Introduction to the special issue on cognitive epidemiology

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Abstract

This is an introduction to a special issue of the journal *Intelligence* on cognitive epidemiology. Cognitive epidemiology is a new field of study, which examines the associations between intelligence—usually from early in life—and later morbidity (physical and mental) and mortality. In addition to exploring and establishing associations, studies within cognitive epidemiology attempt to explain them, by testing possible confounders and mediators, and complex pathways, of intelligence-health associations. Popular among mediators are health behaviours and education, and the well-known risk factors for chronic illnesses such as cardiovascular disease. In this special issue, readers will find advances in all of these matters. Thirteen new empirical studies, all involving large cohorts of humans, provide novel associations between intelligence and mortality, morbidity, and health behaviours and risk factors. New hypotheses of these associations are tested. This is the largest collection of cognitive epidemiology studies to date. Together, they will take the field forward by a quantum jump. This is a feast of cognitive epidemiology, establishing that, beside education and occupation, health outcomes contribute to the impressive predictive validity of intelligence differences.

As a recognised field of study, cognitive epidemiology—the study of how intelligence, especially from early life, is related to later health, illnesses and mortality—is new. There was an early report that the mean IQ of a geographical area was associated with mortality rate (Maller, 1933), but the first peer-reviewed empirical study of individual cognitive assessments and mortality dates from as recently as the late 1980s (O'Toole, Adena, and Jones, and see also O'Toole, 1990, and O'Toole & Stankov, 1992). Its bedding in as an area of research in which findings and ideas were published and discussed by different research groups occurred from 2001 onwards, after Whalley and Deary (2001) showed that intelligence measured in boys and girls at age 11 was significantly associated with survival up to 76 years in a follow-up study of the Scottish Mental Survey of 1932. Since that latter time, progress has been fast. Studies from different groups in different countries accumulated, and the first systematic review (Batty, Deary, & Gottfredson, 2007), and a glossary (Deary & Batty, 2007) and overviews (Batty & Deary, 2004; Gottfredson & Deary, 2004; Deary, 2005; Deary, 2008), of the field have appeared. The samples in the field of cognitive epidemiology are frequently large enough to provide robust estimates of effect sizes, and to test subsidiary hypotheses. For example, the association between intelligence in early adulthood and death by middle age was demonstrated in a sample of one million men (Batty, Wennerstad, Davey Smith, Gunnell, Deary, Tylenius, & Rasmussen, 2009).

In discussing the predictive validity of intelligence, the long-standing examples have been education and occupation. People with higher intelligence tend to gain more and higher educational credentials and score better on achievement tests, and they tend to work in more professional jobs and to have better occupational performance. But it is only recently that there was a satisfactory body of evidence which allowed one to add to those and state

with confidence that people with higher intelligence tended to live longer and generally have better health and lead healthier lifestyles. Those are now well-established, in different populations examined at different ages, and for various causes of death.

The aims of this special issue of Intelligence are fourfold: to extend the well-established associations between intelligence and mortality to new cohorts; to extend the association between intelligence and illness states to new health outcomes; to explore possible mechanisms for the associations; and to expand and refine the theoretical bases of cognitive epidemiology. The purpose of this introduction to the special issue is not to evaluate their contribution; that is left to David Lubinski in his Discussion. Rather, this introduction—by the elicitor of the articles, all of which were refereed by at least two independent reviewers—describes the players and acts and scenes in this human drama of how cognitive ability plays out into health, illness and death.

The contributors in this issue are an unusually eclectic group for *Intelligence*. There are differential and cognitive and other psychologists, of course, but there are also behaviour geneticists, epidemiologists (many), gerontologists, neurologists, other medical specialists, medical and other sociologists, and statisticians. If cognitive epidemiology is to survive and flourish, it will need to retain this collaborative mix, which affords an appropriate breadth of mind in thinking about causal pathways and possible mechanisms.

