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Original article

Contribution of socioeconomic position over life to frailty differences in old age: comparison of life-course models in a French sample of 2350 old people

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ABSTRACT

Purpose: To assess the impact of socioeconomic position (SEP) over life on a measure of frailty in old age.
Methods: This is a cross-sectional population study of people aged 70 years and more in which 2350 respondents were interviewed in 2008 to 2010. The relationships between different indicators of SEP (childhood standard of living, level of education, occupational class, and current affluence) and quartiles of a frailty index including 43 variables were assessed in ordinal regression models adjusted for potential confounders.
Results: Mean age of the population was 83.3 ± 7.5 years, with 59.4% of women. The mean value of the frailty index was 0.19 ± 0.13, with values ranging between 0 and 0.65. All periods of social disadvantage were associated with increasing frailty in bivariate analysis. In multivariate analysis, a poor level financial security in the old age was the SEP indicator the most strongly associated with frailty (odds ratio [OR]: 2.81, 95% confidence interval [CI]: 2.20–3.59), followed by a low level of education (OR: 1.45, 95% CI: 1.17–1.80) and occupation during active life (OR: 1.38, 95% CI: 1.06–1.79).
Conclusions: Socioeconomic inequalities over life affect health capital in old age. The most important risk factor identified in this study, contemporary financial difficulties, was also the most accessible to prevention.

Introduction

Socioeconomic factors are important determinants of health status, throughout adulthood and old age [1]. European studies have shown that disadvantaged people die earlier than people in advantageous socioeconomic circumstances (high level of education or income) and that groups of lower socioeconomic status are more likely to report poorer health [2]. Socioeconomic inequalities can be enhanced in old age. Indeed, aging is often associated with a loss of income because of retirement or widowhood, and old people are more likely to face financial difficulties compared with their midlife counterparts. Data from two English cohorts have actually highlighted social gradients in both walking speed [3,4] and incidence of functional impairment [5].

A growing body of evidence suggests that health inequalities in later life cannot be fully understood without taking into account earlier life experiences. For instance, data from the Wisconsin Longitudinal Study showed that exercise in later life is influenced by socioeconomic status at the age of 18 years, an association partly mediated by socioeconomic resources and health in midlife [6]. In a Swedish cohort of men and women born in the period of 1915 to 1929, Mishra et al. [7] examined the effect of socioeconomic position (SEP) across lifetime on mortality in old age. Findings indicated that SEP at birth, in adulthood, and in later life independently increased mortality risk.

Among health measures in old age, frailty is increasingly used in both clinical and epidemiologic studies. Frailty is a geriatric concept that refers to the increased vulnerability to stressors [8]. This is an age-related predictor of adverse health outcomes and mortality in old age, which is the result of a decrease in physiological reserves of

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multiple systems [9]. Although the existence of a social gradient in frailty in old age is well documented [10–20], only a few studies have examined the effect of the period of exposure to social inequalities [19,21].

In this context, this study aims to investigate the effect of SEP at each life stage on health in old age, measured using a frailty index (FI).

Material and methods

Study design and population

This work is part of a cross-sectional study carried out to characterize health and functional independence among people aged 70 years and older (SIPAF study, French acronym for "Système d'Information sur la Perte d'Autonomie Fonctionnelle de la personne âgée," meaning "information system for loss of functional autonomy of the elderly"). Subjects were selected at random among participants in a supplementary pension fund, AG2R La Mondiale (Paris, France), with over-representation of strata of the oldest olds. The French pension system is composed of three levels: basic, supplementary, and private. The supplementary pension is mandatory and operates on the principle of "pay-as-you-go." It complements the basic pension, proportionally to earned salaries. At the time of the sample selection, the source population was composed of the 2,100,000 retirees. Recruitment took place across whole France from 2008 to 2010. Participants were interviewed at home by trained nurses who collected information on health and social history. In 16.6% of the cases, a close relative was present to confirm or complete the answers of the participants. The vital status of the participant was followed up until June 5, 2012 for 2296 people (97.7% of the study sample). The research protocol was approved by an independent ethics committee (permission n°060316).

