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Research paper

Trajectories of general cognition and dementia in English older population: An exploration

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ABSTRACT

Background: While the challenge of dementia in the older English population is widely shared; opposing views are expressed about its trend. We aimed to estimate current dementia prevalence, explored recent trajectory of cognition likeliest to lead to dementia, and examine cohort effects.
Setting: The English Longitudinal Study of Ageing (2002–2015) is the primary nationwide longitudinal ageing study, which in the latest wave collected for the first time dementia status in the population. The previous six waves provided instead measures of general cognition to establish decade-long trajectories of cognition (n = 12,196).
Materials and methods: Dementia is ascertained using the Telephone Interview for Cognitive Status. Dementia in wave seven is predicted by latent trajectories of general cognition over the previous six waves, while controlling for contemporaneous confounders including age, sex, cohort, education, wealth, occupation, marital status, comorbidities, health behaviours, sensory function and social connections (offline and online). Logistic regression with standard errors adjustment for latent trajectories as covariates is used.
Results: The prevalence of dementia in the older English population aged 60–89 is 9.0% (confidence interval, 9.0–9.1%). Risk factors for general cognitive deficits are also responsible for dementia including sedentary behaviour, presence of comorbidities and lack of social connections. In contrast to cohort effects, which show no association, past trajectories of general cognition has the strongest association with dementia in the last wave.
Conclusion: Consistent with the long prodromal stage of dementia, decade-long trajectories of cognition are strongly consequential. Also, online social connections deserve further examination for its potential.
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1. Introduction

With increasing number of people passing the age of 60 years combined with an extending period of living beyond it, concern about dementia has been widely shared. But estimates of the prevalence of dementia and its trend have not commanded a consensus. The World Alzheimer Report (2015) put estimates of 46 million people with dementia today and 132 million by 2050, suggesting a moderate trend. But figures from England and the US suggested a decrease instead [1,2]. On the English figure, the authors put the decreasing trend down to the fact that the younger cohort (the War cohort compared to the pre-War cohort) have benefited from better public services impinging on cognitive health such as housing conditions and education. This suggestion

of cohort difference reflects evidence uncovered in a recent study of cognitive ageing in England [3]. It shows cohort differences in decade-long cognitive trajectories to be substantial. Therefore, good estimate of prevalence is sorely needed and any developments that presage incidence of dementia are worth examining.

Recognising the importance of cognitive change over an extended period, we recently studied non-demented older English people to delineate the trajectories of general cognition in the English Longitudinal Study of Ageing (ELSA) waves 1–6 [4]. Notably, there were no measures of dementia collected in the previous six waves so the study used cognitive scores capturing episodic memory and executive functions. We applied latent class trajectories method where the population likely clustered into a few trajectories. Each trajectory is distinct from another based on the way cognition changes as its members age. Like other studies seeking to draw a few empirically based latent trajectories [5], we found four trajectories of cognitive change that are robust to

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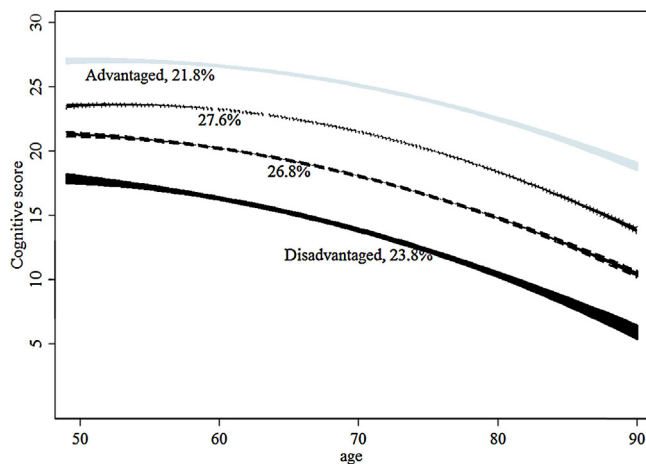 *E-mail address:* tampubolon@manchester.ac.uk (G. Tampubolon).

