Personal activity intelligence and coronary heart disease in a healthy European population: the HUNT study

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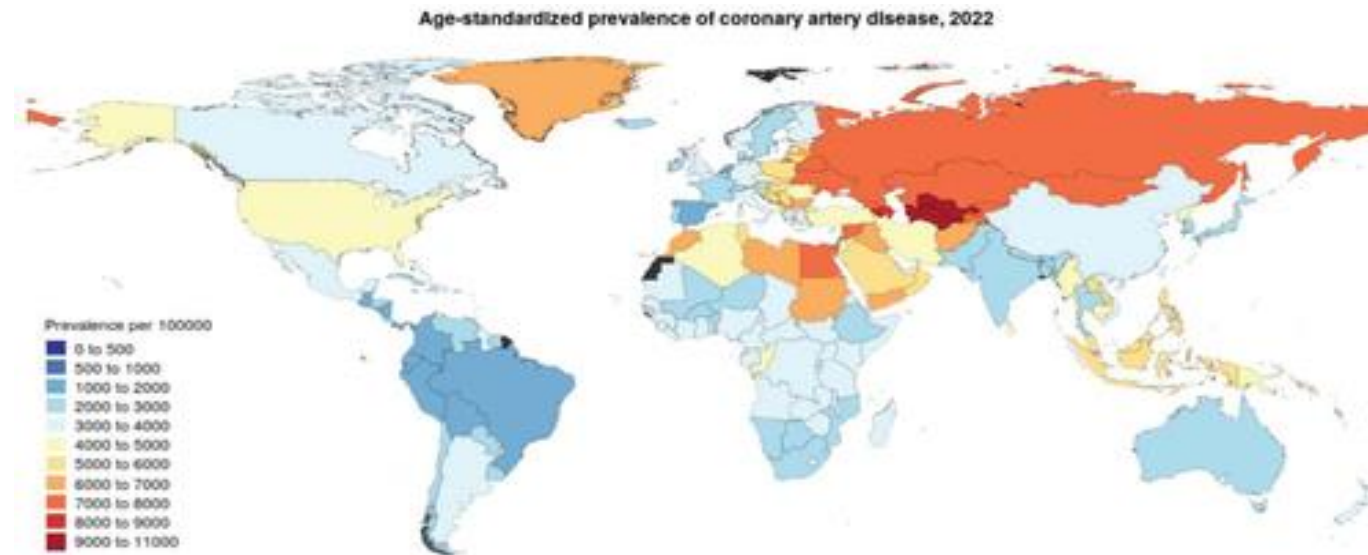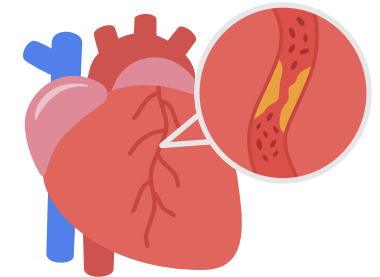
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Disclosure

