

The Impact of Health on Human Capital Stocks

Fourth World KLEMS Conference

May 23, 2016

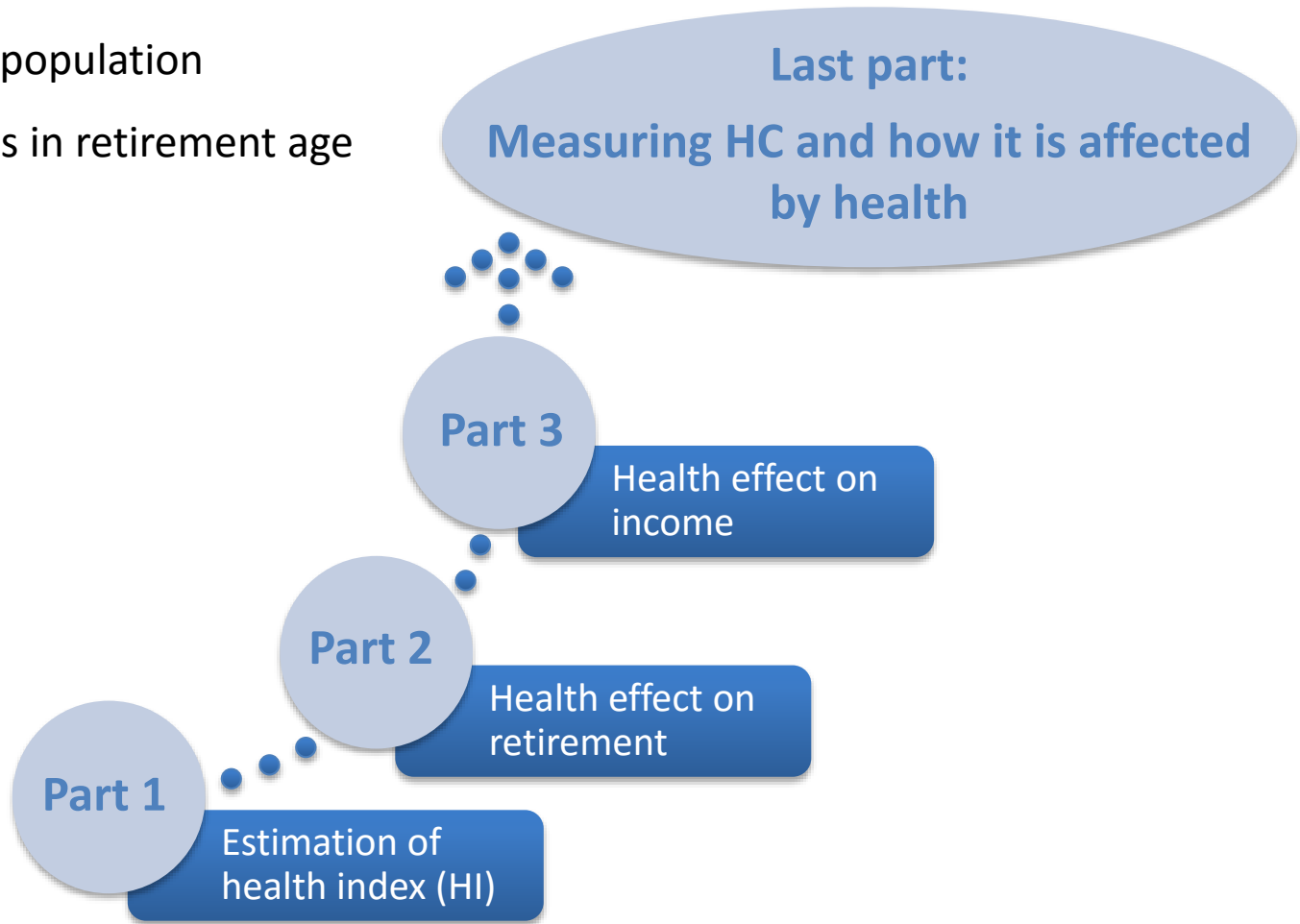
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Research Approach

