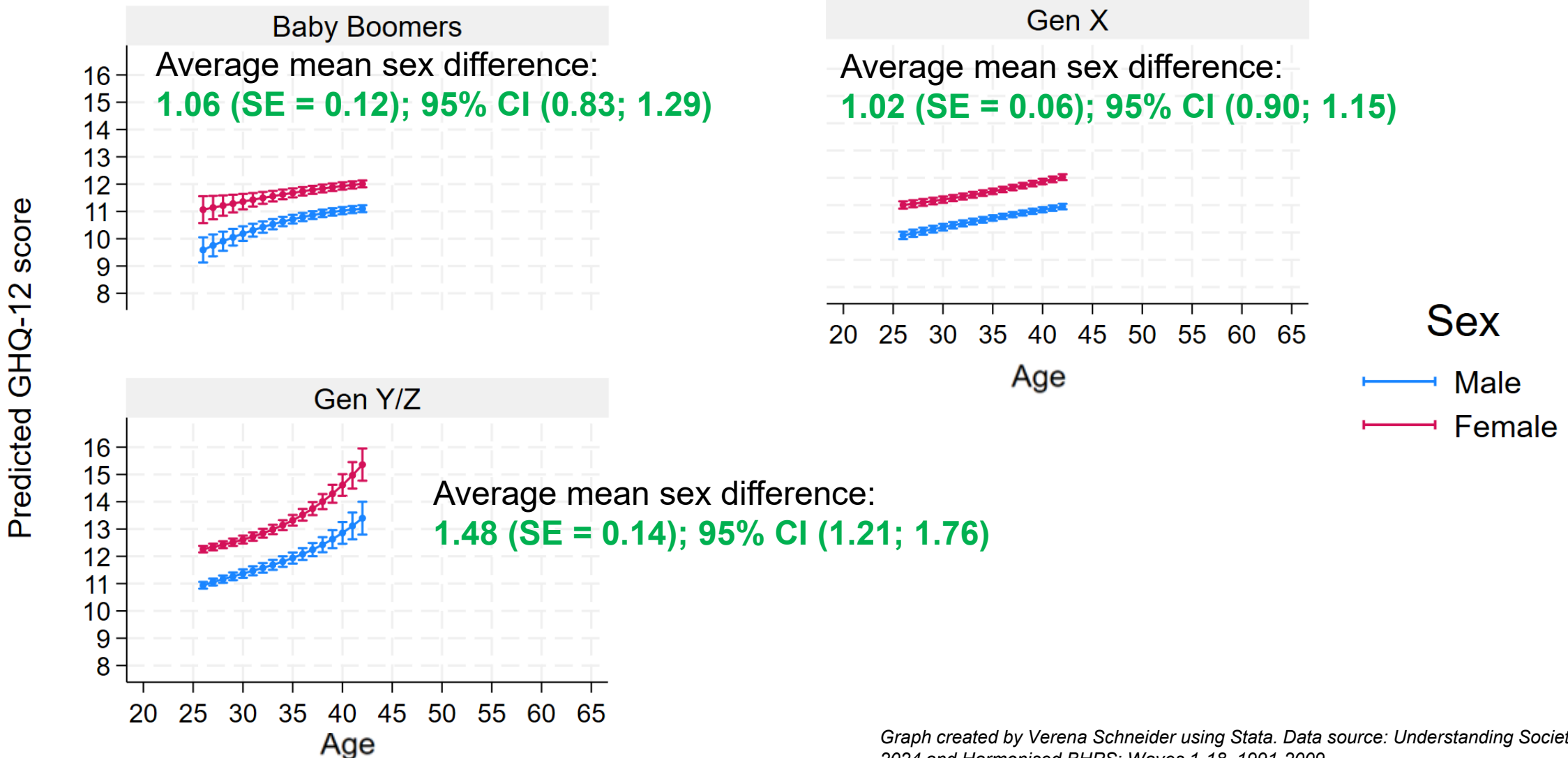
RQ2: Does the association between sex and health outcomes vary by different social/ gendered contexts, i.e., across generations?