- None

Acknowledgements

- The Trøndelag Health Study (HUNT) participants & management.
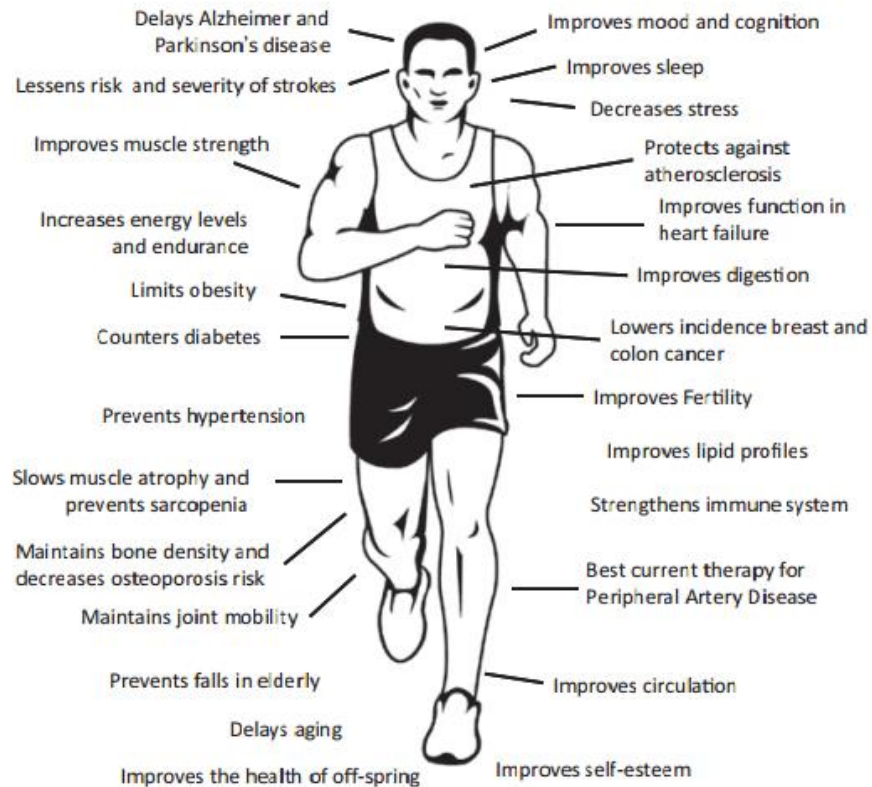
Coronary Heart Disease Burden

- Leading cause of death worldwide
- 315 million prevalent case globally in 2022
- Age-standardized prevalence in 2022: 3605/100,000

- Regional variation in the prevalence

Age-standardized prevalence of coronary artery disease, 2022

Prevalence per 100000
- 0 to 500
- 500 to 1000
- 1000 to 2000
- 2000 to 3000
- 3000 to 4000
- 4000 to 5000
- 5000 to 6000
- 6000 to 7000
- 7000 to 8000
- 8000 to 9000
- 9000 to 11000

Benjamin Stark et al. *JACC* 2024; 83:2320-2320.

Exercise Health Benefits

Delays Alzheimer and Parkinson's disease
Lessens risk and severity of strokes
Improves muscle strength
Increases energy levels and endurance
Limits obesity
Counters diabetes
Prevents hypertension
Slows muscle atrophy and prevents sarcopenia
Maintains bone density and decreases osteoporosis risk
Maintains joint mobility
Prevents falls in elderly
Delays aging
Improves the health of off-spring

Improves mood and cognition
Improves sleep
Decreases stress
Protects against atherosclerosis
Improves function in heart failure
Improves digestion
Lowers incidence breast and colon cancer
Improves Fertility
Improves lipid profiles
Strengthens immune system
Best current therapy for Peripheral Artery Disease
Improves circulation
Improves self-esteem

Burden of physical inactivity

Prevalence of adults aged 18+ years not meeting WHO physical activity guidelines, by WHO region, 2010–2016

WHO regions: African Region, Region of the Americas, Eastern Mediterranean Region, European Region, South-East Asia Region, Western Pacific Region

