

# Cross-national differences in grip strength among 50+ year-old Europeans.

## Results from the SHARE study

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**Background:** Hand grip is a measure of physical functioning and a predictor of morbidity, disability and mortality.

**Objective:** To study hand grip strength in people aged 50 and older across 10 European countries.

**Design:** Cross-national, cross-sectional population-based study.

**Setting:** Sweden, Denmark, the Netherlands, Germany, France, Switzerland, Austria, Spain, Italy, and Greece.

**Participants:** The study population comprised 22,777 men and women aged 50 and older who participated in the SHARE (Survey on Health, Ageing and Retirement in Europe) study.

**Measurements:** Hand grip strength was measured twice on each hand using a dynamometer (Smedley, S Dynamometer, TTM, Tokyo, 100 kg). In the analyses, the maximum grip strength measurement was used (Maxgrip), along with self-reported body weight (Ph012) and height (Ph013).

**Main results:** Of the 21,972 50+y old participants in SHARE, grip strength measurements were obtained in 20,014 (91.0%). Additional information on height and weight was present in 19,688 (89.6%). The unadjusted maximum grip strength measurements show an age-dependent decline from age 50 and onwards in both genders, with men having higher grip strength scores than women. The gender differences and the pattern of decline are similar in all SHARE countries. However, northern (Sweden and Denmark) and continental (the Netherlands, Germany, Austria, Switzerland, and France) SHARE countries have higher grip strength scores compared to southern (Spain, Italy and Greece) SHARE countries, the difference being almost constant over the entire age range, on average 13.7% [CI: 13.4;14.0] higher for men, and 17.1% [CI: 16.8;17.4] higher for women. Adjusting for height and weight did not change the country and gender-specific pattern or the

North-South gradient over the entire age range (Men: 9.4% [CI: 9.1;9.7]; women: 14.1% [CI: 13.8;14.5]).

**Conclusion:** Grip strength is easily measured in a large cross-national survey. Gender-specific grip strength declines with age in all countries. The pattern of decline is similar in all countries, but people aged 50 and over in the southern European countries have lower grip strength than their northern and continental European peers. The North-South pattern is intriguing and might reflect both genetically and other biologically determined factors. However, the pattern is in conflict with the present knowledge that higher grip strength is a predictor of better survival and lower disability, as the Mediterranean countries are those countries in Europe with lowest old age mortality. If this survey is extended to a longitudinal one it may help us to understand more of the underlying mechanisms that are analogous to the gender difference in grip strength, which indicates that men have substantially better grip strength than women, but still higher mortality rate, even if grip strength predicts mortality within each gender.