GHQ-12 sex differences (2FM)

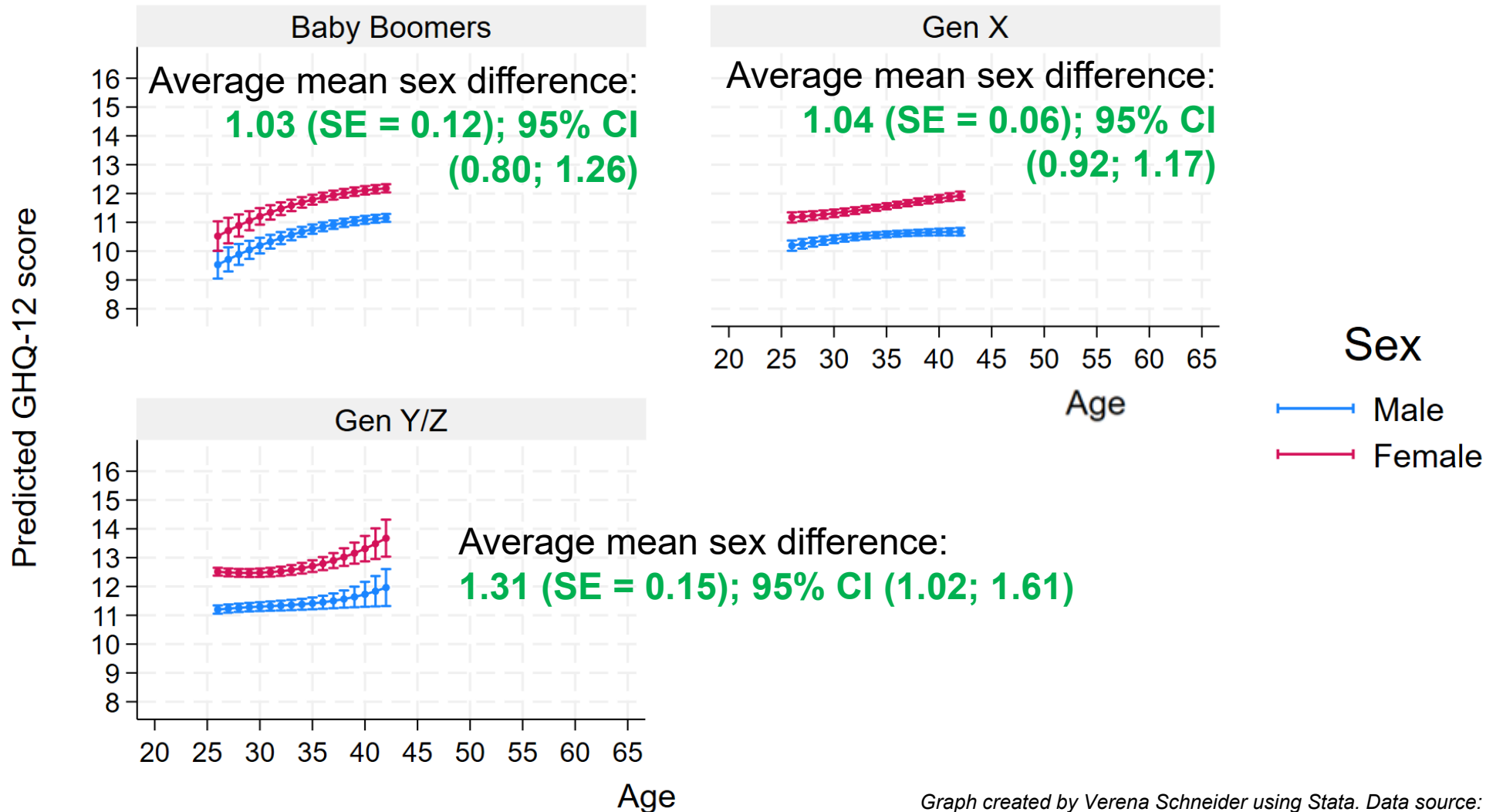


How much of this is driven by greater sex differences in younger age?

