

Viewpoint: Time travel with *Oliver Twist* – Towards an explanation for a paradoxically low mortality among recent immigrants

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Summary

First-generation immigrant populations in industrialized countries frequently have a lower mortality than the host population, a finding that is unexpected and often dismissed as the result of bias. We propose an alternative explanation for a real, albeit temporal, mortality advantage. We base our argument on two premises: First, that there are differences in the progression of the health transition between the immigrants' countries of origin and industrialized host countries; and, second, that there are differences in the speed at which changes in mortality from various causes occur after migration. Mortality from treatable communicable and maternal conditions, still high in many countries of origin, quickly declines to levels close to those of the host country. Mortality from ischaemic heart disease, the most common cause of death in the host countries, takes years or decades to rise to comparable heights. This is because of the time lag between increases in risk factor levels and an increased risk of coronary death. Hence, first-generation immigrants may initially experience a lower mortality than the host population, a point that has so far been under-appreciated in discussions of immigrant mortality. After adopting a western lifestyle immigrants face an increasing risk of ischaemic heart disease. The increase occurs on top of a persisting risk from conditions associated with childhood deprivation, e.g. stomach cancer and stroke – the unfinished agenda of the health transition that immigrants experience.

keywords health transition, migrants and transients, modern history of medicine, public health

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A thought experiment

Let us assume, for a moment, that *Oliver Twist* (Dickens 1837–1839) and his literary contemporaries of the 1830s could have migrated to twenty-first century England, Germany, the US or another industrialized country. How would a change of residence in time have altered their mortality risk? This question, bizarre as it may seem, is of public health interest. We shall see that an answer can help to understand why the mortality among many of today's immigrant populations from countries such as Mexico (Wei *et al.* 1996), Turkey (Razum *et al.* 1998), China (Sheth *et al.* 1999), or Vietnam (Swerdlow 1991) is substantially lower than that of their host population from an industrialized country (Table 1) – quite unexpectedly so, given the socio-economic inequality immigrants are often facing. Attempts to explain this paradox have long

focused on (self-)selection of healthy individuals into migration, the 'healthy migrant effect' (Kliewer 1992); on inaccuracies in population figures (Ringbäck Weitoft *et al.* 1999); and on bias, e.g. a return of critically ill individuals to their country of origin, which would render them statistically immortal (Raymond *et al.* 1996). Recent evidence, however, suggests that selection effects, error and remigration cannot fully account for the mortality advantage (Swerdlow 1991; Abraido-Lanza *et al.* 1999; Razum *et al.* 2000) – hence the search for an alternative explanation.

In our thought experiment, the protagonists from *Oliver Twist* would migrate from a society with pervasive poverty and high mortality (Szreter 1999), mainly from infectious and maternal causes, to a society that has in the past 150 years undergone a gradual shift to a lower mortality, mainly from chronic, lifestyle-related diseases such as

Table 1 Mortality risk of immigrants *vs.* host population, age-adjusted

Country of origin	Host country	Data source	Risk estimator	Men	Women	Source
China	Canada	Canadian Mortality Database	Relative risk	0.55	0.63	Sheth <i>et al.</i> (1999)
Mexico	USA	National Longitudinal Mortality Study	Hazard ratio	0.57	0.60	Abraido-Lanza <i>et al.</i> 1999
Vietnam	UK	National Health Service register (cohort)	Standardized mortality ratio	0.64	0.56	Swerdlow (1991)
Southern Europe*	Germany	German Socioeconomic Panel	Relative risk		0.68	Razum <i>et al.</i> (2000)

* Countries of origin of 'guest workers' who migrated to Germany mostly in the 1960s (Turkey, Yugoslavia, Portugal, Italy, Spain). Relative risk estimate for men and women combined.

ischaemic heart disease (Feachem *et al.* 1992). This health transition progressed in close association with changes in social and living conditions, lifestyle (the 'risk factor component'), and health care provision (the 'therapeutic component'). We shall discuss the likely effect of migration on the mortality experience of protagonists from *Oliver Twist* and assess evidence relating to risk factor prevalence and mortality experience among today's immigrants from transitional, economically less developed or less urbanized countries and regions.