Health assessment

In addition to self-assess their health on a Likert scale between "very good" and "very poor," participants were asked to name the health problem(s) they experienced or for which they were treated from a list of 14 chronic diseases including asthma, allergies, diabetes, cataract, high blood pressure, heart attack, stroke and/or cerebral hemorrhage, chronic bronchitis and/or emphysema, arthrosis and/or (rheumatic) arthritis, osteoporosis, gastric or duodenal ulcer, malignant tumor, migraines and/or frequent headaches, and chronic anxiety and/or depression (list of chronic diseases used by the European Commission to monitor population health). Polypharmacy, evaluated from the consultation of the prescriptions, was defined as five medications or more and excessive polypharmacy as 10 medications or more. Mood status was assessed with the 15-item Geriatric Depression Scale [22]. Depression was defined as a score higher than 5 and severe depression as a score higher than 10. Cognitive status was evaluated with the Mini-Mental State Examination (MMSE) [23]. Mild cognitive impairment was defined as a score of 26 or less and more severe cognitive decline as a score of 20 or less.

Participants were asked about geriatric problems, such as unintentional weight loss (of 10% of body weight during the past 6 months), urinary incontinence, falls during the past year, and imbalance when walking. Specific questions about sensory and functional limitations dealt with the ability to see newspaper print clearly, the ability to see the face of someone 4 meters away clearly, the ability to hear distinctly what is said in a conversation, and the ability to chew hard foods without difficulty, optionally with corrective devices (glasses, hearing aids, and dentures). In addition, participants were asked whether they were able to come and go within and outside the house, whether they can walk up and down stairs without difficulty, and whether they can lift a bag weighing 5 kg without difficulty. The evaluation of activity restrictions examined the need of help in the five activities of daily living included in the Katz index [24], that is, bathing, dressing, toileting, transferring, continence and feeding, and the need of help in instrumental activities of daily living [25] such as food preparation, the ability to use a telephone, housekeeping, shopping, and the ability to manage one's finances.

The level of physical activity was assessed with the International Physical Activity Questionnaire [26] and three levels of activity were distinguished (low, moderate, and high) according to time spent walking and doing moderate (for instance, carrying light loads, leisure bicycle ride, tennis) and vigorous activity (for instance, carrying heavy loads, digging, lifting a pack of six bottles, or speed bicycle) during the past 7 days.

Frailty index

According to Searle et al. [27], variables included in an FI should meet different requirements: being deficits associated with health outcomes, age related, not too prevalent, and covering a range of systems. Based on these requirements, we created an FI by adding deficits in 43 variables encompassing the different dimensions of the health assessment described previously. These variables which were either binary, ordinal, or continuous were coded in a 0 to 1 interval (e.g., 0, 0.5, 1). Details about the variables included in the FI and their prevalence in the study sample are given in Table 1. Among the 43 variables included, only variables dealing with chronic diseases failed to show a positive association with age, probably because of survivor effects in our old to very old population. Subjects with missing data for more than 10% of the variables included in the index (i.e., 4 in 43) were excluded from the analysis. The relevance of the resulting index was tested with regard to the risk of dying during the follow-up of the study.

Social history assessment

According to Galobardes et al. [28], we used different specific indicators of SEP over four periods of life (childhood, young adulthood, midlife, and old age; Fig. 1). To assess early life SEP, participants were asked to qualify their family standard of living in childhood (well off, limited, or deprived). The measure of young adulthood SEP was based on the number of years of education (estimated from the school-leaving age minus 6 years). Low-level education corresponded to the first quartile of the distribution of years of schooling ($\leq$7 years), whereas high-level education corresponded to values above the 75th percentile (10 years). Three levels of occupational status were defined as follows: low (blue-collar workers), intermediate (intermediate white-collar workers, employees, and shopkeepers), and high (high-level white-collar workers). The midlife SEP was assessed using the highest level of occupation between the study participant and his and/or her spouse or partner. The SEP in old age was captured through self-perceived financial security, using the questions: "Do you think your economic situation is? Very good, good, fair, poor, very poor" and "In case of unexpected financial problems, can you cope by yourself?" A negative answer to this last question, as well as a poor to very poor reported economic situation indicated a poor level of financial security. A reported economic situation in the middle indicated moderate financial security.

Other variables

Information was also collected about other health risk factors such as tobacco smoking and alcohol drinking. Concerning tobacco