# Cross-national differences in grip strength among 50+ year old Europeans

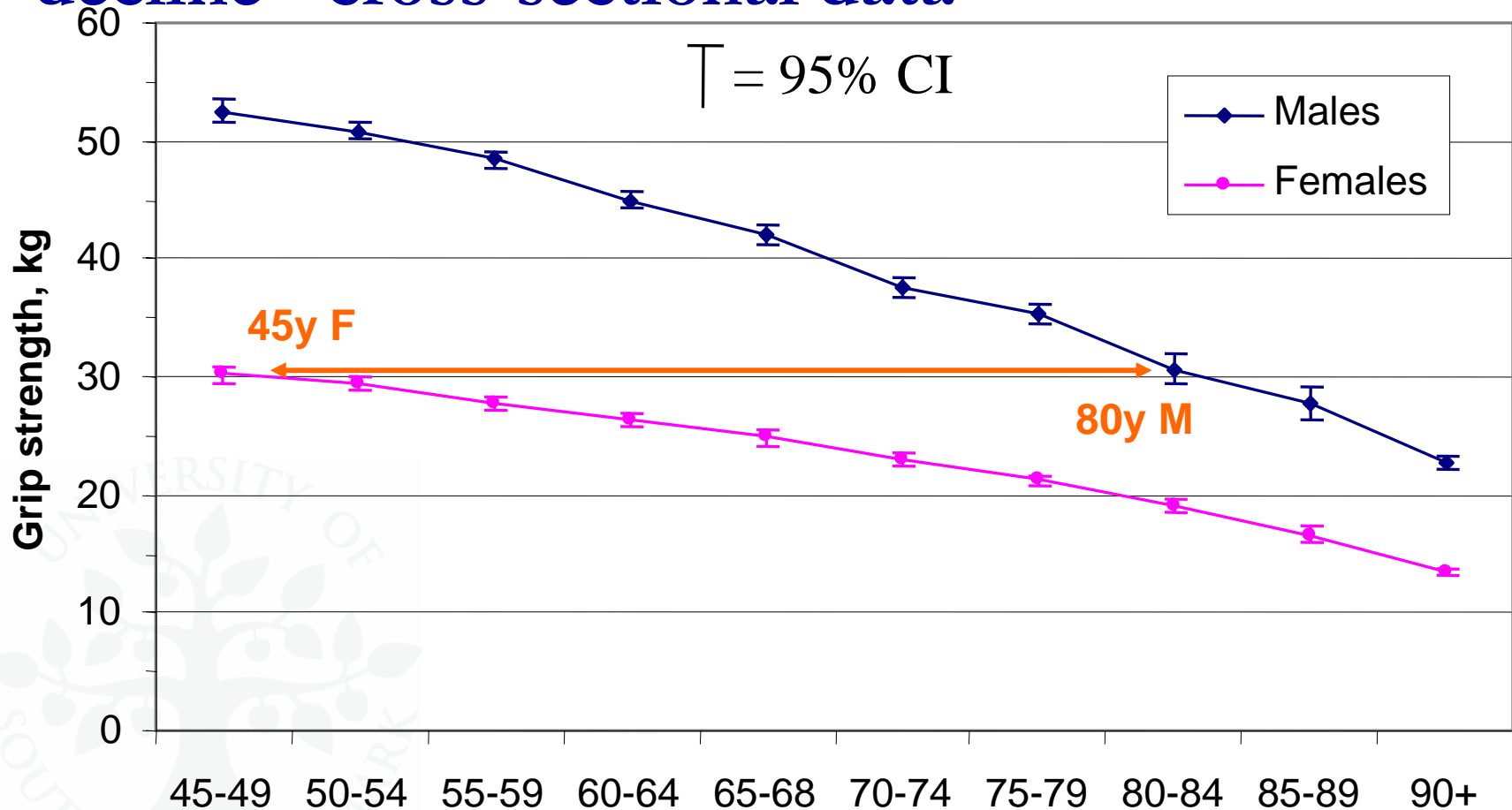
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# The natural history of grip strength decline - cross-sectional data





# Why use grip strength?

## Grip strength is

- Correlated to other muscle groups, incl. lower extremities (Rantanen 1994)
- A good "overall measure" of muscle strength (Innes 1999, Rantanen 1994, Richards 1996)

