Intelligence 37 (2009) 517–519

Contents lists available at ScienceDirect

Intelligence

Introduction to the special issue on cognitive epidemiology

Ian J. Deary

Centre for Cognitive Ageing and Cognitive Epidemiology, Department of Psychology, University of Edinburgh, 7 George Square, Edinburgh EH8 9JZ, United Kingdom

ARTICLE INFO

Article history:
Received 29 April 2009
Received in revised form 30 April 2009
Accepted 5 May 2009
Available online 23 May 2009

Keywords:
Intelligence
Mortality
Health
Illness
Morbidity
IQ
Cognitive epidemiology

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, 1988, 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, 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 et al., 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

E-mail address: i.deary@ed.ac.uk.

0160-2896/$ – see front matter © 2009 Elsevier Inc. All rights reserved.
doi:10.1016/j.intell.2009.05.001

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-this issue) 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 et al. (2009-this issue) is based on the Caerphilly Prospective Study situated in Wales ($N = 1870$). 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-this issue) 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-this issue) 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 et al. (2009-this issue) is based on the Whitehall II study situated in England ($N = 5292$). 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 et al. (2009-this issue) 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 ($N = 3035$). They examine childhood IQ in relation to the metabolic syndrome in the 50s. The article by Der, Batty, and Deary (2009-this issue) is based on the National Longitudinal Survey of Youth 1979 situated in the USA ($N = 7476$). 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-this issue) based on the Vietnam Experience Study situated in the USA ($N = 3654$). 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-this issue) is based on the 1958 National Child Development Survey ($N = 6369$) and the 1970 British Cohort Study ($N = 6074$), 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-this issue) is based on the UK Health and Lifestyle Survey situated in England, Wales and Scotland ($N = 9003$). 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-this issue) is based on the Path Through Life study situated in Australia ($N > 7000$). They examine the association between intelligence and processing speed and the adoption of healthy behaviours at different adult ages. The article by Deary et al. (2009-this issue) is based on the Aspirin for Asymptomatic Atherosclerosis study situated in Scotland ($N = 1993$). They examine the association between intelligence and complying with taking medication over two years. The article by Johnson, Hicks, McGue, and Iacono (2009-this issue) is based on the Minnesota Twin Family Study situated in the USA ($N = 1252$). 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 valuable 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.

References

Anstey, K. J., Low, L.-F., Christensen, H., & Sachdev, P. (2009). Level of cognitive performance as a correlate and predictor of health behaviours that protect against cognitive decline in later life: The path through life study. *Intelligence, 37*, 600–606 (this issue).

Arden, R., Gottfredson, L., & Miller, G. (2009). Does a fitness factor contribute to the association between intelligence and health outcomes? Evidence from medical abnormality counts among 3,654 US Veterans. *Intelligence, 37*, 581–591 (this issue).

Batterham, P. J., Christensen, H., & Mackinnon, A. J. (2009). Fluid intelligence is independently associated with all-cause mortality over 17 years in an