Health conditions → HC → economic growth

by impacting on the labour force's productivity and its quantity supplied

- Ageing population
- Changes in retirement age



Health and HC

HC Estimation with Health Effect on Income

LLI is calculated for a representative individual in each category using backwards recursion, so market income is 0 beyond some age, here 69 – LLI equals current income

$$LLI_{s,a=69,e,h} = income_{s,a=69,e,h}$$

If aged 68, LLI equals current income plus discounted future income of those aged 69 with the same sex and education, conditional on survival

$$LLI_{s,a=68,e,h} = EMR_{s,a=68,e} income_{s,a=68,e,h} + sr_{s,a=69} \frac{1+g}{1+\delta} LLI_{s,a=69,e,h}$$

| $35 \leq a \leq 68$

If aged between 16 and 34, LLI takes account of education enrolment (school, FE, HE)

$$LLI_{s,a,e,h} = EMR_{s,a,e} income_{s,a,e,h} + sr_{s,a+1} \frac{1+g}{1+\delta}$$

[$ENR_{s,a,e} LLI_{s,a+1,e+1,h} + (1 - ENR_{s,a,e}) LLI_{s,a+1,e,h}$]

| $16 \leq a \leq 34$

Health and HC

HC Estimation with Health Effect on Retirement

Besides its impact on income, health effects are also implemented in the EMR to account for **increases in retirement probabilities when health is poor**

$$EMR_{s,a,e,h} = (1 - RETR_{s,a,e,h} - UNEMR_{s,a,e} - Other_{s,a,e})$$

Where RETR is the retirement rate, UNEMR is the unemployment rate and Other is the labour force drop out rate for other reasons.

For now assume only the retirement rate is affected by health.

Health and HC

The sum of HC across all classified categories yields the estimate for the aggregate value of employed HCS for men and women in good and in poor health:

$$HC_{sex,health} = \sum_{age} \sum_{edu} LLI_{edu,age} Population_{edu,age}$$

Health Index

Data and Model

Panel Data: Understanding Society, waves 1-5
Sample: Individuals aged 16+ of 40,000 HHs

To address type II endogeneity (mainly through reporting bias), model of self-assessed health (SAH) is estimated as a function of more objective health problems, Z , and some socio-economic variables, X , using pooled ordered probit

(following Bound (1991), Disney et al. (2006)¹ and Jones et al. (2010)²)

$$SAH_{i,t}^* = \alpha + \beta_{1,i}Z_{i,t} + \beta_{2,i}X_{i,t} + u_{i,t}, \quad \begin{array}{l} i = 1, 2, \dots, n; \\ t = 1, 2, \dots, T \end{array}$$