Mortality from infectious and maternal causes

Our imaginary migrants in time would be subjected to immediate and dramatic improvements in the accessibility and effectiveness of medical care, and would benefit from numerous public health measures that have been implemented since their time.

*Oliver's mother may not have died in childbed but could have been saved by modern emergency obstetric services (De Brouwere *et al.* 1998), offered in a public hospital and covered by health insurance or social security.* In spite of worldwide improvements in the treatment of infectious and maternal conditions in the past decades, populations in lower-income countries still face problems of geographical and financial access to and low quality of health services today. A marked gradient in maternal mortality persists (WHO & UNICEF 1996), and women who emigrate to an industrialized country experience substantial reductions in maternal risk, relative to their country of origin (Ibison *et al.* 1996; Razum *et al.* 1999).

Oliver and his contemporaries would escape the high mortality associated with poor sanitation and living conditions (Szreter 1999). For example, they would literally eliminate their risk of dying from epidemic diseases like cholera which ravaged England in 1831 and 1832 (Snow 1855). Little Dick, Oliver's friend from the baby farm, may not have wasted away and died but could have

been diagnosed and put on specific antimicrobial treatment; moreover, his immune response may have been sufficiently strengthened through an enhanced nutritional status so as to avert clinical disease. By migrating to industrialized countries, both our hypothetical time migrants and today's immigrants from lower-income countries profit from environmental and public health measures that prevent the epidemic spread of infectious disease, and from advances in biomedicine that provide a cure for many conditions. For example, their risk of tuberculosis declines rapidly in the presence of simple screening and treatment programmes (Wilcke *et al.* 1998). To sum up, they experience a substantial and almost immediate decline in their risk of dying from maternal and infectious causes, and as a result, their overall mortality and in many cases their infant mortality will be lower than that of their populations of origin – irrespective of (self-) selection of particularly healthy individuals into migration.

Mortality from chronic diseases related to lifestyle

In *Oliver Twist's* time, the prevalence of lifestyle-related risk factors for ischaemic heart disease and particular cancers, common in industrialized countries today, was low. *Oliver lived a childhood free from obesity. He was deprived of sufficient calorie intake (Figure 1) and of meat (assumed to make him rebellious and aggressive), as well as of sugar-sweetened drinks which contribute to childhood obesity today (Ludwig *et al.* 2001). Being, in addition physically active – he walked the 70 miles from the place of his early confinements to London in 6 days – he would be at low initial risk of ischaemic heart disease.* Comparable living conditions prevail in rural areas of low-income countries today (Kitange *et al.* 1993). Having subsisted under such circumstances it will take many years before Oliver and today's immigrants experience a measurable effect of lifestyle-related cardiovascular risk factors on their mortality (Benfante