GHQ-12 sex differences (2FM, ages 26-42)

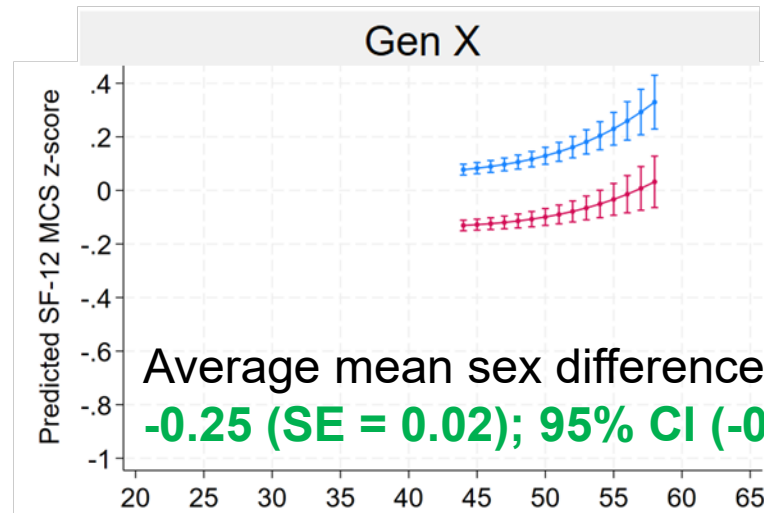
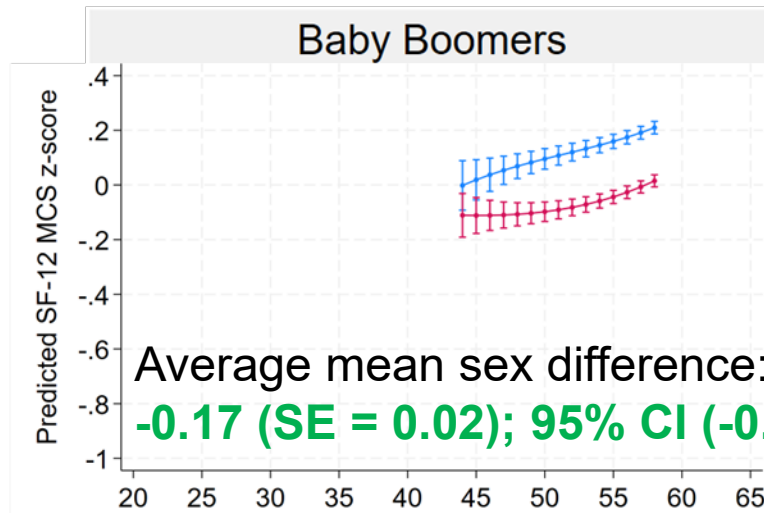


GHQ-12 sex differences (3FM, ages 26-42)

