

Association of Leg Length with Mortality: Evidence From NHANES I

INTRODUCTION

Epidemiologic and demographic studies have tried to explain the association between early childhood conditions and health outcomes in adulthood. Some authors claimed that adult leg length is particularly sensitive to environmental factors and diet in early childhood (Wadsworth et al. 2002, Gunnell et al. 1998). Others suggest that leg length appears to be a biomarker for factors acting specifically in the prepubertal period (Lawlor et al. 2003). It has been proposed that cohorts exposed to disadvantage circumstances in childhood are typically found to experience increased levels of morbidity, disability and mortality when they are older adults (Elo and Preston 1992; Mosley and Gray 1993). We examine the association of leg length with adult mortality in the U.S. controlling for some demographic and health variables using a longitudinal a data set over a period of 20 years

BACKGROUND

- Leg length has been associated with three of the main causes of death in the U.S.: heart disease, cancers and diabetes.
- Coronary heart disease (CHD), pulse pressure (PP) and blood pressure have been associated with leg length (Smith et al. 2001; Lanberg et al. 2003).
- Taller people have been shown to have an increased risk of breast, prostate, colorectal and hematopoietic cancer; while the risk of stomach, cervical and esophageal cancer is lower in taller individuals (Gunnell et al. 2001).
- Factors related to the insulin resistance syndrome were shown to be less favorable in men with shorter legs, and leg length was found to be inversely associated with diabetes (Lawlor et al. 2002; Smith et al. 2001; and Moses et al. 2004).

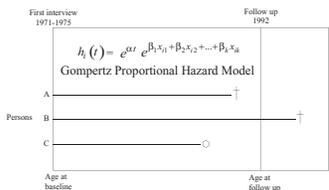
DATA

- Nutrition, Health and Examination Survey I (NHANES I): 1971-1975 (anthropometry component) and its epidemiologic follow-up in 1992 (vital status and mortality components).
- Sample restricted to people aged 35 and older at NHANES I.
- The selected sample consisted of 10671 people. About 42% died between the baseline and the follow up -more than half of the deaths were males (58%). The majority of people who survive the whole period were females (68%).

RESEARCH QUESTIONS

- Is there a relationship between adult leg length and adult mortality in the U.S. population?
- Are there any racial and gender differences in the U.S. so that leg length is associated with mortality for particular races or a particular gender only?

METHODS



Gompertz Proportional Hazard model with a gamma frailty component to account for population heterogeneity at older ages.

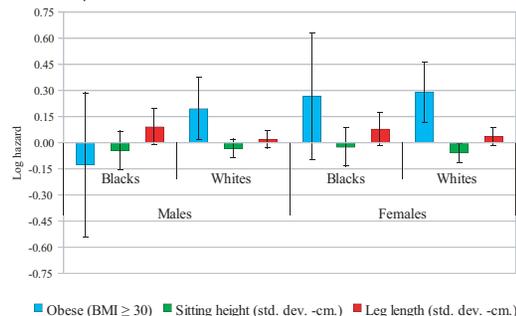
RESULTS

Hazard of death for people aged 35 and older fitting separate models by race: NHANES I and Epidemiologic follow up 1992

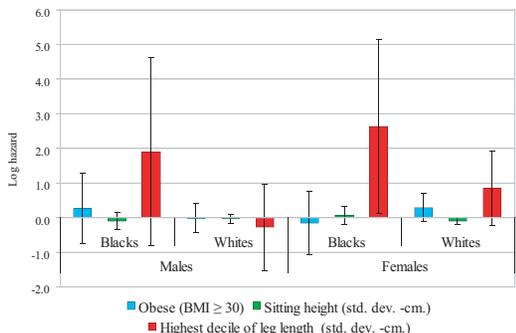
Variable	Blacks HR	Whites HR
BMI groups*		
Underweight	1.003 **	1.923 ***
Overweight	1.757 **	0.973
Obese	0.801	1.276 ***
Sitting height	1.070	0.987 **
Leg length	0.993 **	1.008 †

Note: All results control for sex, education, marital status, size of place, triops and subcultural identity.
*** p<.001 ** p<.01 * p<.05
†borderline BMI (18.5-24.9) is the reference category

Parameter estimates (95% C.I.) of the hazard of death by BMI, sitting height, and leg length fitting separate models by sex and race: NHANES I and epidemiologic follow up 1992



Parameter estimates (95% C.I.) of the hazard of death by BMI, sitting height, and lowest vs. highest deciles of leg length fitting separate models by sex and race: NHANES I and epidemiologic follow up 1992



DISCUSSION

- Despite the empirical evidence showing an inverse association of leg length with three of the main causes of death, we did not find an inverse association between leg length and mortality for the U.S. population. Rather, we found a significant direct association with mortality.
- For every 2-inches (5 cm.) increase in leg length of white people, the hazard of death increases by about 4%. For blacks, a similar increase in leg length implies an increase in the hazard of death of about 8%.
- There is a stronger association between leg length and mortality for black people compare to whites. This finding may be explained by the significantly worse childhood exposure (i.e., living standards, infant mortality) that black people experienced before 1950 (Ewbank, 1986) compare to whites, given that we are analyzing people born before 1940's.
- Fitting separate models by sex and race we found that leg length is associated with the hazard of death for black males only, increasing this hazard by 9.8% for every 2-inch (5 cm.) increase in leg length.
- Comparing the two extreme deciles (lowest vs. highest) of leg length by fitting separate models by race and sex we found an association with the hazard of death for black females only. The hazard of death is about twice as large for black females whose leg length lies in the upper tenth-percentile compare to those females in the bottom ten percent.

ACKNOWLEDGEMENTS

I would like to thank both Douglas Ewbank and Beth Soldo from the Population Studies Center of the University of Pennsylvania for their valuable guidance and support. I am also very grateful for the time and effort of Laura McNamara & Nykia Perez from the Penn Demography Library in helping me putting together this poster.