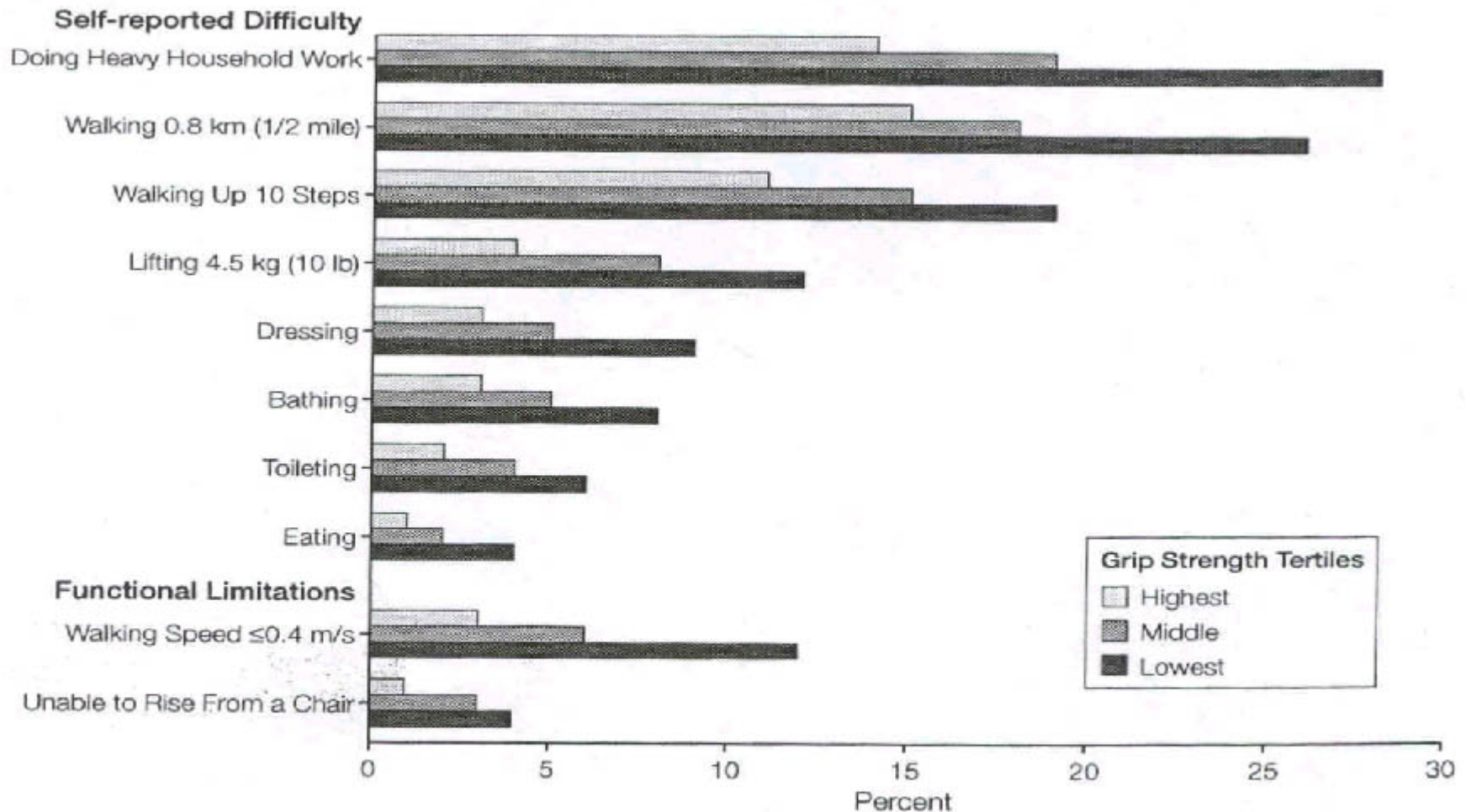
## Grip strength is a strong predictor of

- Disability (Nybo 2001, Rantanen 1994 and 1999)
- Morbidity (Rantanen 1998, Blake 1988)
- Mortality (Rantanen 2002, Al Snih 2002, Fujita 1995)



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# Grip strength predicts disability



Proportion of subjects with functional limitations and disability according to baseline (1965-1970) grip strength tertiles in 3218 initially healthy 45- to 68-year-old men at exam 4 from 1991-1993. (Rantanen 1999)

# Why use grip strength? - 2

Grip strength is

- Easy to use in surveys
- No ceiling effect
- Discriminates at all ages
- High participation rates
- Feasible even in the weakest subjects