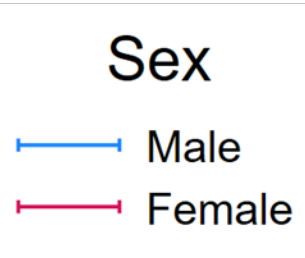
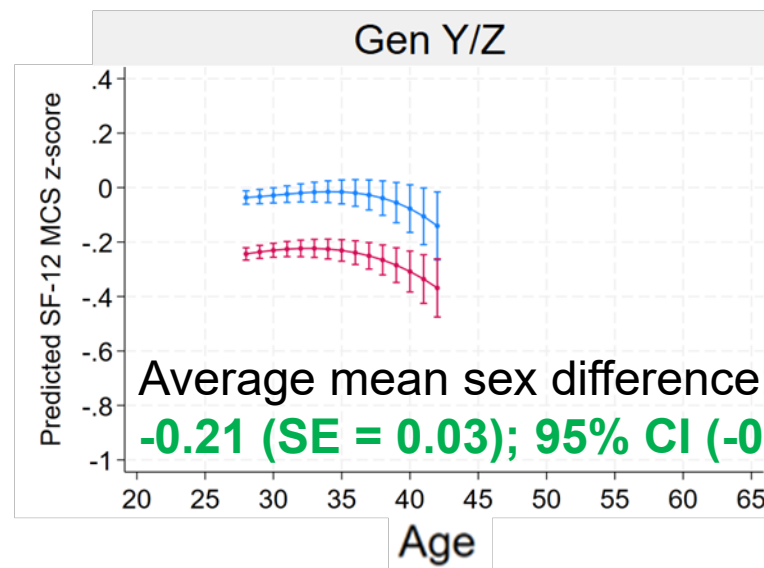
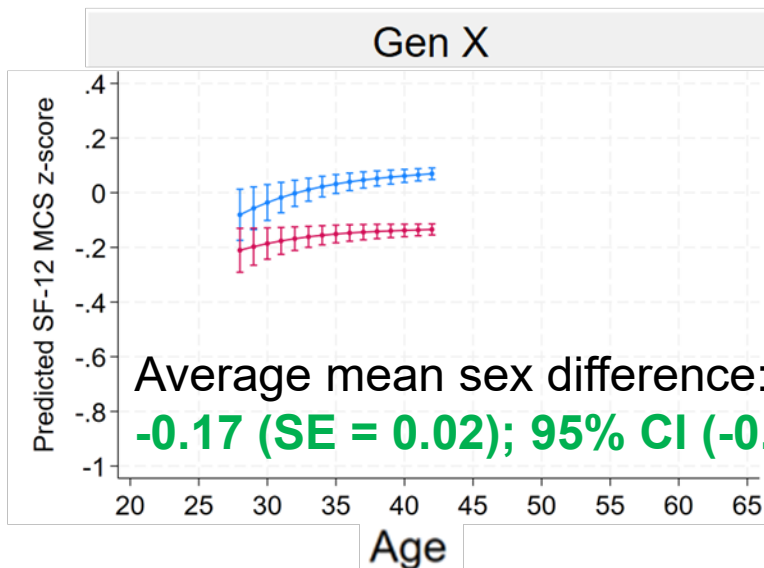


SF-12 MCS sex differences (3FM)

Age 44-58



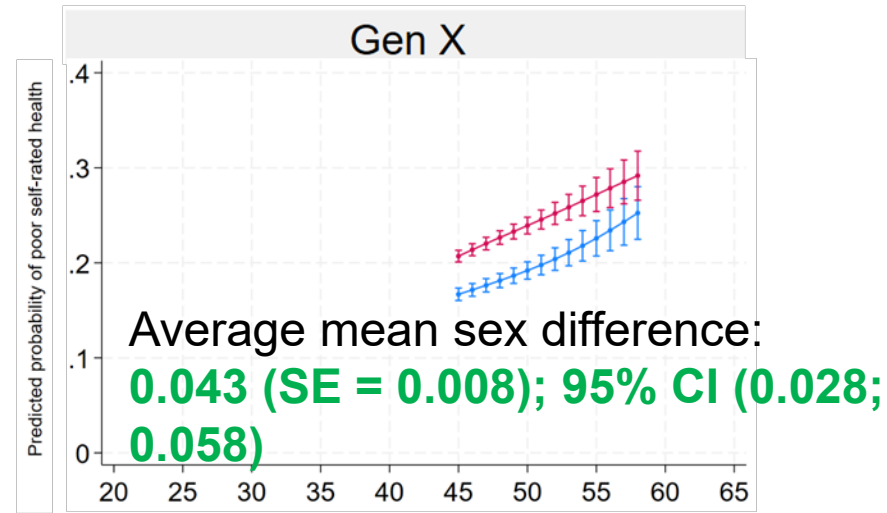
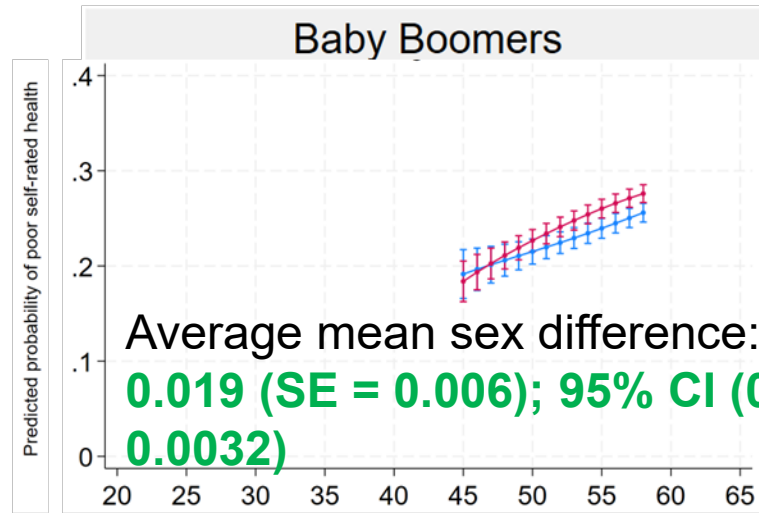
Age 28-42



