European Latsis Prize 2011 “Demography”

Laudatio for James Vaupel, Germany

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It is my great pleasure to present to you this evening, on behalf of the Expert Jury for the 2010 European Latsis Prize, the laureate James Vaupel.

James Vaupel, who is Director of the Max Planck Institute for Demographic Research, exemplifies, perhaps better than any other demographer, the interdisciplinary character of his discipline and its centrality to current events and the future of our societies. Europe, the first part of the world to experience long-term mortality decline and an ageing society, is a particularly appropriate field for research into population change and its determinants. Vaupel has, in the course of his research, overturned previous long-standing beliefs about his subject, has reintroduced biodemography as a fruitful field of study, and has established his Institute as the foremost in its field, while also willingly accepting a responsibility to train and nurture the next generation of scholars. He has done all this while publishing over 330 articles and contributions to books.

Population aging and its economic and social consequences are together the foremost demographic challenge of the 21st century, and are increasingly shaping policy and politics in Europe and other regions of the world, both rich and poor. Understanding processes of mortality decline and rising longevity, as well as the falling fertility which has accompanied them, is at the top of the scientific agenda in demography and related disciplines. Vaupel’s work has challenged three dominant paradigms. The first was Gompertz’ Law, dating from 1825, which stated that mortality rises exponentially with age, a generalization that appeared to apply to a very wide range of organisms including humans. Because the rate of increase is so rapid, with mortality doubling every seven years or so in humans, the prospects of extending human life span would seem to be limited. The second paradigm derivedfrom evolutionary biology and life history theory, where it was argued that as an organism moved through its life the remaining amount of lifetime reproduction would shrink, so selection against mutations affecting those later ages would weaken, deleterious mutations would accumulate in the genome, and the organism would senesce and mortality would rise. Evolution, then, would lead to steeply rising mortality following the end of reproduction in humans; the possibilities for medical science to overcome this genetically driven senescence would be severely limited. The third paradigm was that of James Fries, who influentially argued that human life expectancy was approaching a biological limit at around 85 years as a population average. He argued that as it did there would be a "compression of mortality" in the sense that deaths would be increasingly concentrated in the years just before this biological limit, as increasing proportions of people survived through the earlier years.

These three pillars of the dominant paradigm implied that future gains in life expectancy would be very limited, and therefore that the economic and social implications of population aging would also be limited. They also suggested that investment in biomedical advances against aging would be largely wasted, except in so far as they improved the quality of life prior to the biological limit.

Vaupel's seminal work on the demography and biodemography of aging and mortality has shown that all three of these views are mistaken. The combined effect of this work has been to revolutionize our view of longevity and aging. Vaupel's conclusions are based on analysis of human demography, the demography of other species of animals and plants, the demography of some inanimate human artifacts, and on new extensions of evolutionary life history theory. The combined impact is of the utmost scientific importance and policy relevance.

Vaupel's best-known empirical work, some of it with Oeppen, was a close analysis of historical demographic data from European countries, which showed that mortality at older ages had continued to decline rapidly with no end or deceleration yet apparent, even in countries like Sweden that already had exceptionally long life. With others, he showed that contrary to Gompertz' Law, the exponential increase with age of human mortality began to decelerate around age 85; indeed after age 110 the human mortality rate stopped rising altogether and became flat, with an risk of death of about 0.4 or 0.5 per year. This finding has been solidified as reliable data on larger numbers of so-called super centenarians, aged 110 and above, have been analyzed. Thus was discovered a mortality “plateau”, strikingly contrary to the Gompertz generalization.

Early on, Vaupel became interested in non-human demography, and his analysis of mortality in automobiles of different makes and vintages revealed both rising mortality with age and eventual plateaux in their case as well. Subsequent experimental work on longevity in populations of light bulbs revealed plateaux there as well. As a natural extension of his work on human mortality, Vaupel also became interested in the mortality of other species. He worked with the entomologist Jim Carey in a massive experimental study of mortality in captive fruit fly populations, where not only plateaux but also mortality decline in extreme old age were found. A series of carefully designed experiments then ruled out a number of less interesting explanations for these results, such as declining population density. This work attracted a great deal of scientific attention, and was the beginning of a new and dynamic wave of research inspired and led by Vaupel in the biodemography and evolutionary biodemography of aging and longevity. This reshaped not only our view of human longevity but also the way biologists view aging in other species. The mortality plateaux inspired a wave of theoretical work by mathematical demographers, statisticians and geneticists.

Vaupel’s first important theoretical contribution (with Manton and Stallard)was the model of heterogeneous frailty. This insight was expressed in a simple and tractable mathematical model which has proved valuable in many contexts. A more fundamental theoretical contribution was made jointly with his student, Annette Baudisch. They showed that the classic theory of senescence, with its prediction of inevitable rise in mortality following sexual maturity and the onset of reproduction, was not universally applicable. In particular, it did not apply to many species with “non-determinate growth” such as fish and plants. These species continued to grow throughout their lives, and as they grew their reproductive output increased and their mortality declined. Their life histories were very different than those of mammals or insects which grew to a particular size, and then ceased growing and began to reproduce. Thus the elegant classical theory of the evolution of senescence was shown to apply at best only to a particular subset of organisms, and was not a universal law.

Vaupel's empirical and theoretical contributions have been matched by his impact on research, teaching and publication in the field of demography. In little more than a decade after 1996, Vaupel and his colleagues established one of the leading demographic research institutes in the world and the Max Planck Institute has retained that position ever since. The Institute is characterized by excellence, innovation, and breadth in the coverage of demographic topics. Its signature theme, the centrality of mathematics to advances in demographic theory and research, distinguishes it from other demographic research centres.

Due in large part to Vaupel's initiatives, the Institute has contributed enormously to increased integration and cross-fertilization within European demography. It has provided significant support for demographic research and demographic researchers in the formerly socialist countries of Central and Eastern Europe.Vaupel was also instrumental in creating the International Max Planck Research School for Demography (IMPRSD) and the European Doctoral School of Demography. He has been a leader in the dissemination of demographic research. He founded the online journal *Demographic Research*, the first free, open-access, peer-reviewed, international journal in demography. His latest invention is Population Europe, a collaborative network of Europe's leading demographic research centres. Population Europe, supported by the European Commission, serves both academic and lay audiences (including policy-makers) by providing timely and accurate reports on demographic issues.

For all these contributions to demography, to social science and to the understanding of our societies, the Expert Jury unanimously and enthusiastically recommends the award of the 2011 Latsis Prize to James Vaupel.