# Aim of using grip strength in SHARE

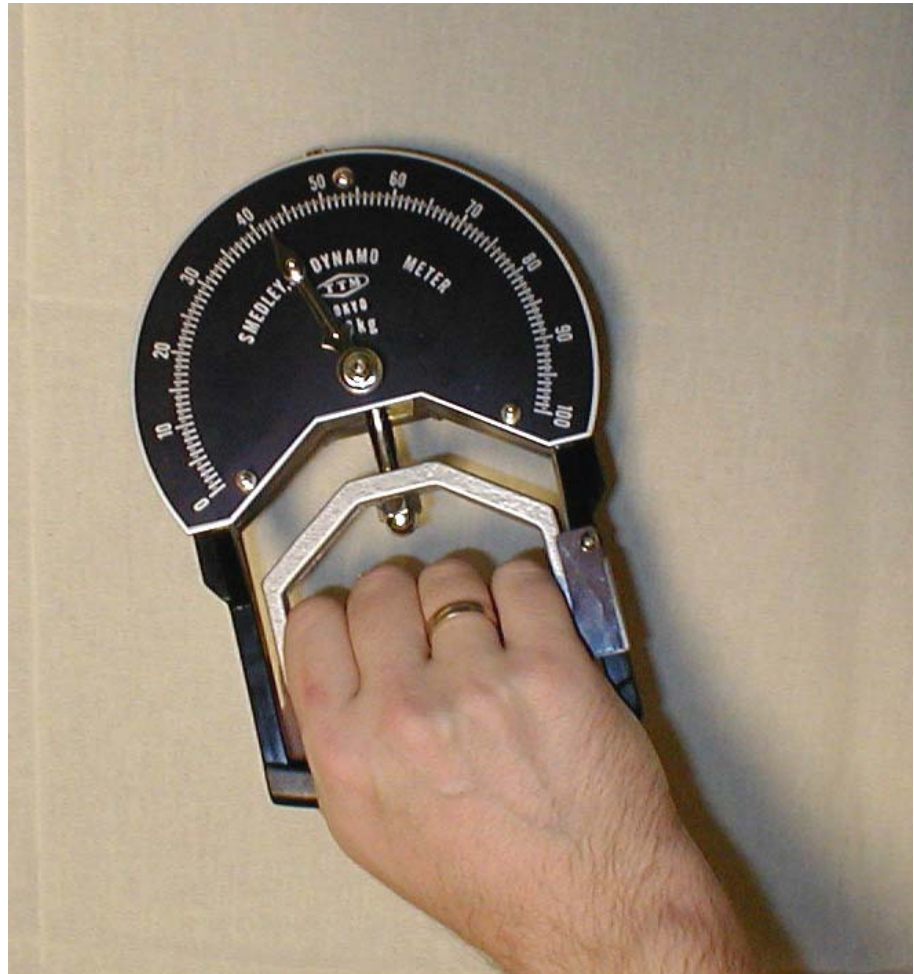
- Cross-national comparisons using the same instrument
  - Are mortality differences across countries reflected in grip strength?
  - Does grip strength predict differently across nationalities regarding disability, morbidity and mortality? (SHARE longitudinal)





# Method

- Standing (sitting) position
- 90° angle of the elbow
- Upper arm tight against the trunk
- Adjusted inner lever to fit hand size
- 2 measurements of each hand
- All interviewers got the same instruction
- Valid measurements defined
  - < 20kg between 2 measurements in one hand
  - 0 kg < valid < 100 kg
- Maximum grip strength used