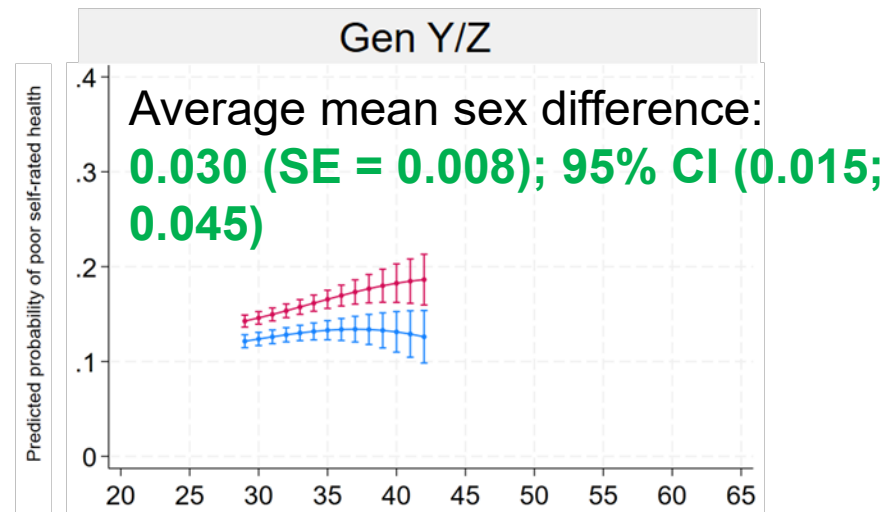
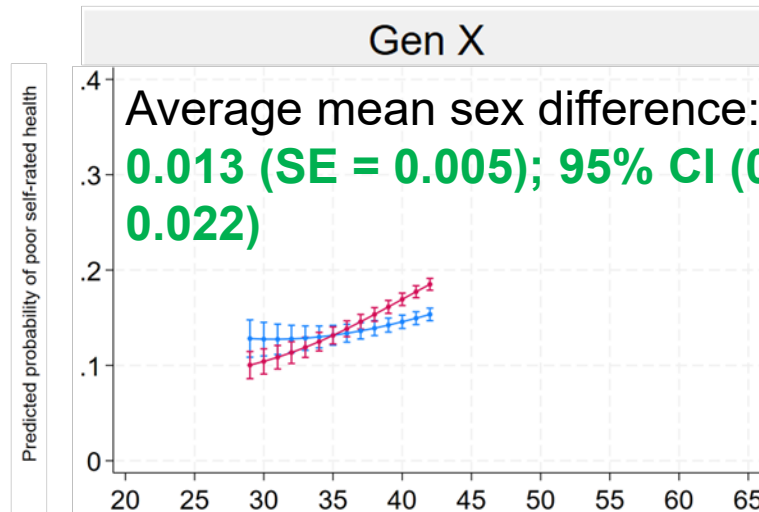
Graph created by Verena Schneider using Stata.
 Data source:
 Understanding Society:
 Waves 1-15, 2009-2024
 and Harmonised BHPS:
 Waves 1-18, 1991-2009