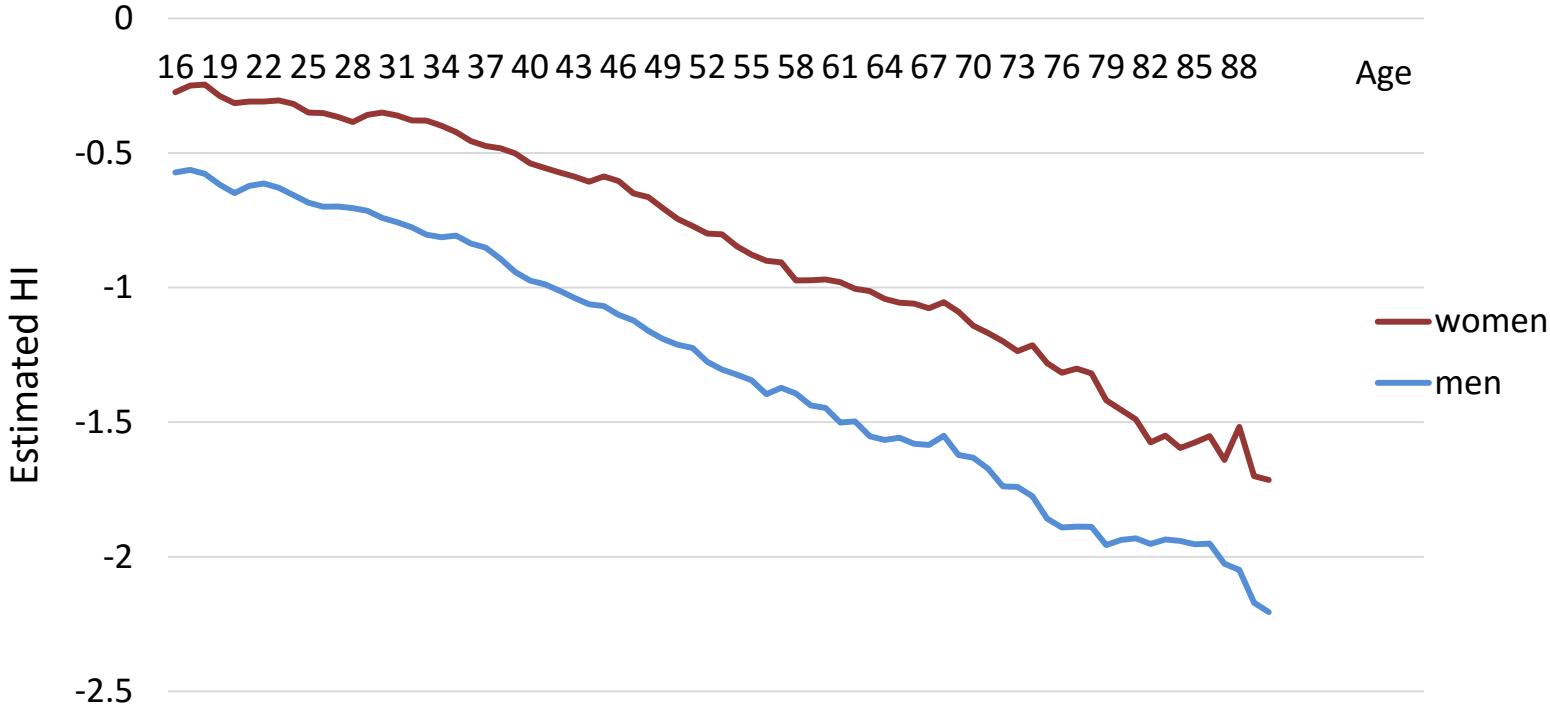
$$\begin{array}{l} SAH = 1 \text{ if } SAH^* \leq \alpha_1 \\ SAH = 2 \text{ if } \alpha_1 < SAH^* \leq \alpha_2 \\ SAH = 3 \text{ if } \alpha_2 < SAH^* \leq \alpha_3 \\ SAH = 4 \text{ if } \alpha_3 < SAH^* \leq \alpha_4 \\ SAH = 5 \text{ if } \alpha_4 > SAH^* \end{array}$$