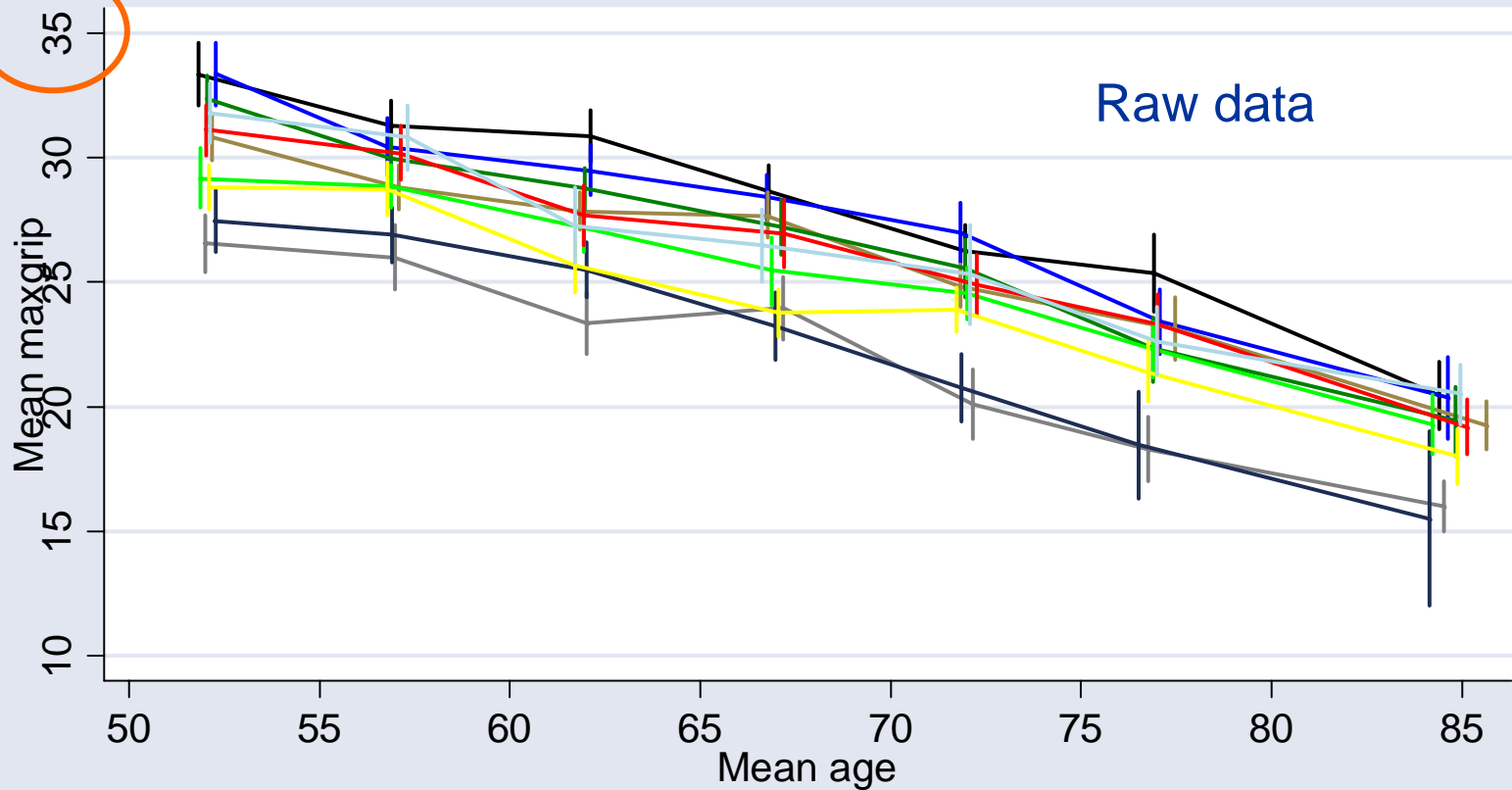




# Results - feasibility

	<b>50+ y N</b>	<b>GS n</b>	<b>valid GS, n</b>	<b>%</b>
<b>AT</b>	1,938	1,650	1,627	84.0
<b>GE</b>	2,946	2,700	2,683	91.1
<b>SE</b>	3,010	2,816	2,779	92.3
<b>NL</b>	2,878	2,684	2,661	92.5
<b>ES</b>	2,373	2,177	2,041	86.0
<b>IT</b>	2,506	2,253	2,232	89.1
<b>FR</b>	1,748	1,528	1,508	86.3
<b>DK</b>	1,637	1,550	1,531	93.5
<b>GR</b>	1,980	1,752	1,736	87.7
<b>CH</b>	956	904	890	93.1
<b>Total</b>	<b>21,972</b>	<b>20,014</b>	<b>19,688</b>	<b>89.6</b>