Self-rated health sex differences

Age 45-58



Age 29-42



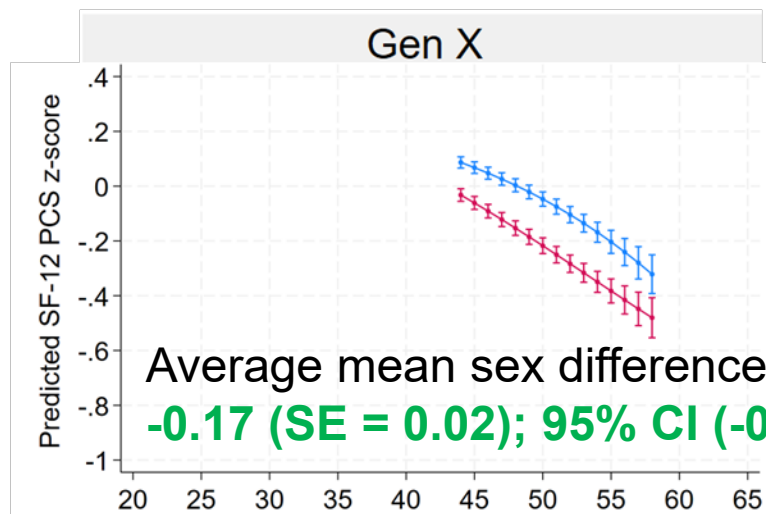
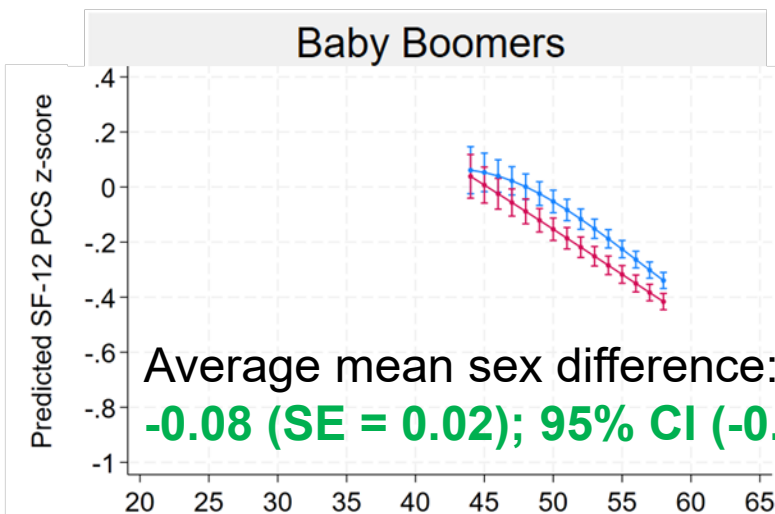
Sex

Male
 Female

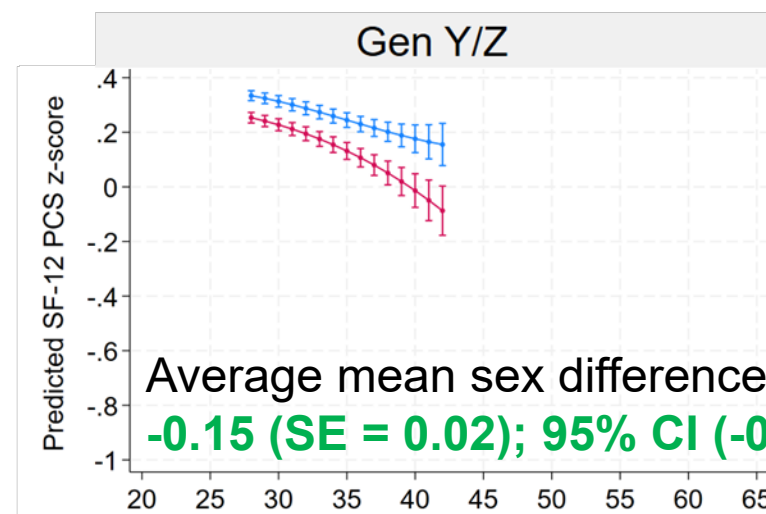
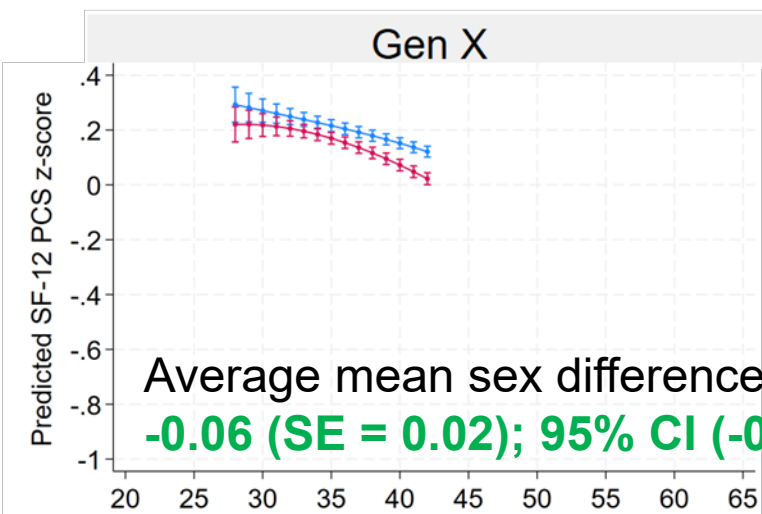
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SF-12 PCS sex differences