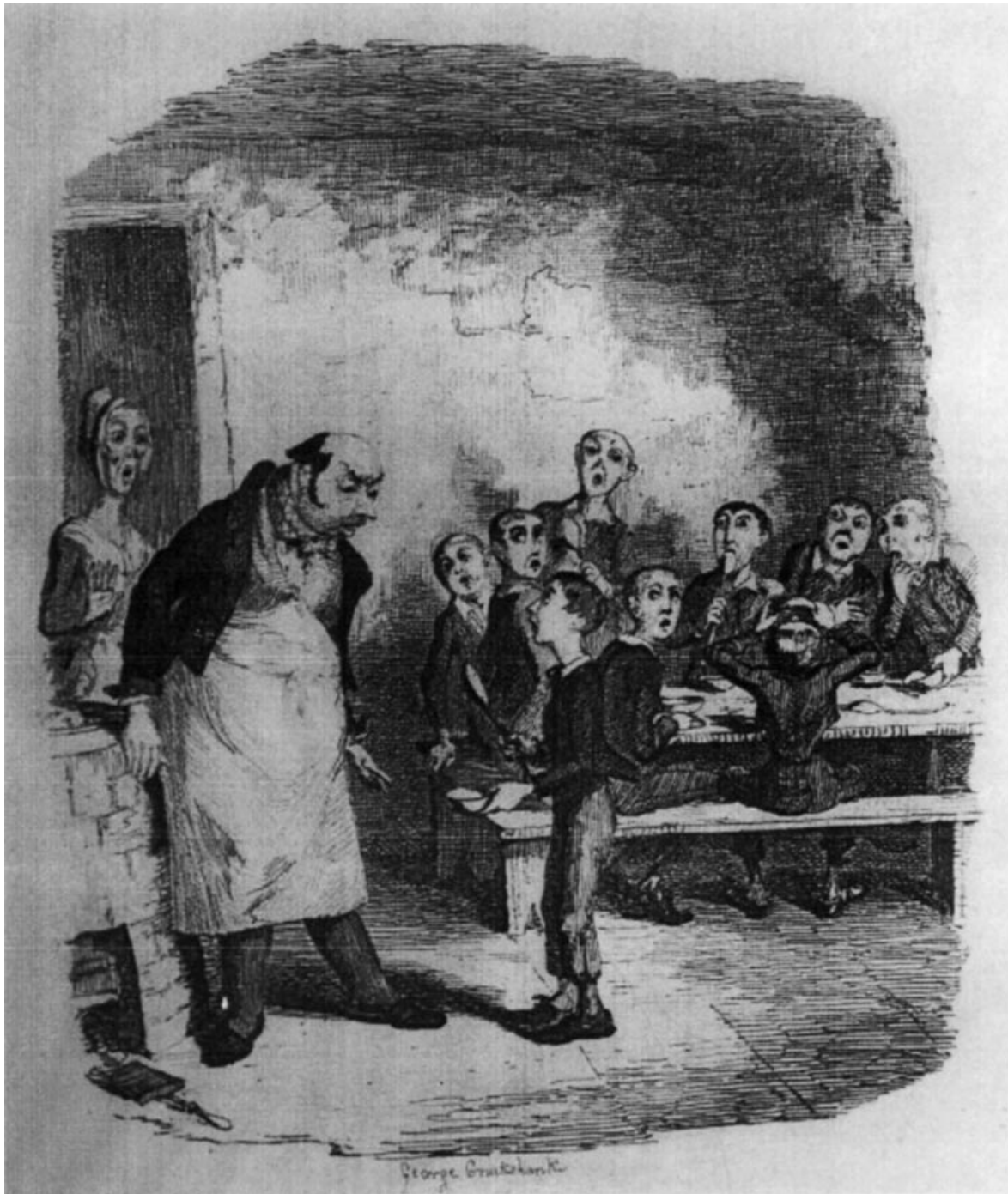


Figure 1 Oliver asks for “some more”. Illustration by George Cruikshank (1837).

1992; Law & Wald 1999; Anand *et al.* 2000); they may even impart their lower risk to the next generation if they maintain their customary lifestyle in the host country (Marmot & Syme 1976).

Mr Bumble, the beadle, led a comfortable life before his downfall and would thus have higher cardiovascular risk factor levels. Assuming that he was of low birth weight and became obese only as an adult he might be at elevated risk

of hypertension (Leon *et al.* 1996) and possibly of haemorrhagic stroke, or, after adopting the lifestyle of today's industrialized countries, of ischaemic heart disease (Barker 1995; Frankel *et al.* 1996). Still, people like him might experience comparatively low and declining mortality from ischaemic heart disease for some years after migration by benefiting from today's biomedical treatment options.

Treatment will show its maximum effect within 2 years, a far shorter period than the risk factors for ischaemic heart disease take to accelerate mortality (Law & Wald 1999).