Legend: Females, 18-44 years; Females, 45-69 years; Females, 70+ years; Males, 18-44 years; Males, 45-69 years; Males, 70+ years
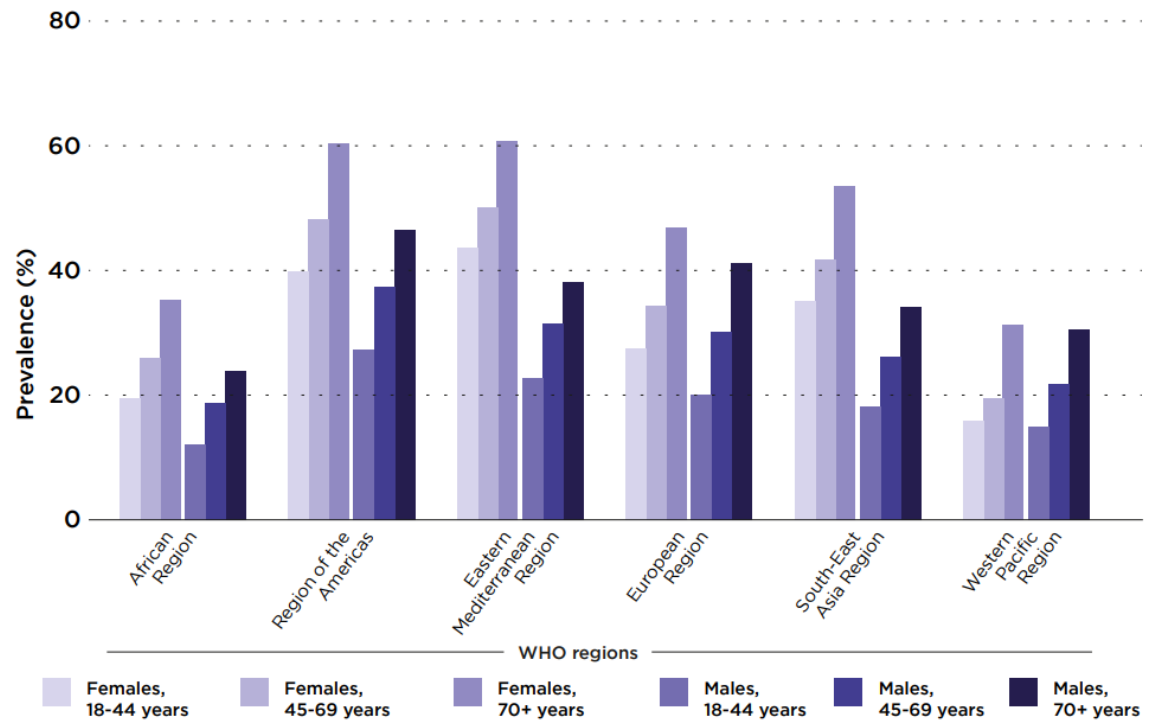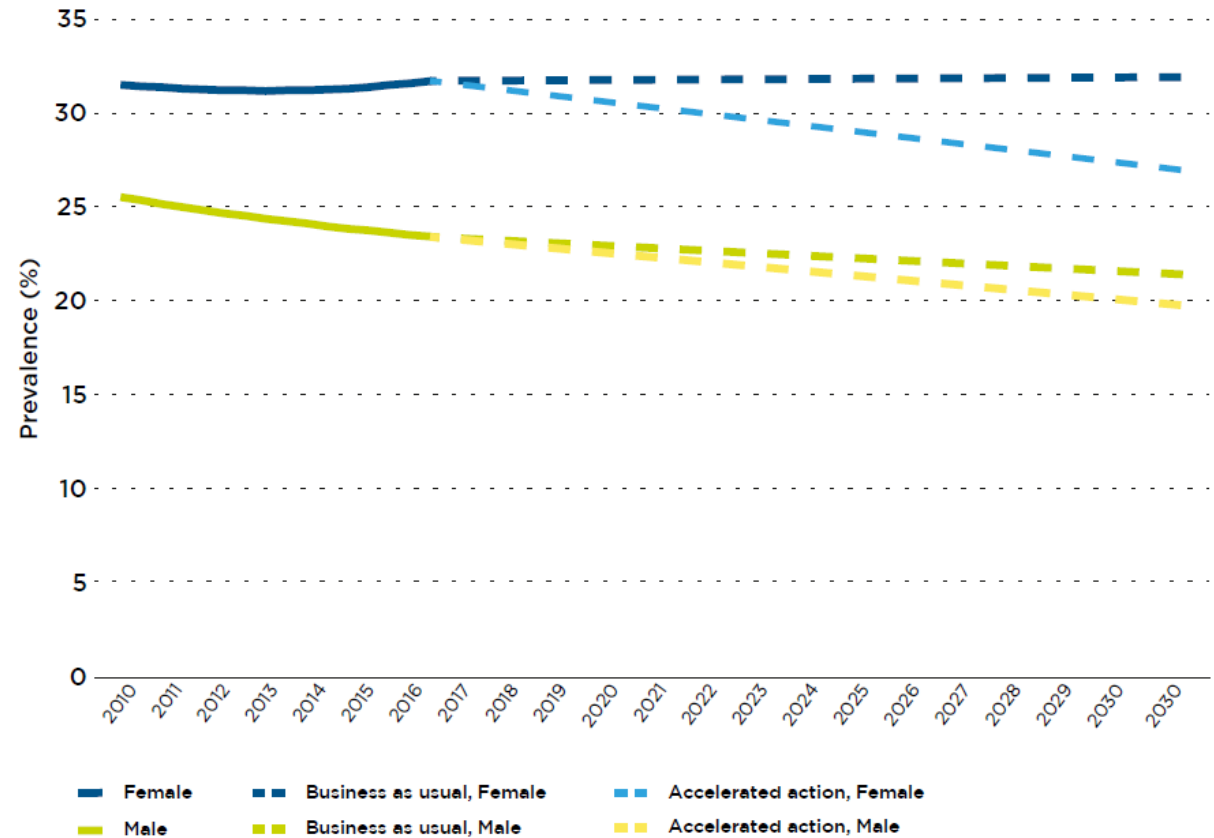
WHO Global status report on physical activity 2022