Age 44-58



Age 28-42



Sex

Male
 Female

Graph created by Verena Schneider using Stata.
 Data source:
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 Waves 1-15, 2009-2024
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 Waves 1-18, 1991-2009

Summary

- Women consistently report poorer mental health and self-rated health than men.
- These differences are more pronounced in the younger generation groups, despite more egalitarian gender norms; yet small overall.
- No meaningful sex differences were found in physical functioning overall, yet differences across generations followed the same trend as in other outcomes.
- Results were robust in sensitivity analyses.



Interpretation

- Although effect size differences for generation differences in the effect of sex are small and not clinically meaningful, the magnitude of the effect differences cannot be interpreted in this study.
 - No generation where gendered processes do not exist or one that is “completely gendered”.
 - Gender is multi-dimensional: opposing social processes (e.g., effects of gender norms vs second shift vs social media, etc.)
- The increasing sex differences in health over generations, although small, can be interpreted as evidence for gendered/social mechanisms.

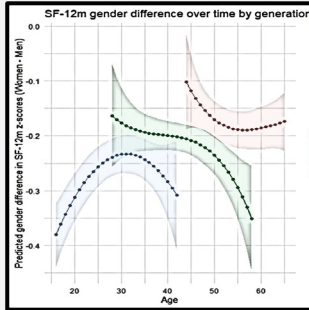


MIND THE GAP

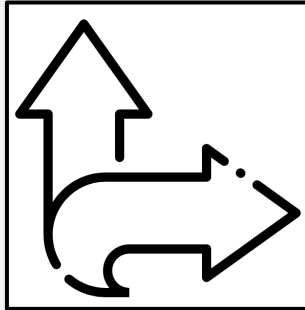
Limitations

Age
Period
Cohort

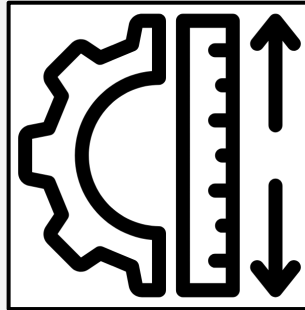
APC issue
– potential
for bias



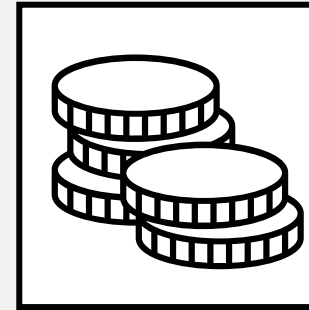
Limited age
overlap &
choice of
generation