The different speed at which risk factors and therapeutic interventions show their effect could explain the absence of a secular increase in mortality from ischaemic heart disease observed, e.g. among Turkish migrants in Germany (Razum & Zeeb 2000) and Mexican immigrants in the US (Stern & Wei 1999). Low mortality from ischaemic heart disease is not universal among immigrants from lower-income countries, however. South Asians, for example, are more insulin-resistant than Europeans (McKeigue *et al.* 1989), even before migration (Bhatnagar *et al.* 1995), and experience a comparatively high risk of ischaemic heart disease. Underlying is a gene-environment interaction, or a combination of impaired foetal growth and adult obesity.

Oliver's objectionable acquaintances in London, The Artful Dodger and Master Charley Bates, loved to smoke their long clay pipes, feeling a 'sense of freedom and independence'. But, even they could not have afforded cigarettes (had they already been available) every day and by the pack, as many of today's smokers in industrialized countries can. Depending on their age at migration and the time they take to adapt their smoking habits, they will maintain their relatively lower risk of lung cancer for a number of years. There are parallels to the smoking habits

in the countries from which today's immigrants originate: the proportion of smokers may be higher, but the amount consumed per person lower than in industrialized countries. For example, in the 1960s and 1970s, when many Turks emigrated to Germany, *per capita* tobacco consumption in Turkey was much lower than in Germany (Figure 2). Given the well-known dose-response relationship between tobacco consumption and lung cancer, Turkish immigrants will initially have experienced a lower risk than Germans.

*Oliver and his contemporaries would share a high risk of stomach cancer relative to the host population; stomach cancer is associated with unfavourable hygienic and living conditions in childhood which facilitate the transmission of H. pylori, a key aetiological factor (Swerdlow 1991; Rothenbacher *et al.* 1998; Leon & Davey Smith 2000). Oliver's mother, had she survived, would have been at much lower risk of breast cancer at the time of migration than women in the host country – assuming that she had lower energy intake and higher energy expenditure for much of her life, associated with lower concentrations of ovarian progesterone (Jasienska & Thune 2001). Adult mortality in industrialized countries is largely driven by mortality from ischaemic heart disease, at considerably higher absolute rates than the mortality from stomach cancer in most countries where immigrants originate from (OECD 2000). Moreover, mortality from lung cancer among men and breast cancer among women is higher in industrialized countries than in most lower-income countries (WHO 1996; Jasienska & Thune 2001). Hence, immigrants will initially experience a lower overall mortality than the host population. Their mortality may remain lower for many years, depending on the time they take to adopt a western*

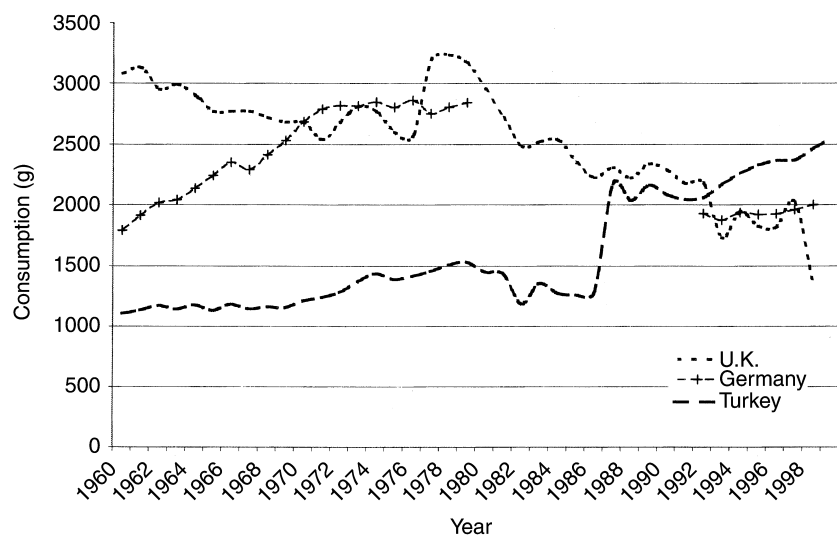


Figure 2 Tobacco consumption UK, Germany and Turkey (grams per capita, age 15 and above; no data available for Germany 1980–91. Source: OECD (2000).

lifestyle. After decades, their mortality from ischaemic heart disease may catch up with that of the host population (Anand *et al.* 2000), while their elevated risk from stroke and stomach cancer is likely to persist (Davey Smith *et al.* 1998; Leon & Davey Smith 2000).

