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The biology of inequalities in health: the LIFEPATH project

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ABSTRACT

Socioeconomic differences in health have been consistently observed worldwide. Physical health deteriorates more rapidly with age among men and women with lower socioeconomic status (SES) than among those with higher SES. The biological processes underlying these differences are best understood by adopting a life course approach. In this paper we introduce the pan-European LIFEPATH project which uses multiple cohorts – including biomarker data – to investigate ageing as a phenomenon with two broad stages across life: build-up and decline. The 'build-up' stage, from conception and early intra-uterine life to late adolescence or early twenties, is characterised by rapid successions of developmentally and socially sensitive periods. The second stage, starting in early adulthood, is a period of 'decline' from maximum attained health to loss of function, overt disease and death. LIFEPATH adopts a study design that integrates social science and public health approaches with biology (including molecular epidemiology), using well-characterised population cohorts and omics measurements (particularly epigenomics). LIFEPATH includes information and biological samples from 17 cohorts, including several with extensive phenotyping and repeat biological samples, and a very large cohort (1 million individuals) without biological samples (WHIP, from Italy). The countries that are covered by the cohorts are France, Italy, Portugal, Ireland, UK, Finland, Switzerland and Australia. These cohorts are only a small proportion of all cohorts available in Europe, but we have chosen them for the combination of good measures of socioeconomic status, risk factors for non-communicable diseases (NCDs) and biomarkers already measured (or availability of blood samples for further testing). The majority of cohorts include 'hard' outcomes (diabetes, cancer, Cardiovascular Disease (CVD), total mortality), and the extensively phenotyped cohorts also include several measurements of the functional components of healthy ageing, including frailty, impaired vision, cognitive function, renal and brain function, osteoporosis, sleep disturbances and mental health. All age groups are represented with two birth cohorts, one cohort of adolescents and several cohorts encompassing young adults (age 18 and above). Furthermore, there is a strong representation of elderly subjects in seven cohorts. The specific objectives of the project are: (a) to show that healthy ageing is an achievable goal for society; (b) to improve the understanding of the mechanisms through which healthy ageing pathways diverge by SES, by investigating life course biological pathways using omic technologies; (c) to examine the consequences of the current economic recession on health and the biology of ageing (and the consequent increase in social inequalities); (d) to provide updated, relevant and innovative evidence for healthy ageing policies (particularly 'health in all policies') using both observational studies and an experimental approach based on a reanalysis of data from a 'conditional cash transfer' randomised experiment in New York and new data collected as part of an earned income tax credit randomised experiment in Atlanta and New York. To achieve these objectives, data are used from three categories of studies: 1. national census-based follow-up data to obtain mortality by socioeconomic status; 2. cohorts with intense phenotyping and repeat biological samples; 3. large cohorts with biological samples. With these objectives and methodologies, LIFEPATH seeks to provide updated, relevant and innovative evidence to underpin future policies and strategies for the promotion of healthy ageing, targeted disease prevention and clinical interventions that address the issue of social disparities in ageing and the social determinants of health. The present paper describes the design and some initial results of LIFEPATH as an example of the integration of social and biological sciences to provide evidence for public health policies.

KEYWORDS: Social inequalities; Socioeconomic status; Healthy ageing; Life-course; Omics; Biology