Mechanisms
unknown



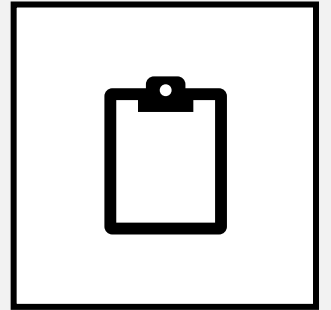
Magnitude of
gendered
mechanisms
unknown



Within-
gender
inequalities
not
considered



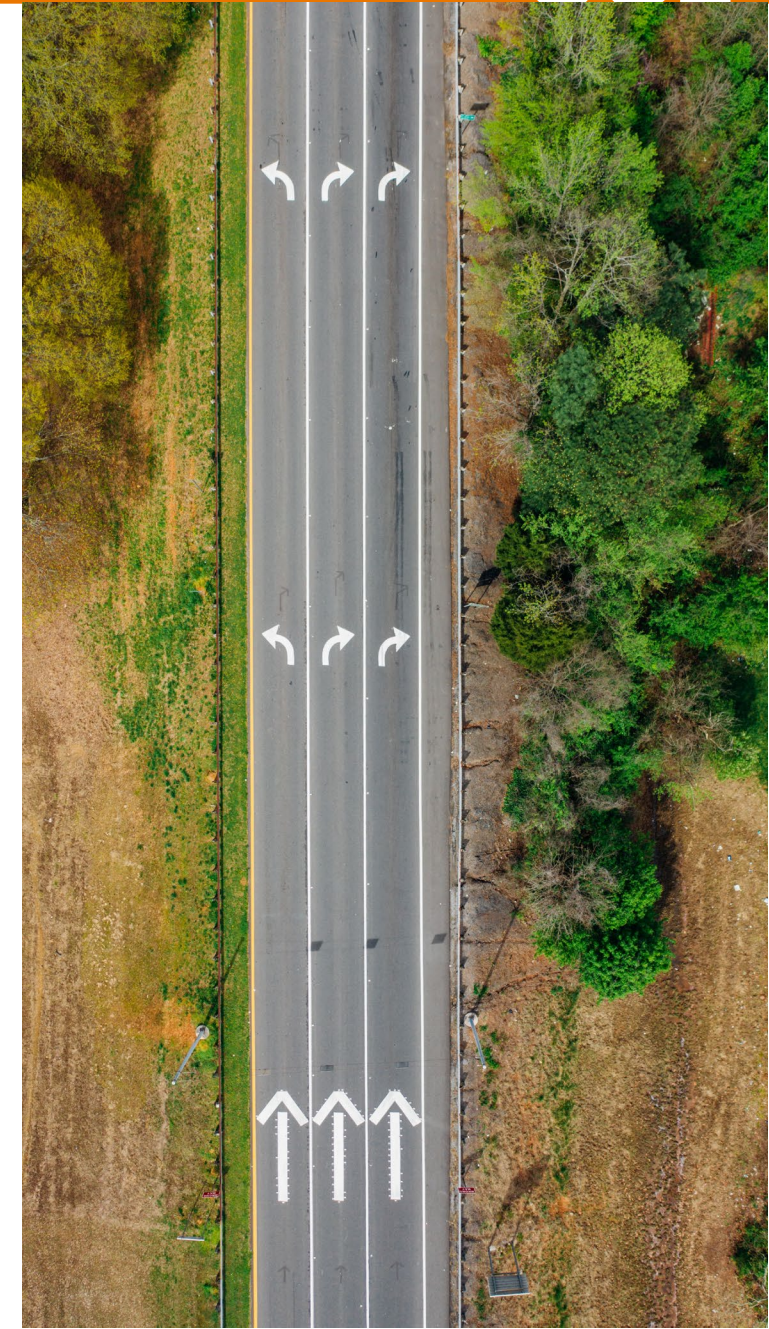
Baseline
survey
weights –
potential
attrition bias



Self-reported
outcome
measures

Conclusion

- Generational patterns suggest social, rather than purely biological, factors contribute to sex differences in mental health, self-reported health, and potentially, physical functioning.
- However, differences were small and the specific social mechanisms underlying these patterns are unclear.
- Next steps: Causal mediation analyses to understand social/gendered mechanisms in sex-health associations.





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