Trends in Physical Activity

WHO targets to reduce physical inactivity by 15% in 2030

Two scenarios for future global physical activity trends – business as usual or accelerated action to achieve the global target for adults by 2030

WHO Global status report on physical activity 2022
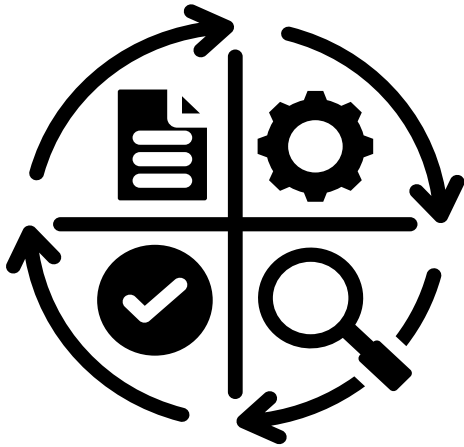
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Personal Activity Intelligence (PAI)

What is PAI?
'Activity Metric' - quantifies the amount of physical activity needed for a healthier longer life.

PAI inherently credits vigorous over moderate intensity activity, and translates heart rate during physical activity into a simple **weekly score**.

Scientific gaps

Although, higher PAI levels are associated with reduced risk of CVD, dementia, all-cause mortality, health outcomes

- Association between PAI and CHD in an European population is not known

- CHD assessment tools do not include indices of physical activity or exercise

Aims

- To investigate the association between PAI and fatal and non-fatal coronary heart disease in healthy participants from Norway

- To investigate whether the addition of PAI to a conventional coronary risk assessment could enhance its prognostic accuracy relative to identifying subsequent CHD

Methods

Population-based, Cohort study

2006-2008

End of Follow-up
01 January 2021

Trøndelag Health Survey (HUNT), Norway.
22,869 women and 18,092 men

PAI estimation based on a validated algorithm using responses to physical activity questions

Relative exercise intensity, with ~ 44%, 73% and 83% of heart rate reserve signifying low-, moderate, and vigorous intensity activities