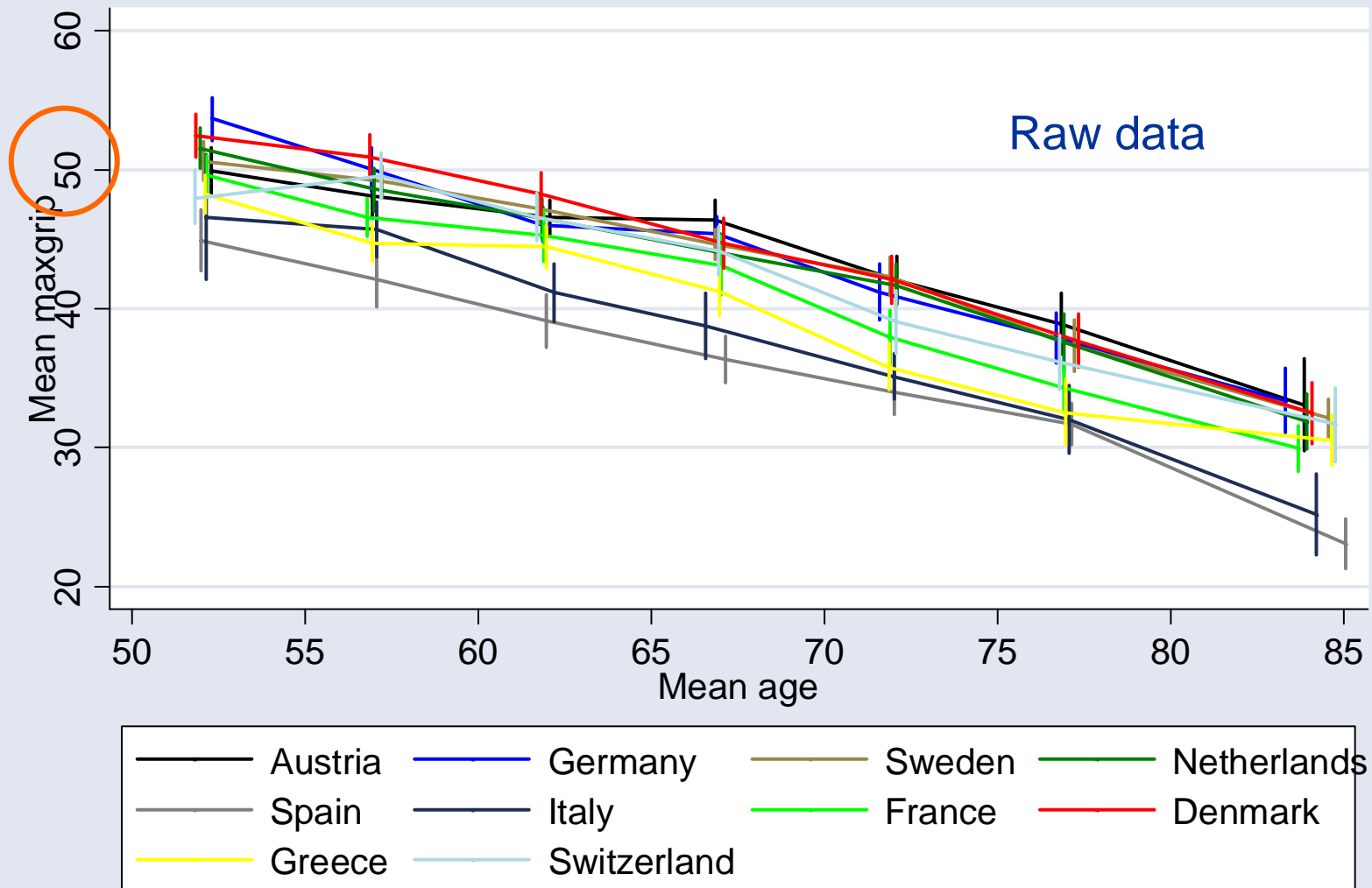
## Females



— Austria	— Germany	— Sweden	— Netherlands
— Spain	— Italy	— France	— Denmark
— Greece	— Switzerland		