¹ 9 waves of BHPS

² 12 waves of BHPS

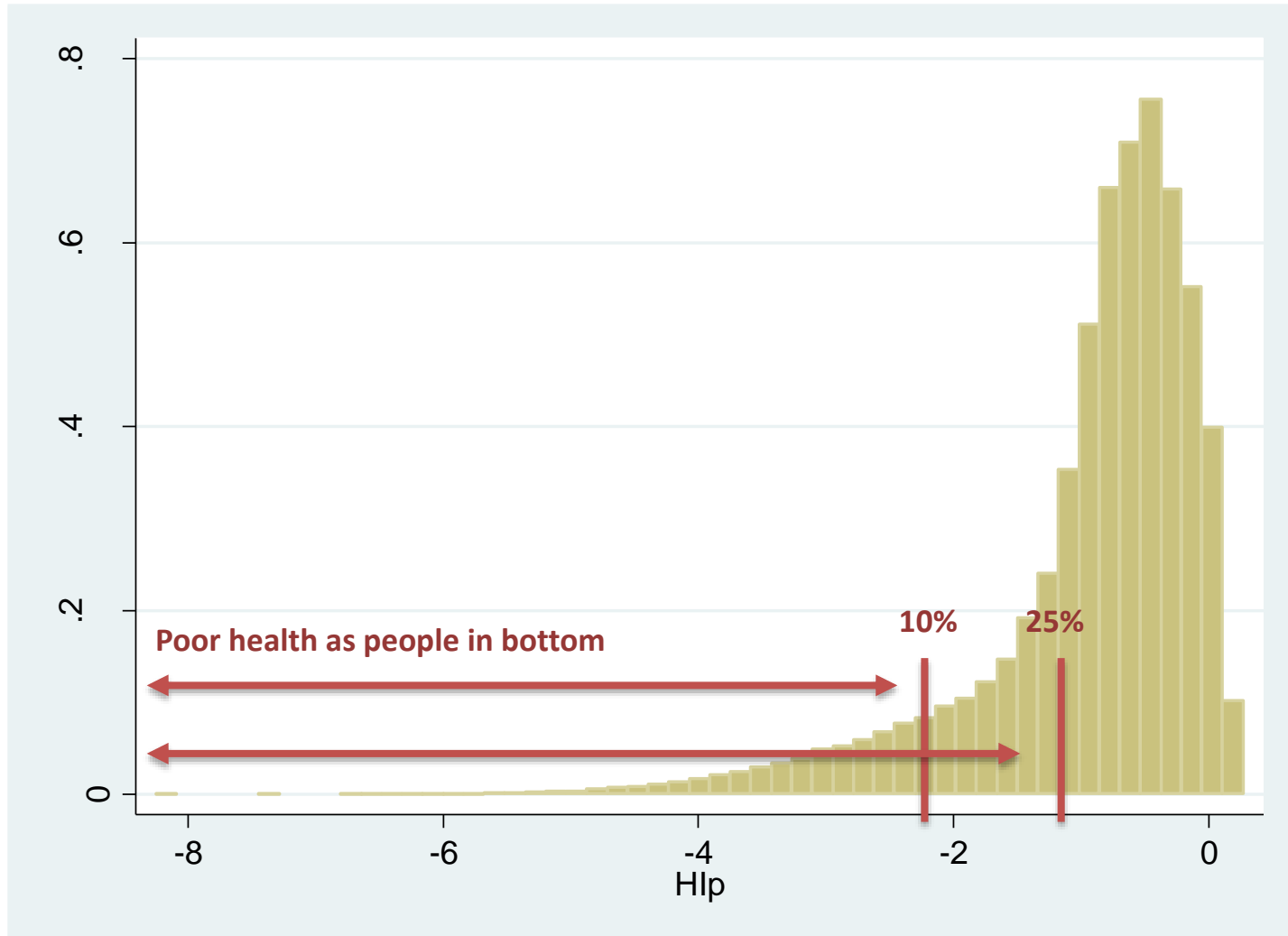
Health Index

Estimated HI



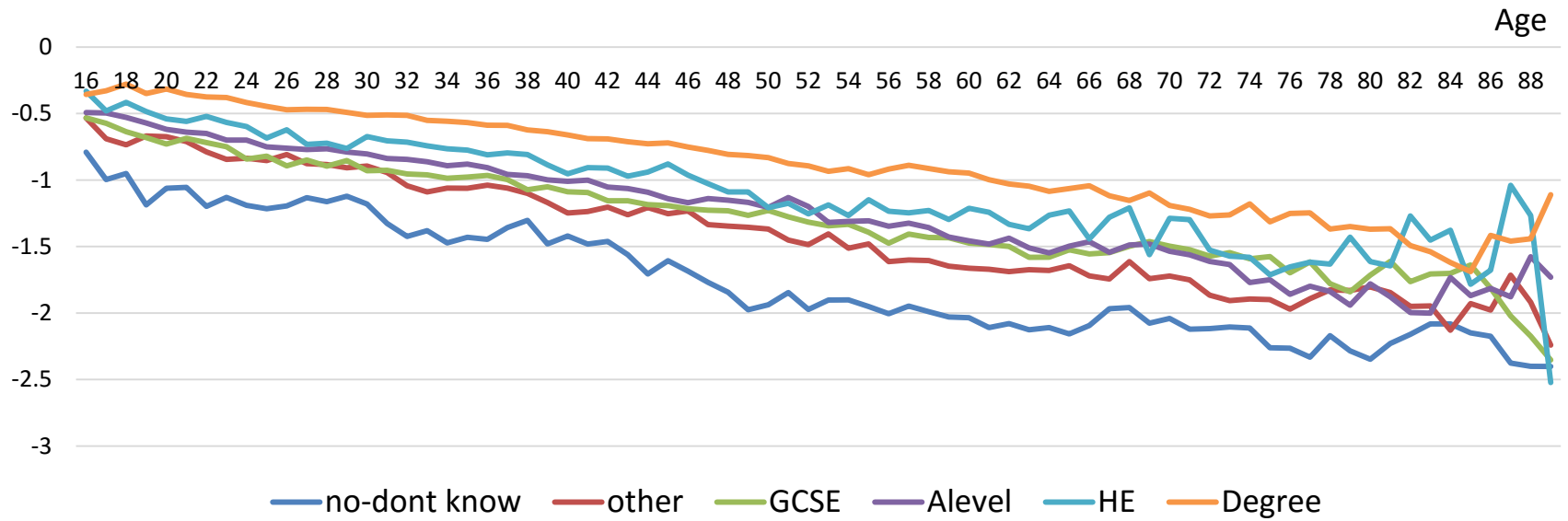
Health Index

Distribution of Estimated HI



Health Index

Estimated HI for Men by Qualification



Health & Retirement

The estimated HI in the Retirement Model

Panel Data: Understanding Society, waves 1-5

Sample: Individuals aged 50+, employed in wave 1

Retirement probabilities are estimated as a function of SAH* (of individuals and their spouses), caring activities, CAR , and socio-economic factors, X , using probit

$$\begin{aligned} & \Pr(\text{ret}_{i,t} = 1 | SAH^*, SAHSP^*, CAR, X) \\ &= \alpha + \beta_{1,i} SAH_{i,t}^* + \beta_{2,i} SAHSP_{i,t}^* + \beta_{3,i} CAR_{i,t} + \beta_{4,i} X_{i,t} + u_{i,t}, \end{aligned}$$

$$i = 1, 2, \dots, n;$$

$$t = 1, 2, \dots, T$$

Health & Income

The estimated HI in the Hourly Wage Model

Panel Data: Understanding Society, waves 1-5

Sample: Individuals aged 16+, employed in all waves

Health effect on hourly wages of first and second job are estimated as a function of SAH* and socio-economic factors, X , using OLS. Endogeneity was addressed by running separate regressions for each qualification category (as this yielded similar effect sizes when GP visits were used as an IV).

$$\ln wage_{i,t,edu} = \alpha + \beta_{1,i,edu} SAH_{i,t,edu}^* + \beta_{2,i,edu} X_{i,t,edu} + u_{i,t,edu}$$

$$i = 1, 2, \dots, n;$$

$$t = 1, 2, \dots, T$$

Health and HC

Construction of Database

Information of individuals aged 16 to **69** (*effective human capital*) on

- Number of total and employed population
 - + Unemployed population
 - + Retired population
- Annual earnings when employed
- Enrolment rates for school, FE and HE
- Survival rates