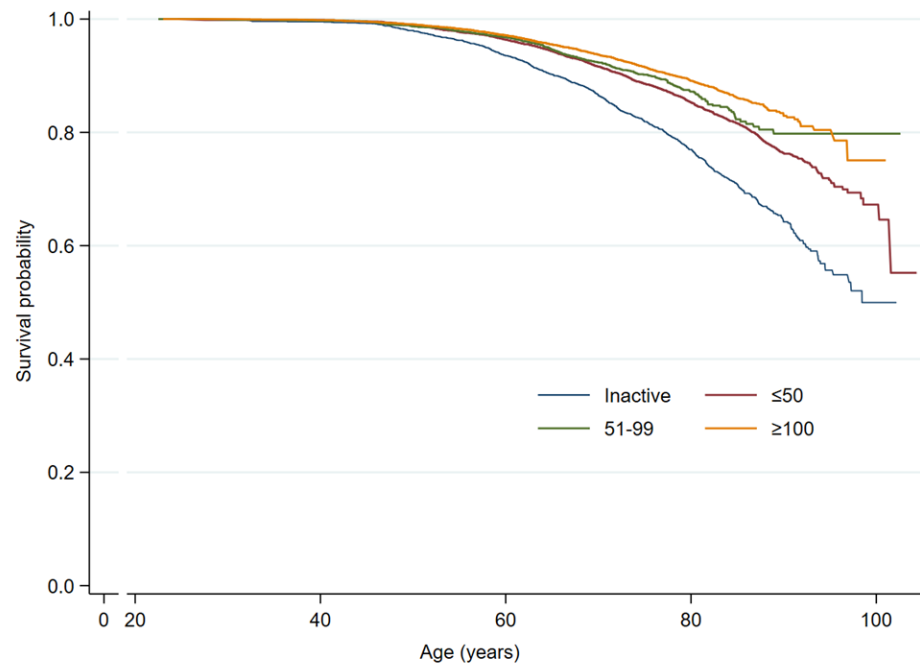Trøndelag Hospital Trust Myocardial Infarction Registry and the Norwegian Cause of Death Registry.

Diagnosis of, or death from CHD (ICD10: I20-I25), MI (I21-I23), chronic CHD (I25), CVD mortality (I00-I99)