Fig. 1. Four trajectories of general cognition over a decade, 2002–2013 (ELSA waves 1 to 6). Source [4].

attrition during the decade (Fig. 1). We were also able to identify an advantaged trajectory (grey at the top) and a disadvantaged one (black at the bottom). The advantaged trajectory is strongly curvilinear, showing cognitive maintenance beyond 50, whereas the disadvantaged one is characterised by cognitive decline throughout [4]. The trajectories were also associated with cohorts, particularly with the post-War cohort members more likely to be found in the advantaged trajectory. If these few trajectories were indeed useful beyond distinguishing more or less advantageous change, then they should have some predictive power. Such power, if demonstrated, allows such trajectories, derived based on common cognitive instruments, to be used as an additional tool in our arsenal to anticipate or respond to dementia. Thus, we hypothesise that these four trajectories should carry some predictive information of dementia in wave 7.

We therefore aimed:

- to estimate the prevalence of dementia in the English older age population using a nationwide sample and internationally comparable tests for dementia status;
- to pick out trajectories of general cognition over the preceding decade that can tell apart those who are likely to have subsequent dementia;
- to examine cohort difference in prevalence of dementia;
- to identify contemporaneous risk factors predisposing older people to dementia.

2. Materials and methods

The English Longitudinal Study of Ageing (ELSA) is the main resource for a nationally representative ageing study of the English older population. The first wave was in 2002 and subsequent waves follow biennially. The data are freely available from the UK Data Archive (www.data-archive.ac.uk) as study number 5050. More details of the study are given elsewhere [6–11].

2.1. Ethics review

Ethical approval for all the ELSA waves was granted from the National Research and Ethics Committee (and its predecessor bodies) of the UK National Health Service www.hra.nhs.uk. The University of Manchester's institutional review board has exempted this study since it used publicly available anonymised secondary data for research.

2.2. Ascertaining dementia prevalence in the population

Dementia status was ascertained using tests from the Telephone Interview for Cognitive Status, an alternative to the Mini-Mental State Examination [12]. Two versions are possible from the results: based on the Langa-Weir approach with a cut-off 6 to mark demented status [13] and the Herzog-Wallace approach with a cut-off 8 [14]. Further information on refinement and modification to the tests are available [15–20]. We chose the Langa-Weir approach which consists of these tests: immediate and delayed recall of words, serial 7s, and backward counting; the total scores range from 0 to 27.

2.3. Confounders

We included an extensive set of confounders, which were known to affect cognitive function of older English people [3] or were used in the original validation of the tests [14]. Demographic covariates include sex (Female) and age (60 to 89 since aged is capped at 90). Cohorts are birth groups marked by socio-historical events to make them comparable to the US sister study (the Health and Retirement Study), to a recent study of this sample [3], and to a recent dementia prevalence study in Western Europe [1]. The four cohorts are pre-Depression cohort (born before 1930, the reference), Depression era cohort (1931–1938), War cohort (1939–1945) and post-War cohort (born after 1946).

Cognitive functions, like other health functions, are also shaped by social determinants of health [21,22]. These determinants include occupational class (three categories: managerial, intermediate and routine manual class as reference), wealth tertiles (wealthiest, middle and poorest as reference), marital status (married/union, divorced or separated and single as reference) and education [23].

It is not only the major social determinants such as wealth and occupation that can affect cognitive ageing. Broader social factors such as social networks can also influence cognitive functioning of older people through stimuli encountered in social interactions of various kinds, including traditional and online social interactions: in face-to-face meeting, by phone or by emails. Social networks include three social connection modes constructed from responses about how often cohort members (1) meet with friends, or (2) speak on the phone to them, or (3) write to or email them; the responses range from 0 for never or less than once a year to 6 for three times or more a week.

Since it is widely known that risk factors for cardiovascular disease (CVD) may be implicated in cognitive decline [24], we also include these risk factors or cardiovascular disease status. Moreover, since comorbidities generally increase with age (not only CVD and cognitive problems), broader comorbidities are also considered, covering diabetes, cancer, chronic obstructive pulmonary disease (COPD), arthritis and depression. The presence of depressive symptoms was assessed using the eight-item version of the Center of Epidemiologic Studies Depression Scale (CESD). The CESD has gained general acceptance as a tool to screen for depressive symptoms in older people and has been widely used in studies of late-life depression in England and the US [25]. Respondents responded to the eight questions regarding their feelings during the past week by answering "yes" or "no" to the following items:

(1) you felt depressed;
(2) you felt that everything you did was an effort;
(3) your sleep was restless;
(4) you were happy;
(5) you felt lonely;
(6) you enjoyed life;
(7) you felt sad;
(8) you could not "get going".