COMMENTARY

Medical demography and epidemiology: dizygotic twins

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Abstract Demography is the statistical study of populations, epidemiology of health of populations. Fascinating challenges for future research, shared by epidemiology and demography, are to be found in the human life course, how the life course is transmitted over generations, how the healthy life is shaped by dynamics within the life course and how the life course is affected by the social and economic environment. The life course begins when two future parents meet. Then social disadvantage or privilege is beginning and diverse rates of ageing are being fixed. Health in utero and at young age will co-determine health at middle and old age, among others mediated by a greater intelligence and a better education. Particularly better education compresses cognitive disability at the end of life, building cognitive reserves that increase brain plasticity and enhance resistance to damage. While with extended life spans may come extended life spans with disability, the twin demography and epidemiology may show how to lighten the burden of senescence at the end of life.

Keywords Demography · Epidemiology · Cognitive epidemiology · Ageing · Life expectancy, disability · Social status · Life table analysis

Demography is the statistical study of populations, studying changes in these populations in response to birth, migration, aging and death. Central to modern demography is the study of the human life course: how we are born,

transmitted over generations and how the healthy life is shaped by dynamics within the life course and how the life course is affected by the social and economic environment [1, 2].Health and ill health are transmitted over generations through genetic, social and cultural mechanisms [3, 4]. Social status is as heritable as money or hypercholesterolemia. Social epidemiologists assume extrinsic conditions causing ill health, but the tenacity and ubiquity of these relationships between socio economic status, education, disease and mortality in very different societies defy that simple theory [5]. This does not mean that extrinsic conditions play no role. In complex systems, many processes interact. Indeed, it has been shown, also in this journal, that a social "good" or "bad" environment will promote good health or disease in its inhabitants [6, 7]. But there is more to it. In the European Union, the largest differences in health between social classes are to be found in the former

socialist states, while in the rest of the EU there is no

obvious correlation between socio economic differences in mortality and inequality in society [8]. Somewhat surpris-

ingly, the lowest mortality differentials between social

classes have been found in the Mediterranean countries,

where cardiovascular mortality is lowest [9]. The sharp

grow up, find a partner, settle down, get children, raise

them, become a grandparent, age and die. While demography is small in academia, it is arguably the most

multidisciplinary human science of all, drawing from

anthropology, economics, sociology, biology and, last but

not least, medicine and epidemiology. Demography and

epidemiology join at many places, but particularly at the

beginning and the end of the life course: fertility, birth,

aging and death. Fascinating challenges for future research,

shared by both epidemiology and demography, are to be

found in the human life course, how the life course is

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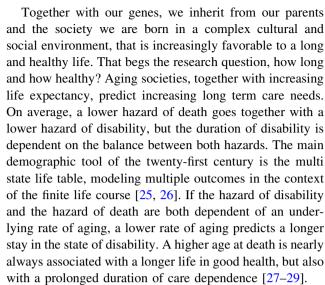
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decline in total mortality has been dominated by decreasing cardiovascular mortality. The risk of cardiovascular mortality is enhanced by psychosocial stress, caused by poverty and social disadvantage [10]. The message may be important, suggesting that lowering cardiovascular mortality in all classes will decrease at least absolute mortality differences between social classes.

The rates of aging are higher in those who are disadvantaged. At the same chronological age since birth, people of lower socio economic classes have an older biological age, closer to death. The life course begins even before conception, when two future parents meet. Then social disadvantage or privilege is beginning, diverse rates of ageing are becoming fixed. In some cultures, if you are a boy or a girl can already determine if you are born or aborted [11]. Increased paternal age at conception predicts mortality in adulthood [12]. If your father is of a lower social class, you are more likely to be obese [13]. Students with no siblings experienced higher respiratory mortality [14]. The Journal extensively documented how health at middle and old age, and particularly cardiovascular disease, is strongly determined by health in utero and at young age [15-20].

The history of the human species has been determined by selection for increasing brainpower, to cope with the increasing demands of social life in large societies [21]. There is a direct evolutionary link between longevity and intelligence. Optimal use of brainpower needs a long youth to learn, a long parenthood to support the children and additional help from grandparents, creating a potential evolutionary role for the elderly. Even in the society of today, the more intelligent children with the better education will live a longer life, more protected against coronary heart disease and stroke later in life [22, 23].

Some of the effects of innate intelligence are direct, increasing life expectancy free of cognitive dysfunctioning and decreasing life expectancy with cognitive disability [24]. In developed societies, higher levels of innate intelligence lead to a higher education, a better trained intelligence and to a greater likelihood of maintaining that trained intelligence at old age. That supplies a reserve of cognitive skills and capacities, allowing to cope better with brain damage [24]. The upshot of this cognitive reserve theory is that existing cognitive reserves and acquired compensatory mechanisms are able to postpone the incidence of clinical dementia to a more advanced age and a more severe stage of brain damage, leading to a worse prognosis and shorter duration of clinical dementia in those that are more highly educated. Better education means better cognitive health for life. Improved education of younger cohorts may be an important driver of future life extension, and even of the gender mortality gap, as girls get increasingly better education than before.



Life expectancy at birth of Japanese women exceeded 86 year in 2008. The residual life expectancy at age 65, describing mortality at old age, is now close to 24 year. If the mortality decline does not stop, the projected mean age at death of Japanese women from the baby boom cohort, today between 50 and 65, is not far from 95 years. This is hard to believe, but demographers showed that this continued mortality decline has always been stretching our imagination [30]. It is at least wise to foresee the possibility, as such an increased life expectancy will severely stretch pension plans and long term care needs.

Epidemiology and demography are dizygotic twins in population health sciences, sharing the healthy life course of humans as common strand [31]. It is a happy observation that we could illustrate this with a large spate of recent articles from the European Journal of Epidemiology. It will be the shared duty of epidemiology and demography to study how to optimize the healthy life span of people, and what will be the policy consequences of longer and healthier lives, but with increased durations of disability. We will not avoid ageing, but together we should be able to alleviate the burden of senescence further.

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