PAI groups: 0 (inactive), ≤50, 51–99, or ≥100 weekly PAI

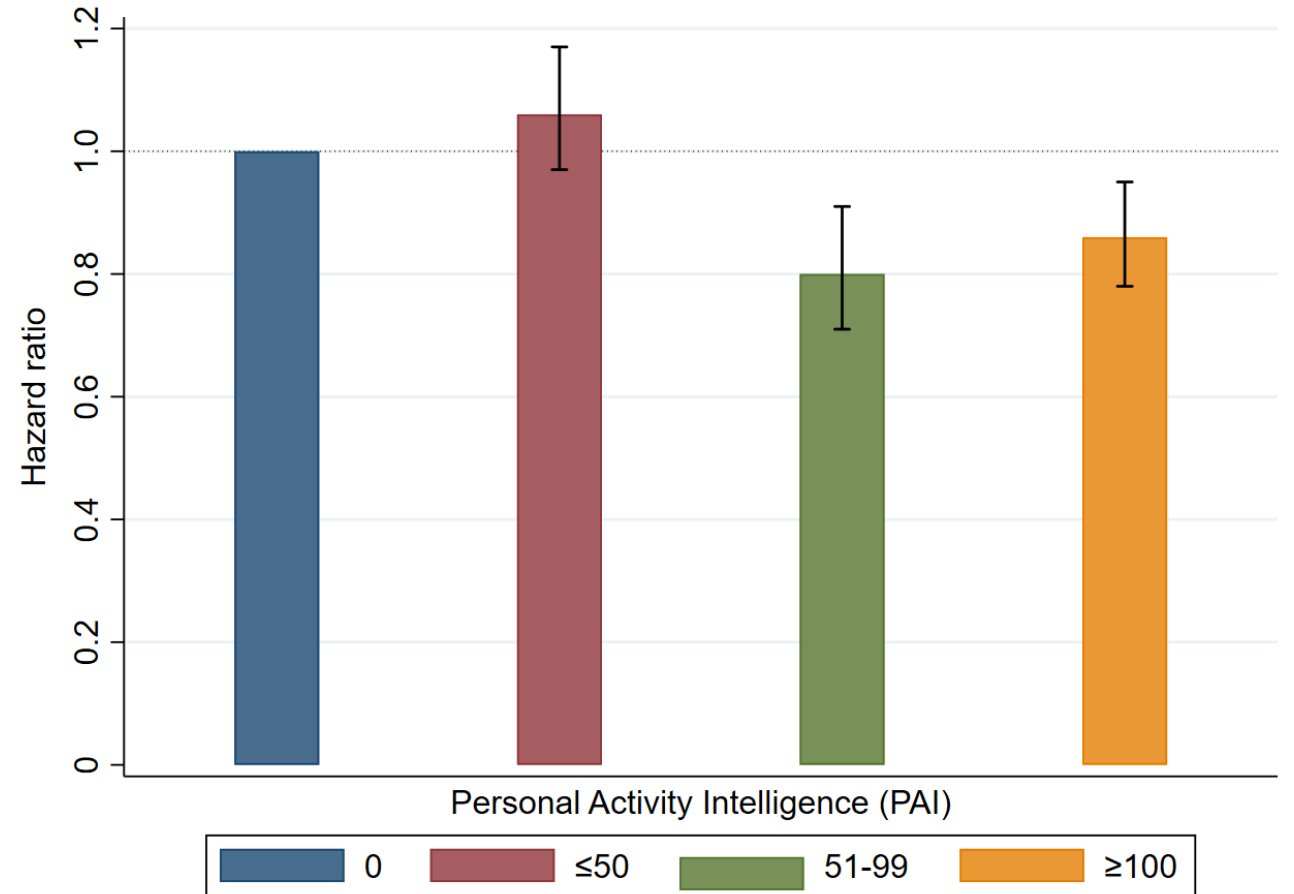Multivariable adjusted Cox proportional hazard models
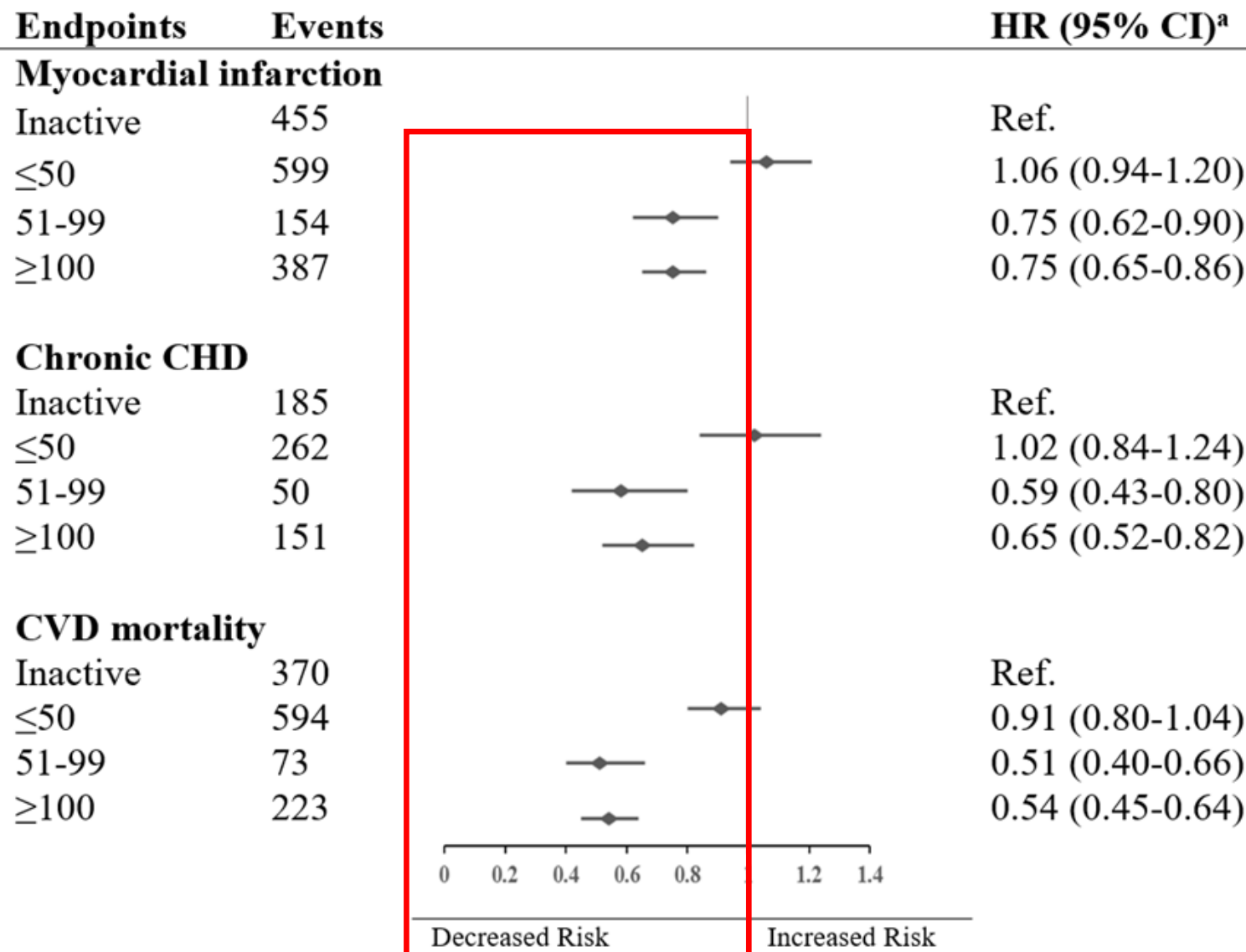
Results

