It is too early to know if intelligence determines cancer incidence and survival

Batty et al. [1] present in this issue of *Annals of Oncology* a fascinating study evaluating the possibility that mental ability (intelligence quotient ('IQ')) in young adulthood (mean age of probands, a million male recruits in the Swedish army, was 19.5 years) might represent a determinant of cancer risk around age 40. They actually report that there was limited evidence of a link between IQ and incidence of cancer, which disappeared after correction for socioeconomic class. One exception was the IQ–skin cancer relationship, with increased rates evident in the higher IQ scoring men. In Sweden, and elsewhere, elevated rates of skin cancer have also been reported in the socioeconomically advantaged. The usual explanation for these data coming from countries in the north is that these persons tend to expose themselves more to the sun, as they can afford to travel during the winter to the southern beaches, with subsequent skin damage, from sunburns to malignant melanoma.

The reader will wonder why such a study was conducted. The authors discuss the background in their paper: there is actually a body of literature in the field of ‘cognitive epidemiology’ that shows a positive relationship between IQ at childhood and subsequent life expectancy. An example is a Scottish observation of 2792 children evaluated in 1932 at age 11. Childhood mental ability was positively related to survival to age 76 years in women ($P < 0.0001$) and men ($P < 0.0001$). A 15-point disadvantage in mental ability at age 11 conferred a relative risk of 0.79 of being alive 65 years later (95% confidence interval 0.75–0.84); a 30-point disadvantage reduced this to 0.63 (0.56–0.71) [2]. Such observations have undergone considerable scrutiny and many cofactors have been excluded, and the results are independent of socioeconomic status [3]. Oncologists have known for a long time about the decrease in mental ability related to childhood cancer therapy and to radiation therapy to the brain [4], and are aware of the existing debate about the so-called ‘chemobrain’, a decrease in cerebral function discussed mainly in the setting of adjuvant therapy for breast cancer (see Ahn et al. [5], also in this issue), and where trial methodology issues make interpretation of results difficult [6].

It is interesting to read that the details of the IQ tests to which the recruits were submitted are subject to ‘military secrecy’, and not standard. One wants to refer the reader to one of the modern ‘intelligence sources’, fully accessible to the public and improved by the public, Wikipedia (http://en.wikipedia.org/wiki/Intelligence_quotient) to read more about the history, various techniques and limitations of these assessments of mental ability. In 1905, the French psychologist Alfred Binet published the first modern intelligence test, the Binet–Simon intelligence scale. His principal goal was to identify students who needed special help in coping with the school curriculum. Along with his collaborator Theodore Simon, Binet published revisions of his intelligence scale in 1908 and 1911, the last appearing just before his untimely death. In 1912, the abbreviation of ‘intelligence quotient’ or I.Q., a translation of the German Intelligenz-Quotient, was coined by the German psychologist William Stern. A further refinement of the Binet–Simon scale was published in 1916 by Lewis M. Terman, from Stanford University, who incorporated Stern’s proposal that an individual’s intelligence level be measured as I.Q. Terman’s test, which he named the Stanford-Binet Intelligence Scale, formed the basis for one of the modern intelligence tests still commonly used today. They are all colloquially known as IQ tests. These tests have been adapted in all countries to specific requirements, and have been also changed as years pass by. The authors of this paper in *Annals of Oncology* indeed indicate that the IQ tests were profoundly changed in the Swedish army recently, determining a cut-off date for recruitment in their study. As they use a methodology which compares percentiles in test achievement, they correct for the changes in test results that might have appeared during the years.

Socioeconomic differences in cancer survival are well documented [7]. Whatever the limitations, however, presently available data seem to show that, while both income and intelligence have independent positive effects on self-reported health, intelligence has a stronger effect than income. A review paper concludes that individuals in wealthier and more egalitarian societies live longer and stay healthier, not because they are wealthier or more egalitarian but because they are more intelligent [8]. Maybe, and one would have liked to see if the ‘more intelligent’ recruits had less tobacco-related mortality, as one would assume that they would smoke less, in a country where anti-tobacco campaigns have been effective in the past decades. Unfortunately, data for tobacco use was available only for a minority of probands, and the numbers of events in this subgroup was insufficient to reach any significant conclusion. Furthermore, the study could not evaluate if smokers at age 19 continued to smoke, or if nonsmokers became smokers. One of the shortcomings of the present study is the relatively brief period of observation, with probands reaching a mean age of 40 and a maximum age of 52 (maximum follow-up was 32.9 years). As most environmentally related cancers will appear after age 50, and as most cancer patients are above the age of 65, it will be up to the next generation of investigators to tell us if there is any relationship between cancer and IQ at
age 19, in the male Swedish at least. But will some positive correlation appear? At least not according to some studies which have failed to see any correlation between IQ and outcome after age 65. One such report indicates that for deaths occurring up to age 65, there was a 36% increased risk per standard deviation decrease (15 points) in childhood IQ which was reduced to 29% after adjusting for social class and deprivation category. There was no statistically significant relationship between childhood IQ and deaths occurring after the age of 65 [9]. Certainly, more studies and exploratory analyses are needed to understand why lower IQ is associated with earlier death. An interesting recent study describes that psychometric intelligence and reaction times were both significantly related to all-cause mortality in a representative sample of 898 people aged 56 years who were followed up with respect to survival until age. The authors conclude that this new field of cognitive epidemiology provides arguably the strongest evidence for the importance of psychological factors in physical health and human survival [10].

M. S. Aapro
Doyen IMO Clinique de Genolier, Genolier Switzerland
(E-mail: maapro@genolier.net)

references