elderly community sample: An investigation of potential mechanisms. *Intelligence*, *37*, 551–560 (this issue).
Batty, G. D., & Deary, I. J. (2004). Early life intelligence and adult health: Emerging associations, plausible mechanisms, and public health significance. *British Medical Journal*, *329*, 585–586.
Batty, G. D., Deary, I. J., & Gottfredson, L. S. (2007). Premorbid (early life) IQ and later mortality risk: Systematic review. *Annals of Epidemiology*, *17*, 278–288.
Batty, G. D., Wennerstad, K. M., Davey Smith, G., Gunnell, D., Deary, I. J., Tylenius, P., et al. (2009). IQ in late adolescence/early adulthood and mortality by middle age: Cohort study of one million Swedish men. *Epidemiology*, *20*, 100–109.
Deary, I. J. (2005). Intelligence, health and death: The new field of cognitive epidemiology. *The Psychologist*, *18*, 610–613.
Deary, I. J. (2008). Why do intelligent people live longer? *Nature*, *456*, 175–176.
Deary, I. J., & Batty, G. D. (2007). Cognitive epidemiology: A glossary. *Journal of Epidemiology and Community Health*, *61*, 378–384.
Deary, I. J., Gale, C. R., Stewart, M. C. W., Fowkes, F. G. R., Murray, G. D., Batty, G. D., et al. (2009). Intelligence and persisting with medication for two years: Analysis in a randomised controlled trial. *Intelligence*, *37*, 607–612 (this issue).
Der, G., Batty, G. D., & Deary, I. J. (2009). The association between IQ in adolescence and a range of health outcomes at 40 in the 1979 US National Longitudinal Study of Youth. *Intelligence*, *37*, 573–580 (this issue).
Gale, C. R., Hatch, S. L., Batty, G. D., & Deary, I. J. (2009). Intelligence in childhood and risk of psychological distress in adulthood: The 1958 National Child Development Survey and the 1970 British Cohort Study. *Intelligence*, *37*, 592–599 (this issue).
Gallacher, J., Bayer, A., Dunstan, F., Yarnell, J., Elwood, P., & Ben-Shlomo, Y. (2009). Can we understand why cognitive function predicts mortality? Results from the Caerphilly Prospective Study (CaPS). *Intelligence*, *37*, 535–544 (this issue).
Gottfredson, L., & Deary, I. J. (2004). Intelligence predicts health and longevity: But why? *Current Directions in Psychological Science*, *13*, 1–4.
Johnson, W., McGue, M., & Iacono, W. G. (2009). How intelligence and education contribute to substance use: Hints from the Minnesota Twin family study. *Intelligence*, *37*, 613–624 (this issue).
Leon, D. A., Lawlor, D. A., Clark, H., Batty, D. G., & Macintyre, S. (2009). The association of childhood intelligence with mortality risk from adolescence to middle age: Findings from the Aberdeen Children of the 1950s cohort study. *Intelligence*, *37*, 520–528 (this issue).
Maller, J. B. (1933). Vital indices and their relation to psychological and social factors. *Human Biology*, *5*, 94–121.
O'Toole, B. J. (1990). Intelligence and behavior and motor vehicle accident mortality. *Accident Analysis and Prevention*, *22*, 211–221.
O'Toole, B. I., Adena, M. A., & Jones, M. P. (1988). Risk factors for mortality in Australian Vietnam-era national servicemen: A case–control study. *Community Health Studies*, *12*, 408–417.
O'Toole, B. J., & Stankov, L. (1992). Ultimate validity of psychological tests. *Personality and Individual Differences*, *13*, 699–716.
Richards, M., Black, S., Mishra, G., Gale, C. R., Deary, I. J., & Batty, G. D. (2009). IQ in childhood and the metabolic syndrome in middle age: Extended follow-up of the 1946 British Birth Cohort Study. *Intelligence*, *37*, 567–577 (this issue).
Roberts, B. A., Der, G., Deary, I. J., & Batty, G. D. (2009). Reaction time and established risk factors for total and cardiovascular disease mortality: Comparison of effect estimates in the follow-up of a large, UK-wide, general-population based survey. *Intelligence*, *37*, 561–566 (this issue).
Singh-Manoux, A., Sabia, S., Kivimaki, M., Shipley, M. J., Ferrie, J. E., & Marmot, M. G (2009). Cognition and incident coronary heart disease in late midlife: The Whitehall II study. *Intelligence*, *37*, 529–534 (this issue).
Whalley, L. J., & Deary, I. J. (2001). Longitudinal cohort study of childhood IQ and survival up to age 76. *British Medical Journal*, *322*, 819–822.
Wilson, R. S., Barnes, L. L., Mendes de Leon, C. F., & Evans, D. A. (2009). Cognition and survival in a biracial urban population of old people. *Intelligence*, *37*, 545–550 (this issue).