Cross-classified by

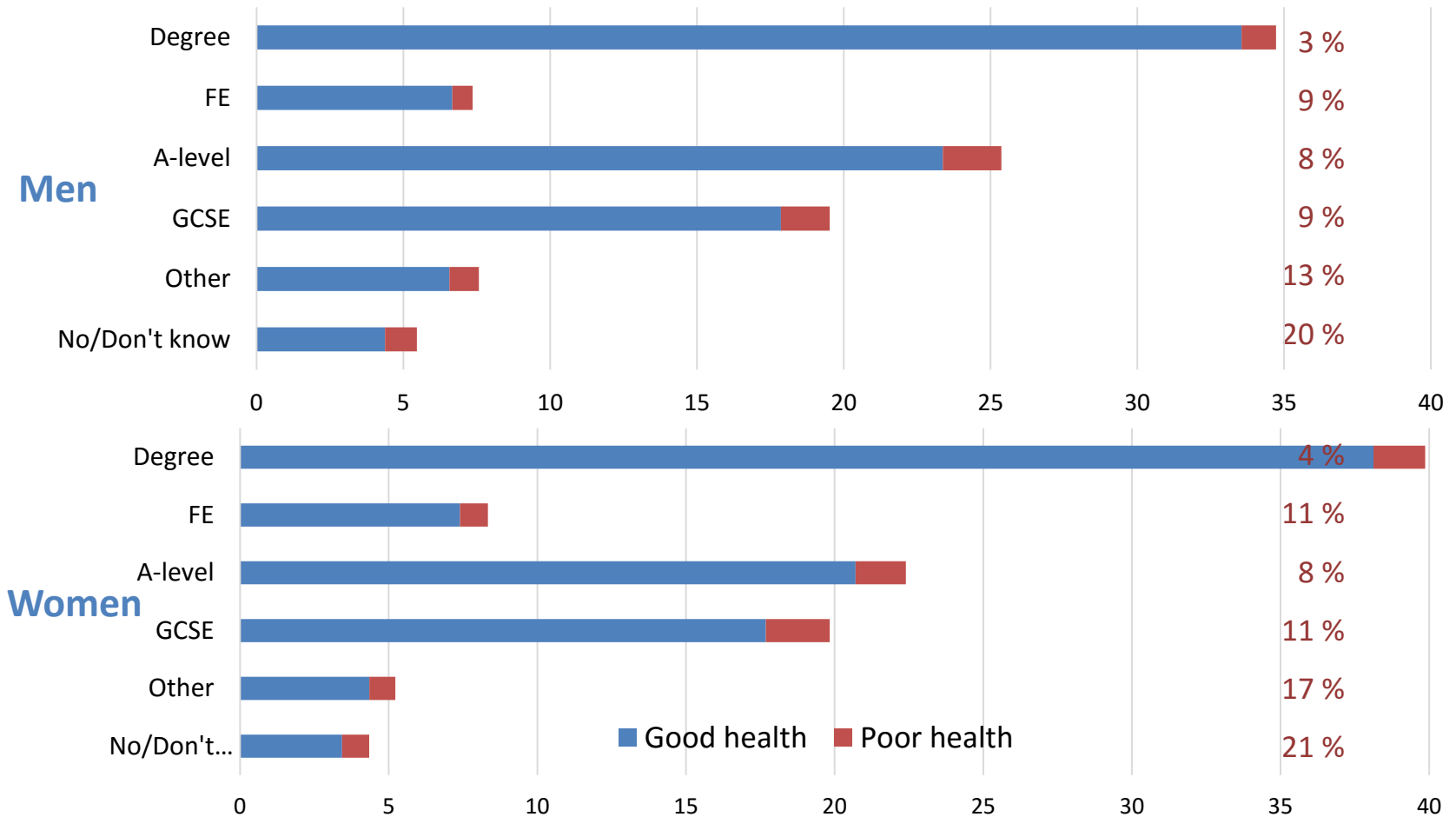
- Gender
- Age
- Qualification (no/don't know, other, GCSE, A-levels, FE, Degree)
 - + Health status

(poor health: bottom 10%/25% of previously estimated HI)

Sources: LFS, USS, Department for Education, HESA, ONS

Preliminary Results: Accounting for Income Differences

Employed HCS (in %) by Health Status and Qualification in 2014



Preliminary Results: Accounting for Differences in Income & Retirement

Average HCS by Health Status - 2014

Poor health defined as lowest	Men		Women	
	25 percentile	10 percentile	25 percentile	10 percentile
Good health	£ 393,409	£ 363,553	£ 258,728	£ 239,115
Poor health	£ 145,925	£ 113,891	£ 98,407	£ 73,442
Poor health - redistributed*	£ 176,971	£ 141,225	£ 125,069	£ 95,666
HC ratio	2.22	2.57	2.07	2.50

** population in poor health is divided across qualifications using shares from healthy population*

Taking account of the greater probability of retirement decreases HC by about another 4% for those in poor health, and so the ratio of good to poor increases. Of course this has much larger effects for the over 50s.

Preliminary Results:

Accounting for Income Differences

How would HC change if everyone in poor health becomes healthy? – 2014

HC (£ in trillion)	Men		Women	
	25 percentile	10 percentile	25 percentile	10 percentile
Good health	£ 7.14	£7.53	£ 4.69	£ 4.99
Poor health	£ 0.59	£ 0.17	£ 0.42	£ 0.12
Total	£ 7.72	£ 7.69	£ 5.11	£ 5.10
Good health	£ 7.14	£ 7.53	£4.69	£ 4.99
Poor health → good health	£ 1.40	£ 0.44	£ 0.88	£ 0.28
New total	£ 8.53	£ 7.97	£ 5.57	£ 5.26
Log Δ in HC (↑)	10 %	4 %	9 %	3 %

Conclusion

Relevance of Human Capital for Policy Makers

1. The effect of health on HC becomes apparent when looking at average rather than total figures
 - Only a small number of people are in poor health but the majority of individuals in poor health have low qualifications and, hence, lower earnings
 - Once controlling for qualification level, individuals in good health have up to 2.6 times higher average HC than people in poor health
2. If all individuals in poor health become healthy, total HCS increases by up to 10% for men and up to 9% for women
3. Next step is to produce time series to gauge the impact of health on the growth in HC