Among the articles, there is a set of studies that have death as the outcome. Like many of the studies in this special issue, the effort involved in completing these projects is near-to-heroic, in terms of the numbers of individuals tested, the length of follow-up, and the detailed information that was collected. Leon, Lawlor, Clark, Batty, and Macintyre's

(2009) article is based on the Aberdeen Children of the 1950s study situated in Scotland (N = 11,603). They examine how childhood IQ relates to death up to the late 50s, with detailed description of the association in the two sexes, at different ages, and for different causes of death. The article by Gallacher, Bayer, Dunstan, Yarnell, Elwood, and Ben-Shlomo (2009) is based on the Caerphilly Prospective Study situated in Wales (N = 1,870). They examine the cognition-mortality association in a sample tested originally in middle age to early old age, with an emphasis on the contribution of prior ability, and close attention to different causal models. The article by Wilson, Barnes, Mendes de Leon, and Evans (2009) is based on the Chicago Health and Aging Project situated in the USA (N = 10,121). They provide a novel comparison of the intelligence-mortality association in black and white older people. The article by Batterham, Christensen, and Mackinnon (2009) is based on the Canberra Longitudinal Study situated in Australia (N = 896). They also examine older people and, also in common with Wilson et al., study processing speed specifically in addition to more general measures of intelligence.

There is a set of studies that primarily have illnesses as the outcome. The article by Singh-Manoux, Sabia, Kivimaki, Shipley, Ferrie, and Marmot (2009) is based on the Whitehall II study situated in England (N = 5,292). They examine the association between intelligence and coronary heart disease, with special focus on socioeconomic status as a possible moderator of the effect. The article by Richards, Black, Mishra, Gale, Deary, and Batty (2009) is based on the UK Medical Research Council's National Study of Health and Development (also known as the British 1946 birth cohort) situated across England, Wales and Scotland (N = 3,035). They examine childhood IQ in relation to the metabolic syndrome in the 50s. The article by Der, Batty, and Deary (2009) is based on the National Longitudinal Survey of Youth 1979 situated in the USA (N = 7,476). They broaden the

outcomes, and examine intelligence in early adulthood in relation to dozens of physical and mental morbidity states experienced by 40 years. Another broad-based report is the article by Arden, Gottfredson, and Miller (2009) based on the Vietnam Experience Study situated in the USA (N = 3,654). They examine early adult intelligence in relation to a general fitness factor derived from a wide range of health indicators. The article by Gale, Hatch, Batty, and Deary (2009) is based on the 1958 National Child Development Survey (N = 6,369) and the 1970 British Cohort Study (N = 6,074), both situated across England, Wales and Scotland. They concentrate entirely on mental morbidity, and examine the association between childhood IQ and psychological distress in adulthood in these two British birth cohorts.

There is a set of studies concerned with the association between intelligence and illness risk factors and health behaviours. The article by Roberts, Der, Deary, and Batty (2009) is based on the UK Health and Lifestyle Survey situated in England, Wales and Scotland (N = 9,003). They use reaction time to assess processing speed and enquire how it measures up against other, more established risk factors for death by cardiovascular disease. The article by Anstey, Low, Christensen, and Sachdev (2009) is based on the Path Through Life study situated in Australia (N > 7,000). They examine the association between intelligence and processing speed and the adoption of healthy behaviours at different adult ages. The article by Deary, Gale, Stewart, Fowkes, Murray, Batty, and Price (2009) is based on the Aspirin for Asymptomatic Atherosclerosis study situated in Scotland (N = 1,993). They examine the association between intelligence and complying with taking medication over two years. The article by Johnson, Hicks, McGue, and Iacono (2009) is based on the Minnesota Twin Family Study situated in the USA (N = 1,252). They use a twin design to examine the environmental and genetic associations among intelligence, education, and substance use.

These thirteen large—the sample sizes are almost all in the thousands—almost entirely longitudinal, studies together make a large advance in cognitive epidemiology. They explore new ethnic and geographical groups in the field, they examine new health outcomes, they explore a wide range of candidate mechanisms that include possible confounding, mediating and moderating variables, and they compare different assessments of cognition. Intelligence is fortunate to have gathered such a collection of high quality reports. Sincere thanks go to the investigators for their enthusiastic and high-quality responses to the call for this issue, and to the referees who worked carefully and quickly.

Note. Ian Deary was the editor of this issue, except for those reports in which he appears as an author, which were edited by Douglas Detterman.

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