Income inequality and mortality risk

Income inequality in a society is associated with an increased mortality risk at all income levels (Lynch *et al.* 1998), an observation that goes beyond the well-known inverse relation between employment grade and mortality (Marmot *et al.* 1984). Underlying are structural causes such as inequitable distribution of resources, resulting, e.g. in differential access to support and social services (Lynch *et al.* 1998, 2000).

*A comparison of Oliver's destitute childhood with the comfortable living conditions of Mr Brownlow, who later adopts him, illustrates the presence of substantial income inequality in the 1830s. Not much has changed in the geographical distribution of relative poverty in London over the past 100 years (Dorling *et al.* 2000), but by migrating in time Oliver and Little Dick would at least increase their access to effective health and social services.* Many work migrants swap a socio-economically disadvantaged status in a middle-income economy such as Mexico or Turkey for a similar position in a high-income economy like the US or Germany. Income inequality, as measured by the Gini coefficient, is greater in their countries of origin than in the host countries (OECD 2000). Migration may hence be associated with temporal gains in absolute as well as relative levels of income and equity. In the long run, however, minority status and socio-economic disadvantages contribute to increasing the mortality risk of immigrants or their descendants relative to that of the host population (Wei *et al.* 1996; Harding & Balarajan 2001).

Mortality of immigrants and the health transition

Our thought experiment demonstrates that the mortality among migrants in time would be lower than that of the population they originate from. Moreover, it would also be lower than the mortality of the host population, at least for a number of years after immigration. Two factors contribute: Firstly, differences in the progression of the health transition between country of origin and host country. Secondly, differences in the speed at which mortality from infections/maternal causes and lifestyle-related causes change after migration. By migrating in time, Oliver Twist and his contemporaries would experience a transition that is rapid in terms of availability of treatment (the 'therapeutic component' of the health transition) but

slow in terms of changing the relative importance of risk factors for ischaemic heart disease and some cancers (the 'risk factor component').

A similar line of argument can be pursued for migration to industrialized countries today. Latino immigrants to the US (Wei *et al.* 1996; Abraido-Lanza *et al.* 1999), Chinese immigrants to Canada (Sheth *et al.* 1999) and Vietnamese boat people in the UK (Swerdlow 1991), for example, depart from societies that still experience, albeit to varying degrees, a relatively high mortality from infectious and maternal causes and limited access to medical care. The immigrants arrive in post-transitional industrialized countries with a high mortality from ischaemic heart disease and better access to care. Like the hypothetical time migrants, today's immigrants hold a different starting position on the continuum of the health transition relative to the population of the host country; after immigration, they undergo a transition that is rapid in terms of the availability of treatment and slow in terms of the changing relative importance of risk factors. This constellation offers a sufficient explanation for a real (albeit temporal) mortality advantage of immigrants from lower-income or less urbanized, transitional societies.

Attempts to explain the low mortality among migrants relative to the host population have long focused on selection effects and bias alone – it was considered too improbable that a minority group with low socio-economic status should have a lower mortality than the majority population. Our alternative explanation resolves the apparent paradox by considering lifestyle, risk factor levels and mortality among populations of origin; yet it does not imply that immigrants are necessarily healthy or happy – there are numerous studies showing a higher risk of chronic disease, e.g. of mental illness, compared with the host population (Bayard-Burfield *et al.* 2000). Neither does it entail longevity: Our thought experiment implies that immigrants from transitional societies may face a double burden of disease when ageing. First, from diseases associated with deprivation during childhood, e.g. stroke and cancer of the stomach (Leon & Davey Smith 2000) – the 'unfinished agenda' of this health transition. Second, from ischaemic heart disease, as the prevalence of lifestyle-related risk factors increases with time lived in the host country (Anand *et al.* 2000). Hence preventive measures should start now, while mortality from ischaemic heart disease is still low, so that migrants can maintain an initial mortality advantage.

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