Commentary: Preston and mortality trends since the mid-1970s

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Preston’s classic 1975 paper1 appeared at a point when life-expectancy in most countries of the world had been increasing for a considerable period. The aim of the paper was to explore the explanations for these improvements. Particular attention was given to the relative contribution of economic factors as measured by national income per head of population. His key conclusion was that less than half of the improvements observed between the 1930s and 1960s could be attributed to such economic factors. Moreover, contrary to what had been assumed, improvements in nutrition and education appeared to have had only a small role. Instead, Preston concluded that considerably more than half of the increase in life expectancy was a result of the positive influence of the global diffusion of medical and health technologies. These ‘exogenous factors’ included innovations in hygiene and sanitation and maternal and child services in less developed areas and specific vaccines and drugs for treatment of bacterial infections in more developed areas. These ground breaking analyses of the causes of mortality improvements in the first 60 years of the 20th Century are still seen as definitive. But are these insights and conclusions equally applicable to global mortality trends over the past 30 years? A rigorous answer to this question goes beyond the scope of a short commentary. However, some general observations can be made.

Many aspects of the mortality trends and their association with national per capita income examined by Preston have persisted. Life-expectancy for the world as a whole has increased over the past 30 years, although at a slower rate than previously. In addition, the key features of the iconic Preston curve are the same today as they were originally. The ‘Millenium’ Preston curve, produced by Deaton,2 relates GDP per capita by country in 2000 to the corresponding level of life expectancy. As Preston described in 1975 the curve still has two parts: a steep upward increase in life expectancy at the lower end of the GDP distribution and a much shallower increase and eventual plateau at the upper end of the GDP distribution. Preston’s intriguing conclusion that factors exogenous to each country’s current level of income accounted for more than half of the growth in global life expectancy (1930s–60s) was graphically illustrated in the original paper by the vertical displacement of the national income per capita and life expectancy curves in successive periods between 1930s and 1960s. A similar vertical displacement is still apparent when the curve for the 1990s is compared with that from the 1960s.3

However, since 1975 largely unanticipated challenges and reversals to global public health have occurred. One of the most important and least anticipated of these is the emergence of new and resurgent infections. In 1967 the US Surgeon General, William H Stewart, declared that ‘infectious diseases are now conquered’. While some may not have supported such a blunt assessment, it does capture the more optimistic outlook of the time which anticipated continued progress in this area. However, from the late 1980s the HIV/AIDS pandemic has had a major impact upon mortality. Most dramatically there have been steep declines in life expectancy in a number of countries of sub-Saharan Africa.4 This has been on such a scale that it has led to a divergence in the mortality experience of the world’s population over the past 15–20 years.5 This represented a reversal in the long-term trend of increasing convergence in global mortality experience that occurred between 1960 and the mid-1980s.

The divergence in global mortality experience due to HIV/AIDS has been reinforced by steep and unprecedented mortality increases in post-Soviet countries such as Russia. Increases in mortality first became apparent in the mid-1960s as recently discussed in this journal.6,7 However, as is well-known major declines in life expectancy occurred in the early 1990s precipitated by the collapse of the Soviet Union. These have been due to substantial increases in mortality at working ages, and among men in particular.8

The focus of Preston’s 1975 paper was inevitably on explanations for mortality decline—the dominant trend of the period he considered. Despite this, can the concepts articulated by Preston throw light on these more recent mortality increases? Country-specific exogenous or endogenous factors considered by Preston have little relevance to explaining the emergence of HIV/AIDS per se. However, the variation in vulnerability of populations to HIV/AIDS is related to such factors. For example, the discovery, development and distribution of anti-retroviral therapy around the world is a clear example of the sort of ‘exogenous’ factor considered by Preston.

The mortality reversals suffered by the post-Soviet countries are a completely different phenomenon. There is no doubt that the massive 6-year fall in life expectancy that occurred in 1990–94 was precipitated by endogenous social, political and economic upheavals that accompanied the break-up of the USSR.9,10 A comprehensive explanation of how this massive societal dislocation was translated into such a rapid mortality increase has yet to be provided, although alcohol is very likely to have been an important proximal risk factor.8 While this period saw a sharp decline in national per capita income this
had little effect upon mortality in childhood and old age—normally the most vulnerable groups in an economic crisis. Intriguingly, the second phase of the recent decline in Russian life expectancy, that began in August 1998 after the foreign exchange crisis, coincided with increasing national wealth per capita.

From a broader perspective, the experience of the Soviet Union and Russia, provide a very general illustration of the consequences of a population being insulated from the exogenous influences discussed by Preston. The ‘iron curtain’ of the cold war provided a relatively impermeable barrier to exchanges between East and West. It could be argued that this was more pronounced in the field of medicine and public health than in many others. In Russia today, epidemiology is still largely thought of (and taught) as being concerned solely with the monitoring and control of communicable diseases—as it was in the UK 60 years ago. This is despite the fact that cancer, heart disease, injuries and violence are the major components of mortality that separate Russia from many other industrialized countries. Strategies for the control of non-communicable diseases are only just coming onto the national agenda, although expertise in these areas is very scarce. A recent analysis of avoidable mortality found that this accounted for an increasing fraction of the East–West differences, and concluded that ‘Our findings suggest that the Soviet health care system has failed to match the achievements of the West over the past three decades, highlighting the need to establish a system that provides effective and equitable care for the Russian population.’

Looking to positive changes and developments that were not fully anticipated in 1975 one of the most obvious has been the extraordinary improvements in child survival. The child survival revolution provides one of the more tangible illustrations of the sorts of exogenous factors that Preston highlighted as explaining mortality decline, including the expanded programme of immunization (EPI) and the development of oral rehydration therapy (ORT) for the treatment of infant diarrhoeal disease. Both could be seen as good examples of imported health technologies. Modern formulations of ORT are attributed to work in the US and Britain in the late 1940s. However, its enormous value only became apparent following its inspired but opportunistic use during the refugee crises in Bangladesh in the early 1970s. Its development from this point onwards was done in low income countries. This has led some to argue that ORT is in fact an example of a reverse transfer of technology, an appreciation of its value in high income country settings has lagged behind that in low income countries. Of course, ORT and EPI are only part of the child survival revolution. The importance of large scale social mobilization around the control of diarrhoeal disease has been central, and it is very likely that improvements in personal hygiene and behaviours including hand washing have played a role in prevention.

In summary, Preston’s 1975 paper continues to provide a valuable conceptual framework for analysing the factors which influence mortality at a national and global level. His conclusion that factors exogenous to a country’s own per capita national income were key mortality and health drivers in the middle of the 20th Century is likely to apply even more in today’s increasingly globalized world.

References

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