- Median follow-up period of 13.1 years
- 3303 endpoint events of either diagnosis (n=3109) or death (n=194) from CHD

Coronary Heart Disease and PAI

Results

Endpoints	Events		HR (95% CI)[a]
Myocardial infarction			
Inactive	455		Ref.
≤50	599		1.06 (0.94-1.20)
51-99	154		0.75 (0.62-0.90)
≥100	387		0.75 (0.65-0.86)
Chronic CHD			
Inactive	185		Ref.
≤50	262		1.02 (0.84-1.24)
51-99	50		0.59 (0.43-0.80)
≥100	151		0.65 (0.52-0.82)
CVD mortality			
Inactive	370		Ref.
≤50	594		0.91 (0.80-1.04)
51-99	73		0.51 (0.40-0.66)
≥100	223		0.54 (0.45-0.64)

Decreased Risk   Increased Risk

11

Results

Adding PAI to traditional risk factors of NORRISK2 prediction algorithm: age, sex, resting systolic BP and use of BP medications, total and HDL cholesterol, smoking status, and family history CHD

Estimation of Net reclassification improvement (NRI) and integrated discrimination improvement (IDI)

		NORRISK2 + PAI				Net correctly reclassified
		<5%	5-7.5%	>7.5%	Total	
NORRISK2	**CHD**					
	<5%	7	7	17	31	0.33%
	5-7.5%	142	157	601	900	
	>7.5%	169	303	1900	2372	
	Total	318	467	2518	3303	
	No CHD					
	<5%	683	83	171	937	46.86%
	5-7.5%	7497	1957	3470	12,924	
	>7.5%	10,390	3485	9922	23,797	
	Total	18,570	5525	13,563	37,658	

NRI: 0.472 (*P*<0.001)

IDI: 0.065 (*P*<0.001)

Conclusion

- Inverse association between PAI and risk of CHD

- Addition of PAI to traditional risk factors improved the CHD risk prediction

- PAI can be used as an adjunct or complement to conventional coronary risk assessment

Thank you for listening!

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