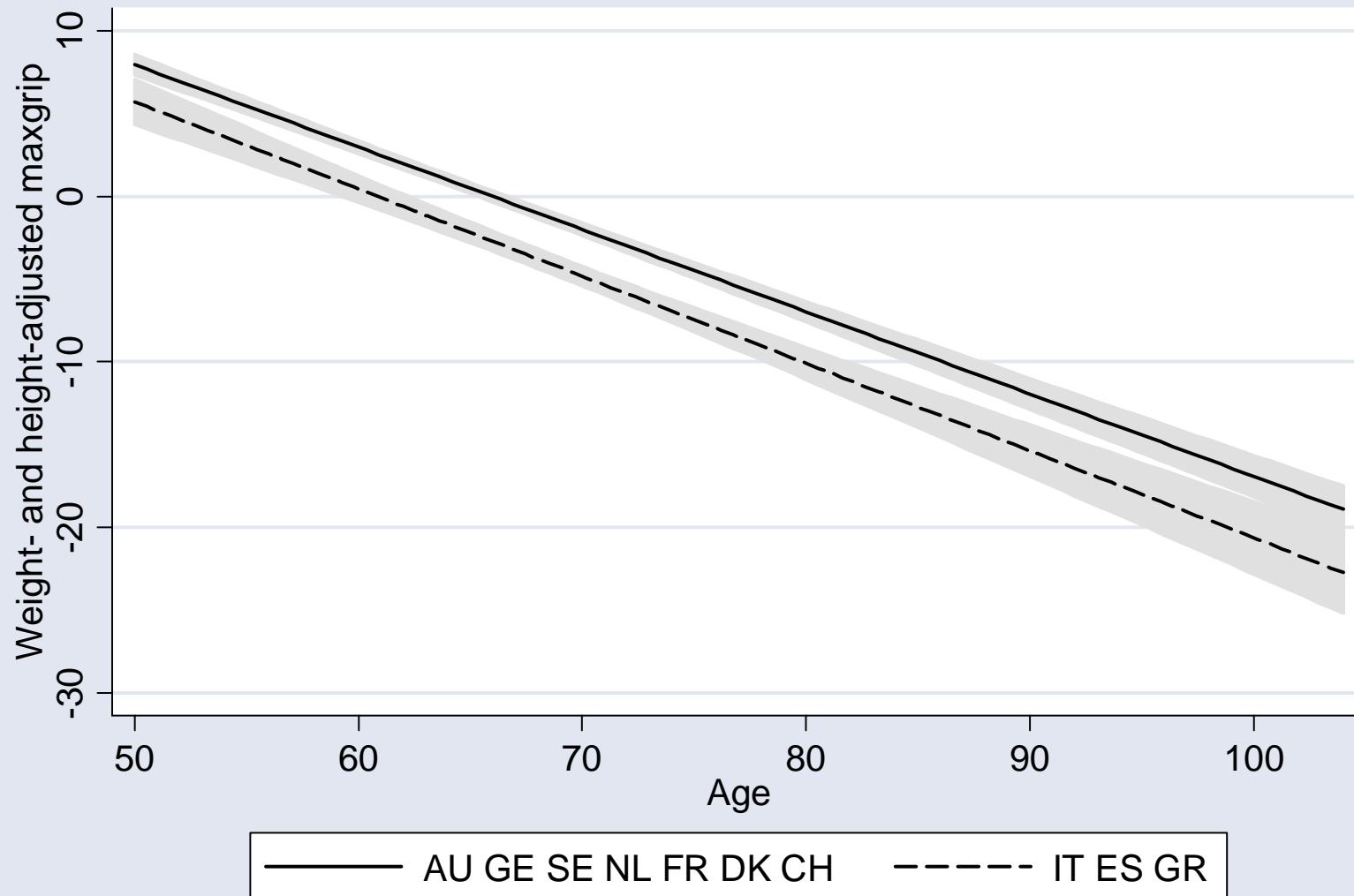


## Males



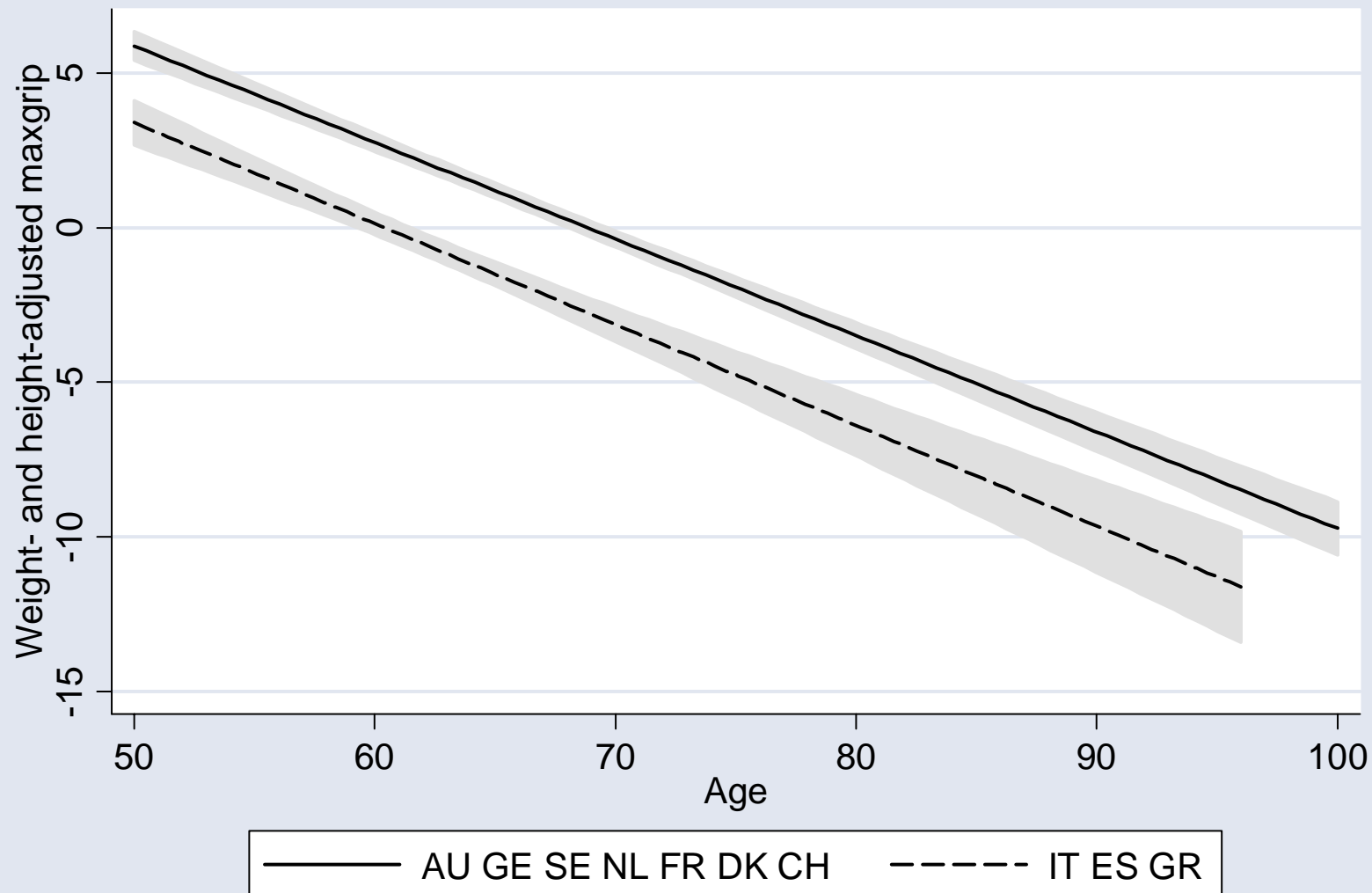


## Males





## Females





# Why these north–south differences?

- Cannot be explained by lower stature in the southern countries
- Does not reflect the higher life expectancy at birth for Italians and Spaniards





# Why these north–south differences?

- Genetics? Twin studies show a substantial genetic component in hand grip
- Environment? Warmer climate, sedentary life style?
- Gene-environment interaction?
- Similar to gender - predicts within gender and country, not across gender or country



